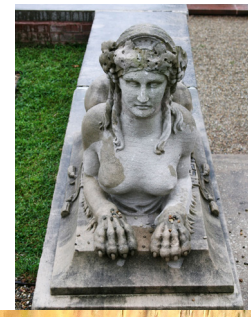
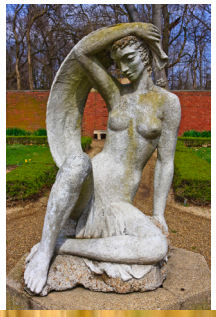
APCAP

ALLERTON PARK CLIMATE ACTION PLAN

TRANSPORTATION



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RESPONDING TO GLOBAL CLIMATE CHANGE...

Unprecedented increases in atmospheric levels of carbon dioxide and other greenhouse gases (GHGs) are responsible for disruption to the stability of our planet's climate. Climatologists have consented that emissions from human activities (i.e. burning fossil fuels) are shaping global climate change – the impacts of which are already being observed and are only expected to increase in severity without significant behavioral change.

In order to avoid the projected effects of climate change, global emissions of greenhouse gases must be reduced by at least 80 percent. Piecemeal and perfunctory efforts to mitigate global climate change will not be sufficient to address an issue of this magnitude; the re-stabilization of Earth's climate will require organizing the knowledge, skills, and motivation of individuals, governments, and societal institutions in an aggressive, coordinated, and comprehensive attack against the causes of climate change.[1]

Illinois Climate Action Plan iCAP...

By signing the American College and University Presidents' Climate Commitment in February 2008, the University of Illinois at Urbana-Champaign (UIUC) joined hundreds of other colleges and universities throughout the nation working to achieve net carbon neutrality by 2050. The Illinois Climate Action Plan (iCAP) was born out of that commitment.

The iCAP provides a framework for realizing carbon neutrality and serves as a macro-level vision for sustainability initiatives at UIUC. The iCAP details emissions reduction targets and outlines strategies to achieve carbon neutrality. According to the iCAP, emissions from transportation accounted for approximately 10 percent of the University's total GHG emissions in 2008. The target for transportation-related emissions assigned in the iCAP is a reduction of 50 percent by the year 2025.[2]

UNIVERSITY CONNECTIONS

The resources and opportunities that Allerton Park provides for the University of Illinois and communities in the region remain largely underutilized. While graduate students have used the park to conduct research on a variety of subjects, including beekeeping, wildlife diseases, forest regeneration, invasive species, and specific features of bird, zooplankton, and deer populations, the park campus is not widely appreciated for its educational opportunities. The conditions that make Allerton Park a perfect model of a living laboratory will be bolstered by the implementation of the sustainability initiatives prescribed in the apCAP.

Allerton Park Climate Action Plan

apCAP...

The Allerton Park Climate Action Plan (apCAP) is the first of a series of more detailed proposals to supplement the iCAP with goals and strategies specific to the needs and resources of on- and off-campus entities. By participating in the development of, and implementing the strategies outlined in, the apCAP, Allerton Park is continuing to exercise its dedication to environmental conservation, and serving as an example of ecological sustainability through institutional reform.

apCAP SUMMARY

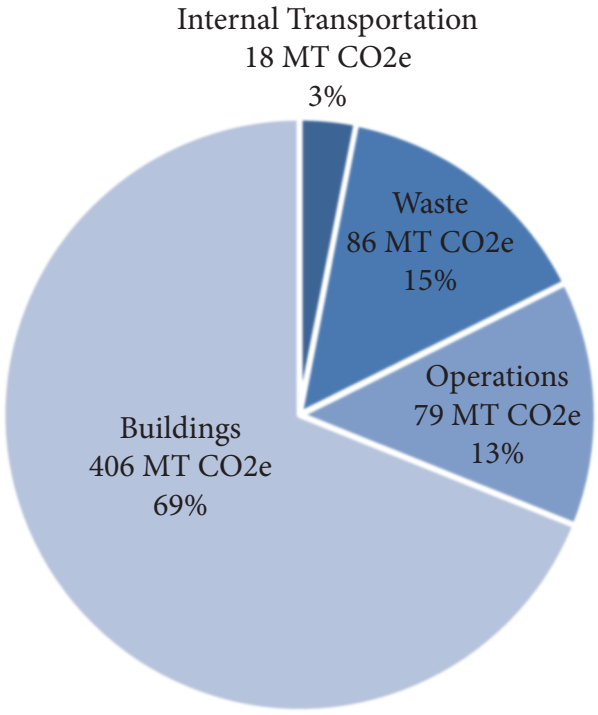
According to the apCAP's Carbon Inventory, energy used in heating, cooling, and providing electricity to buildings accounted for the majority of on-site emissions at Allerton Park in 2011. Although the park generates energy on-site through geothermal heating and cooling systems, wood burning boilers, and a modulating condensing boiler system, Allerton Park is primarily powered by electricity purchased from Ameren Illinois.

Buildings at Allerton Park produced 406 metric tons (MT) of carbon dioxide (CO2) and carbon dioxide equivalent (CO2e) emissions, or 69 percent of the park's total GHG emissions. Emissions from solid waste generation and disposal and wastewater treatment accounted for 86 MT CO2e, or 15 percent of total GHG emissions. The consumption of gasoline and diesel fuels and electricity used in park operations contributed an additional 88 MT CO2e, an additional 15 percent, to the emissions total. The remaining 1 percent (9 MT CO2c) of emissions is a product of Allerton Park's fleet of vehicles, referred to as *internal transportation*.

TRANSPORTATION SECTOR

The apCAP addresses Scope 1 emissions (GHG emissions from sources owned or controlled by Allerton Park), Scope 2 emissions (GHG emissions from the consumption of purchased electricity, heat or steam), and to the extent possible, Scope 3 emissions (emissions related to park operations from sources not owned or controlled by Allerton Park), which include those generated by vehicles not owned or operated by Allerton Park. The apCAP cateogrizes the commuting patterns of these vehicles as *external transportation*.[3]

Emissions by Sector (2011)
EXCLUDING EXTERNAL TRANSPORTATION

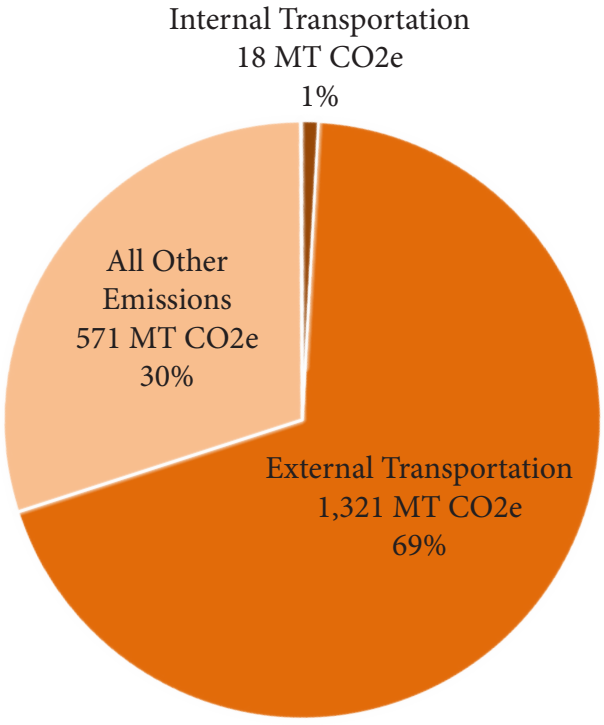


EMISSIONS INVENTORY

Including external transportation in the emissions inventory raises the value of total CO2e emissions by 1,321 MT. Transportation emissions account for 69 percent of the new total, which qualifies transportation as the primary source of GHG emissions at Allerton Park. The exact impact of external transportation is difficult to assess because its two components, staff commuting and visitor commuting, are complex and difficult to monitor, but the probable magnitude of the effects of commuting behaviors demands official recognition and attempts at mitigation.

Another way in which this plan differs from the apCAP is in the classification of transportation and services & operations. This plan classifies the park operations that require moving between locations, and that depend on petroleum-based fuels to do so, as part of the internal transportation sector. As a result, the emissions reduction strategies outline in the apCAP may be less feasible.

Emissions by Sector (2011)
INCLUDING EXTERNAL TRANSPORTATION



VISITOR & STAFF COMMUTING

To assess visitor commuting patterns, traffic counts were derived from the use of pneumatic road tubes located near the park entrances. According to data from these devices, 66,704 trips were made to the park in 2011 (Appendix A). Visual traffic counts were also conducted to determine the number of passengers in vehicles commuting to Allerton Park. On average, 1.44 people occupy each vehicle entering Allerton Park; this number has been multiplied by the number of trips from the traffic count to estimate visitor patronage for fiscal years (FY) 1991 through 2011. According to these estimates, approximately 96,054 people entered Allerton Park by personal automobile.

The average length for visitor trips to Allerton Park is assumed to be 52 miles round-trip from point of origin. This figure equates to the roundtrip distance to Allerton Park from both Champaign-Urbana and Decatur, IL. Champaign-Urbana is assumed to be the origin of most visitor trips to Allerton Park, as it is the home of the University of Illinois and the place of residence for the majority of park employees. Residents of Monticello, the nearest municipality, also make a significant contribution to visitor commuting, but Monticello's close proximity to Allerton Park (5.0 miles) helps to average out extended trips originating from elsewhere in Illinois.

Based on these assumptions, the probable total distance traveled in trips to Allerton Park in 2011 is approximately 3,468,608 miles. The assigned fuel efficiency for visitor vehicles is 23.8 miles per gallon (MPG), based on the average fuel economy of light-duty vehicles, according to fuel economy statistics released by the United States Department of Transportation's (USDOT) Bureau of Transportation Statistics in 2009.[4] Dividing the total distance traveled by the average fuel efficiency and multiplying by the number of trips made reveals the total fuel consumption for visitor vehicles in 2011 to be 145,740 gallons of gasoline. This number is significantly less than the total fuel consumption in 1992, but considerably more than the total fuel consumption in 2002. To some extent, gasoline and diesel usage is responsive to technological advances in fuel efficiency, but the strongest indicator of fuel consumption is number of trips by visitors.[5]

(3,468,608 miles ÷ 23.8 MPG) X 66,704 trips = 145,740 gallons of fuel

According to the Clean Air-Cool Planet Campus Carbon Calculator[6], every mile driven contributes 14.0 ounces of carbon dioxide (CO2), 0.003 ounces of methane (CH4), and 0.01 ounces of nitrous oxide (N20) to the atmosphere. These measurements can be expressed as 0.898 pounds of carbon dioxide equivalent (CO2e). When assessed collectively, visitor and staff commuting in 2011 is shown to have produced

- 127,522.5 pounds of Carbon Dioxide
- 27.33 pounds of Methane
- 91.09 pounds of Nitrous Oxide

or

- 1,321 metric tons CO2e.[7]

The apCAP advocates for a reduction target of 10 percent for visitor commuting, and suggests the following strategies to achieve this goal by 2015:

2 percent reduction by 2013 – Implement a Master Transportation Plan

Decrease emissions by 26.42 MT CO2e

2 percent reduction by 2014 – Create GHG incentives for visiting cars based on their relative efficiencies

Decrease emissions by 26.42 MT CO2e

4 percent reduction by 2014 – Construct bicycling infrastructure

Decrease emissions by 52.84 MT CO2E

2 percent reduction by 2014 – Create a subsidized bike sharing program

Decrease emissions by 26.42 MT CO2e

A Critique of the apCAP Emissions Reduction Targets

2 percent reduction by 2013 – Implement a Master Transportation Plan

While the implementation of the apCAP: Transportation Plan may result in a decrease in emissions, the potential reductions are discussed alongside the strategies outlined in the plan. The implementation of the plan cannot be credited for reducing emissions because the reductions are already being counted. Doing so would result in inaccurate emissions measurements.

2 percent reduction by 2014 – Create GHG incentives for visiting cars based on their relative efficiencies

Because Allerton Park is free to the public, it is not possible to provide monetary incentives, such as reduced entrance fees, to visitors. The ample parking at Allerton Park also prohibits using preferred parking as an incentive to drive fuel-efficient vehicles. Despite the impracticality of providing incentives to visitors, this strategy may also indirectly encourage driving SOVs. In order to achieve the largest transportation-related GHG reductions, Allerton Park's policies should promote transit and active transportation options over automobile use, even when those automobiles are more efficient than average.

INTERNAL TRANSPORTATION

The fleet of vehicles used for maintenance and other park operations generated approximately 1 percent of the park's total GHG emissions and 1.33 percent of all transportation-related GHG emissions. When assessed as a part of all park emissions, the environmental effects of the internal transportation sector seem negligible. However, the goal of the apCAP and this transportation plan is to provide strategies to reduce emissions wherever and whenever possible. The recommendations within this text are designed to decrease energy usage and emissions by encouraging a shift in cultural perceptions concerning transportation. By implementing these recommendations, Allerton Park is functioning as a living laboratory and encouraging positive behavioral changes for it employees.

In 2011, the fleet consumed 1055 gallons of gasoline and 842 gallons of diesel fuel and collectively generated 17.88 MT of CO2e gases. Fuel consumption data was obtained by analyzing the paper slips filled out upon each purchase of fuel (Appendix B) and adding the individual totals of each vehicle or piece of equipment. The slips are filled out by hand, then loosely bundled; a lack of enforcement and standardization in terminology makes it difficult to interpret the information provided. It is possible that some data is missing from the analysis. Nevertheless, the data collected is sufficient for identifying the major polluters within the park fleet.

ALLERTON FLEET FUEL EFFICIENCY RANK	VEHICLE	AVG. MPG
1	2001 Chevy 3500 Express Van	15.5 MPG
2	1976 Dodge Ram	15 MPG
3	1988 Chevrolet Cargo Van - CG11305	14 MPG
4	1987 Ford F-SuperDuty XLT	13 MPG
5	2008 Ford F550 SuperDuty	12 MPG
5	1999 GMC 3500 HD 1 Ton Flatbed Truck	12 MPG
6	1981 Ford 800 FMC	11 MPG
6	1976 Dodge W-200 M880 4WD 3/4 Ton	11 MPG
7	1980 Chevrolet C70 Dumptruck	10 MPG
8	1965 Ford F250 Firetruck	9 MPG

Table 1.0 - Allerton Fleet Fuel Efficiencies

Table 1.0 shows the identifying information of the fleet vehicles and their respective fuel economies, from most efficient to least. While most vehicles in the fleet are used for specific purposes, the fuel efficiency hierarchy depicted in Table 1.0 should inform automobile choice. Fuel efficiencies should be indicated on tags attached to the keys of the respective vehicles to help staff quickly determine which vehicle to use first.

STAFF COMMUTING

The majority of the staff at Allerton Park completed a survey to assess their transportation mode choices, transit options, and travel behaviors. *Personal automobile* was identified as the most popular modal choice for commuting, but participants also reported commuting via motorcycle and bicycle. Four of the twelve respondents reported carpooling with other staff members with varying degrees of regularity. No respondents reported having access to transit options. The results of this survey were used to supplement existing data concerning employee place of residence and commuting frequency. Unfortunately, the survey was not made available to Allerton Park's group of volunteers, even though many maintain consistent work schedules and commuting habits.

The data provided by the employees revealed that commuting by staff accounted for approximately 56,680 vehicle miles traveled (VMT), which required 2,382 gallons of gasoline, and contributed 21.2 MT CO2e emissions to the atmosphere.

The apCAP advocates for a reduction target of 10 percent for staff commuting and suggests the following strategies to achieve this goal by 2015:

3 percent reduction by 2013 – Explore possibilities for telecommuting
Decrease emissions by 1,402.14 pounds CO2e

7 percent reduction by 2014 – Develop an employee carpool program with incentives
Decrease emissions by 3,271.66 pounds CO2e

ALLERTON FLEET

The apCAP advocates for a reduction target of 60 percent for gas-powered fleet vehicles and suggests the following strategies to achieve this goal by 2016:

50 percent by 2014 – Assess replacing 1976 Dodge Ram with fuel-efficient alternative
Decrease emissions by 4.7 MT CO2e

10 percent by 2016 – Assess replacing John Deere Gator Utility Vehicle with fuel-efficient alternative
Decrease emissions by .94 MT CO2e

The apCAP advocates for a reduction target of 50 percent for diesel-powered fleet vehicles and suggests the following strategy to achieve this goal by 2015:

50 percent by 2014 –
Assess replacing Kubota Tractor with a fuel-efficient alternative
Decrease emissions by 4.24 MT CO2e

In addition to the vehicles powered by fossil fuels, Allerton Park owns six electric carts used in daily operations. The carts are currently powered by electricty purchased from Ameren Illinois, which produces energy using a fuel mix comprised of approximately 75 percent coal. In 2011, the carts expended 2,228 kilowatt hours (kWH) of electricity and contributed 2.0 MT CO2e to the atmosphere. Energy usage data was collected from Ameren Illinois account statements and utility metering. Electricity demand from the six carts was responsible for approximately 11 percent of the total 17.88 MT of CO2e emissions generated through internal transportation. Allerton Park is currently in the process of acquiring and installing photovoltaic panels to create a solar-powered charging station for the electric vehicles of the fleet.

The apCAP advocates for a reduction target of 100 percent for the fleet vehicles powered by electricity and suggests the following strategy to achieve this goal by 2015:

100 percent by 2013 –
Install solar recharge station

These goals, though ambitious, will not be impossible to realize with concerted effort from all members of the Allerton Park community.

ROBERT ALLERTON'S LEGACY

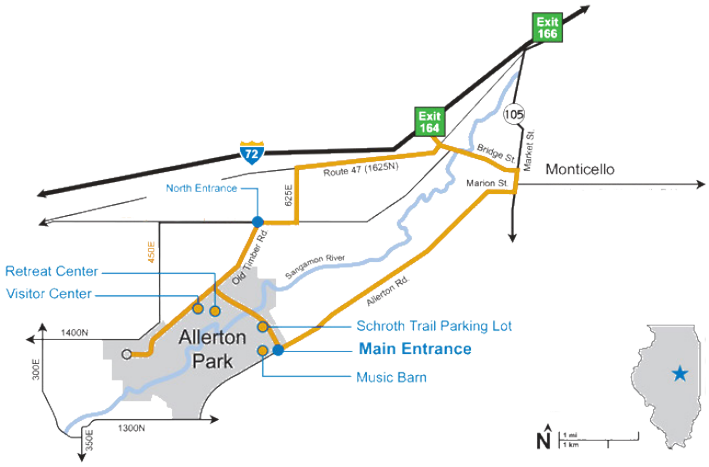
In 1897, Robert Allerton, son of the handsomely wealthy Chicago business mogul Samuel Allerton, made the decision to pursue his interest in farming. The younger Mr. Allerton took occupancy of his father's 19,000 acre farm just west of Monticello in Piatt County, and used the estate as a canvas on which he imaginatively placed a stunning arrangement of formal gardens, sculptures, and other works of art. In 1946, Mr. Allerton left 5,500 acres of the estate he endearingly referred to as "The Farms" to the University of Illinois. The university converted approximately 1,500 acres of the estate into a public park and a retreat center to be used for conferences and other university events.[8]

The legacy of the son of an industrialist may seem unrelated to the issue of climate change, but the unique characteristics of Robert Allerton's former estate present many opportunities to solve unorthodox challenges to achieving the goals of emissions reduction and environmental sustainability. The recommendations found in the apCAP are based on the best and latest empirical research concerning energy conservation and carbon emissions mitigation. However, the inimitability of Allerton Park encourages uncertainty about the applicability of some strategies; innovation and flexibility will be required to achieve success with the climate action plan.

REGIONAL ACCESSIBILITY

Allerton Park is located in the east-central part of Illinois, in the Willow Branch Township of Piatt County, approximately five (5.0) miles west of downtown Monticello. The park is accessible by vehicle from three entrances: a main entrance on Allerton Road at the east end of the park, a secondary entrance from Old Timber Road in the north, and a tertiary entrance from County Road 450 East.

Allerton Park is easily accessible by vehicle from Interstate 72, which runs east-west through Piatt County and connects Monticello to the cities of Decatur and Champaign-Urbana, and Old Route 47, a major non-urban collector roadway. The park's proximity to I-72 has impacted the development patterns of the surrounding land. Its adjacency to a major transportation route increases opportunities for regional growth.



Accessing the park by bicycle and other forms of active transportation can be difficult and unsafe on these roads due to a lack of dedicated pedestrian and bicycle paths. Piatt County has identified the lack of pedestrian, bicycle, and transit facilities as a transportation issue, and has indicated multi-modalism as an objective of their transportation plan. A mile long shared use path, the East Prairie Bicycle Trail, was constructed to the east of Monticello, and the county is developing plans for additional paths to connect Monticello to the Heartland Pathways, the village of Bement, and Allerton Park (Appendix C).

The development of additional transportation options will enhance Allerton Park's connectivity to the surrounding area, and will help to cement its status as a valuable space for the Monticello and University of Illinois communities.

According to the Piatt County Comprehensive Plan, 1,696 students were enrolled in the Monticello Community School District in 2007. 56 percent of those students were enrolled in grades 6 through 12. These youths represent a demographic that has the opportunity, energy, and flexibility to visit Allerton Park regularly, but is prevented from doing so because of issues related to accessibility.

According to data from the 2000 census, 83.5 percent of Piatt County residents over the age of 16 commute to work by driving alone, while 7.6 percent carpool. Ride sharing in 2000 had decreased from 1990 levels by 38.9 percent. Commuting via public transportation, motorcycle, and bicycle each accounted for approximately one tenth of one percent of the total modal share.[9]

The goals and objectives identified by public participants in the development of the Piatt County comprehensive plan reveal that transportation in Piatt County is perceived to be inadequate in the areas of safety, convenience, and cost. The county has identified roadway infrastructure and signage, land use, and transportation agency management as key areas needing improvement in order to facilitate accessibility by public transit and active forms of transportation (i.e. walking and bicycling).

OBJECTIVES:

The objectives of the Allerton Park Transportation Plan include increased accessibility, reduced energy use and emissions generation, environmental protection, enhanced quality of life, and improved health and safety.

o *Accessibility*: Maximize access for local residents and UIUC faculty and students

Accessibility is influenced by many factors, including but not limited to, mobility, density, land use patterns, and transit options. The paradox of sustainable transportation initiatives at Allerton Park emerges from the dual objectives of increasing park patronage and decreasing total VMT. This plan provides a number of proposals that will increase accessibility and reduce transportation-related emissions.

o *Climate Change and Energy Use*: Decrease the use of fossil fuels through reduced travel demand (RTD), investment in technological advancements, and a transition to renewable energy sources

Single-occupancy vehicles (SOV) are the primary means of transportation to Allerton Park; they are also the most energy-intensive. Emissions from vehicles powered by burning fossil fuels can be suppressed by reducing the number of SOV trips (trip degeneration) and travel distances, increasing vehicle occupancy levels (ride-sharing), and increasing the share of trips by active transportation.

o *Environmental Protection*: Protect and restore Allerton Park's natural resources

o *Quality of Life*: Create excellent places and provide high-quality amenities to increase the collective value of the region

o *Health and Safety*: Encourage healthy and active lifestyles for all visitors, including pedestrians

TRANSIT

Public transportation is an important part of increasing access to Allerton Park. If used effectively, the limited regional public transit system can help to encourage visitor patronage.

In 2001, 92 percent of households in the United States owned at least one car, and 59 percent owned two or more. In rural areas, where density is low and development is dispersed, public transit services are often unable to compete with the convenience and mobility of automobiles. The prevalence of free parking also deters transit ridership. In addition to the access and travel opportunities that personal vehicles allow, automobile use provides the additional benefits of high mobility, an awareness of freedom and speed, a sense of pride in car ownership, and the feelings of excitement associated with operating a vehicle. These benefits are not sufficient reasons to advocate for increased POV use, but efforts to increase transit ridership and reduce VMT will be more successful if they take into account the factors that have contributed to the individual and collective dependence on automobiles that is a part of the culture of rural and suburban life.[10]

In order to discourage personal vehicle use, alternative transportation modes have to be perceived as attractive. Travel via transit can be promoted as desirous on its own, but transit offers additional amenities, including scenery, company, freedom from the stress and expense of automobile use, novelty, and flexibility. Studies on transport for tourism (mostly conducted in Europe) indicate that initiatives to encourage public transport to recreational areas are more successful when the travel and tourism elements are packaged and promoted together. While entrance to Allerton Park is free for the public, the special events that would attract the number of visitors necessary to effectively use transit are not. Public transportation to Allerton Park should be marketed alongside park events, and bus passes should be made available for purchase with reduced-cost tickets to concerts and other special events.[11]

University students are less likely to own cars themselves, and are therefore more likely to regularly utilize public transportation. Students comprise a strong potential market for transit, due to their low incomes and flexible schedules, and Allerton Park has been exploring options for bus service from Champaign-Urbana in order to increase accessibility for University of Illinois students. The Piatt County transportation agency, Piattran, primarily provides transit options for residents of Piatt County with special transportation needs. Piattran does not have the resources to provide transportation for more than six passengers per trip, and could only carry passengers in return trips from Champaign-Urbana to Piatt County. The Champaign-Urbana Mass Transit District (CUMTD) has sufficient resources, but could not provide transportation to and from the park without significant profit loss per trip. annual lump-sum contract negotiated between the University and CUMTD.[12]

NS REDUCTION STRATEGIES

The CRIS Champaign Rural Mass Transit agency is able to provide transportation for 14 riders at a cost of fourteen dollars ($14) per passenger. Initially, mass transit will only be an option for special events and during peak times of the year at Allerton Park, but as the park provides more services and activities for university students and other residents of Champaign-Urbana, and as the region realizes projected growth, the demand for alternative transportation options to Allerton Park will increase. As opportunities for ridership increase, Allerton Park should encourage the University of Illinois to include access to the park as a criterion of the annual lump-sum contract negotiated between the University and CUMTD.[13]

The Recreation Division and Transportation Coalition of Casper, Wyoming, an isolated suburban community, have worked together to provide transit service to the starting point of a trail for a weekly community walking program. The program has been effective at exposing participants to trailways, while reducing personal vehicle trips and familiarizing Casper's residents with the local bus service. A similar program at Allerton Park could help to initiate patrons to public transportation options and promote ridership.[14]

A meta-analysis of tourism transit programs revealed that consumers' participation was most contingent on the factors of price (whether or not cost was reflected in value), perceptions of convenience and flexibility, stress avoidance, environmental concerns, and the disadvantages of driving. The most cited reasons for using tourism transit in lieu of private automobiles include: vehicle parking issues, stress avoidance, quality public transportation networks, improvements in overall travel experience, and expenses related to car usage.

According to the meta-analysis, transit ridership exhibited an elasticity of 0.5 for increase in service frequency and an elasticity of 0.7 for increase in service miles or hours. Increases in fares account for an elasticity of -0.4 for transit ridership, while the same factor indicates an elasticity of -0.05 for automobile mode share. This enlightening analysis reveals that increases in transit ridership may not result in equal decreases in VMT.[15]

What level of ridership can a transit agency providing trips to Allerton Park expect to experience?

According to a petition made available to students during Quad Day at the University of Illinois, thirty-two individuals indicated an interest in using transit regularly to access Allerton Park. While the students did not indicate whether or not they own personal vehicles, the number of students with cars on campus hovers around a 75 percent share of the total student population.[16] Not every student participates in Quad Day, and those who do rarely visit each booth or table; therefore, the actual number of individuals interested in transit options to visit Allerton Park is probably much higher.

A regular ridership of 32 passengers would prove difficult for administration, as the shuttle buses provided by the CRIS Champaign Rural Mass Transit agency can accommodate only fourteen passengers per trip. Assessing the effects on emissions with a ridership of 28 passengers will provide more accurate results, as CRIS and Allerton Park are unlikely to provide transit service to four or fewer passengers.

The current roster of events at Allerton Park will necessitate transit use approximately 8 times per year, which would reduce the number of SOV trips by 224. The projected and ideal schedule for Allerton Park events indicates the need for transit approximately 36 times per year, which would reduce SOV trips by 1,008.

However, assuming that the 28 passengers are representative of the general population, 75 percent will have personal cars on campus. Even if those students would otherwise be driving SOVs to Allerton Park, 25 percent of the passengers represent an increase in patronage, instead of a transportation modal shift.

The CRIS Champaign Rural Mass Transit agency's fleet consists of Ford E350 and E450 Shuttle Buses with an average fuel efficiency of 12.8 MPG. Using these vehicles as alternative transportation would expend 33 and 416 gallons of diesel fuel for current and projected ridership opportunities, respectively. The consumption of diesel fuel based on the current schedule would contribute .336 MT CO2e to the atmosphere, while diesel consumption based on the projected schedule would contribute 1.512 MT CO2e.

CURRENT SCHEDULE

Applied to the vehicle counts from FY 2011, and based on the current schedule, provision of transit to and from Allerton Park would replace 8,736 VMT and save 367 gallons of gasoline.

FY 2011:
66704 VMT – (168 trips X 52 VMT) = 66,337 VMT

Reduces VMT by 8,736. Saves 367 gallons of gasoline. Decreases emissions by 3.3 MT CO2e.

Increased emissions from transit: .336 MT CO2e.

Difference: -2.964 MT CO2e.

IDEAL SCHEDULE

Applied to the vehicle counts from FY 2011, and based on the projected schedule, provision of transit to and from Allerton Park would replace 39,312 VMT and save 1,652 gallons of gasoline.

FY 2011:
66704 VMT – (756 trips X 52 VMT) = 27,392

Reduces VMT by 39,312. Saves 1,652 gallons of gasoline. Decreases emissions by 14.7 MT CO2e.

Increased emissions from transit: 1.512 MT CO2e.

Difference: -13.188 MT CO2e.

The projected reductions in emissions would alleviate approximately 1 percent of the 1,321 MT CO2e. If SOV use increases alongside transit use as Allerton Park provides more events and entertainment, the actual emissions reductions will be even less than 1 percent of the total. Transit use must be combined with other strategies that are equally or more effective.

ACTIVE TRANSPORTATION

The least carbon-intensive forms of transportation are those powered by human movement (i.e. walking, running, bicycling, skateboarding). Trips by walking and bicycling produce zero emissions and provide an opportunity for individuals to be physically active. The factors that influence walking and bicycling include culture, individual preferences and circumstances, and the extent to which the environment encourages or discourages active transportation. As non-motorized modes of transportation become more convenient and appear more attractive, park patrons may choose these modes over SOV use, which would effectively reduce VMT and related emissions. Any serious effort to reduce the use of personal vehicles by increasing walking and cycling requires the installation of appropriate infrastructure and facilities.[17]

The effect of the pedestrian environment on VMT is difficult to measure, and studies on those factors differ greatly in their conclusions. The presence of sidewalks in neighborhoods is associated with a .14 percent decrease in VMT. Similarly, each mile of roadway with sidewalks within 1 mile of an individual's residence decreases VMT by an additional 0.645 miles. The limited size and unique characteristics of active transportation study areas makes it difficult to generalize conclusions to Allerton Park. Additionally, the effect that active transportation infrastructure will have on travel behavior near and within Allerton Park is largely contingent on the implementation of Piatt County's active transportation policies, which include the installation of bicycling infrastructure and facilities.[15]

The Allerton Park Shared Use Path Plan (2012) recognizes the need for on-street bicycle paths, paths separated from vehicular traffic, and adequate bicycling parking. These elements will help to meet the basic transportation needs of visitors and foster place attachment and a sense of belonging. A meta-analysis of several studies concerning bicycle commuting indicates a positive correlation between levels of bicycle commuting and bike lanes or paths.[15] The results of some studies suggest the cycling commuters will sometimes take longer routes in order to use bike lanes. Indirect benefits of using active transportation infrastructure to reduce vehicle miles traveled (VMT) include increased safety from separating pedestrians and cyclists from automobile traffic, stronger relationships between visitors and the natural environment, positive health benefits from physical activity, increases in visitor patronage, and the enjoyment associated with the proposed recreational amenities.[18]

In the coming decades, bicycling is expected to become a more common mode of transportation. To prepare for this change, and to help to facilitate it, Piatt County has proposed plans to develop bicycling infrastructure and amenities. The Allerton Park Shared Use Path Plan calls for the construction of approximately 2.71 miles (4.37 km) of interconnected, paved trails. By implementing the recommendations from the Shared Use Path Plan, Allerton Park will strengthen its connections within the region and increase the likelihood that Piatt County and Monticello will implement their plan to connect to the park via bicycle paths.

The completed path will be accessible from County Farm Road and Allerton Road. Entrances within the park boundaries will be located at the House in the Woods, the Gate House, the intersection of Old Timber and Old Levee Roads, the Diversified Farm, the base of the former WILL broadcast tower, and the Schroth Trail Parking Lot.

In order to take full advantage of the existing trails and greenways and those being developed throughout Piatt County, the leadership and decision-makers at Allerton Park need to be intentional about developing public and private partnerships with local governments and institutions and promoting alternative transportation. The capital costs for bicycle path construction are significantly less than the costs for constructing and expanding roadways, and bicycle infrastructure can be aggressively marketed for its benefits, which include more opportunities to engage in physical fitness, more opportunities for recreation-based tourism, enhanced neighborhood connectivity, increased safety, and sustained attention to the issues of environmental preservation.

The University of Illinois's 2013 Campus Bike Plan identifies the following five goals which will be used to guide all decisions concerning bicycles and bicycling infrastructure:

1) Increase safety for all campus users, including pedestrians, bicyclists, transit riders, and motorists
2) Increase sustainability of campus transportation
3) Improve mobility and accessibility for cyclists on campus
4) Fund the ongoing and future improvement of campus bicycle facilities, services, and programming
5) Renew the University's standing as a national leader in bicycle friendliness

Although Allerton Park is not located within or near the University's main campus, the goals of the Campus Bike Plan may be generalized to the park. Coincidentally, the five goals outlined by the 2013 Campus Bike Plan are supported by the recommendations of the 2012 Allerton Park Shared Use Path Plan.

SHARED USE PATH PLAN

The Shared Use Path Plan calls for the installation of 2.71 miles (4.37 km) of active transportation infrastructure, which is to be constructed in three phases.

Phase 1 consists of the development of a linear paved trail measuring 0.57 miles in length, which will span from the House in the Woods to the intersection of Old Timber and Old Levee Roads.

Phase 2 calls for the extension of the path developed in Phase 1 by 0.70 miles, which would culminate in a trailhead near the Diversified Farm.

The first part of the third and final phase (Phase 3A) will require extending the path an additional 0.20 miles to the intersection of Old Timber and County Farm Roads. Implementing Phase 3B will require the construction of 0.20 miles of paved surface commencing along Allerton Road east of Old Levee Road, and extending northwest and around the former WILL radio broadcast tower before intersecting perpendicularly with Old Levee Road. At this point in development, the constructed infrastructure can be categorized as an Off-Road Shared Use Path. The remainder of Phase B involves the creation of a dedicated Bike Lane, identified by lane markings and signage, to extend from this intersection to the Old Timber and Old Levee Roads trailhead constructed during Phase 1.

Excerpt from Allerton Park Shared Use Path Plan *(2012)*

BICYCLING AMENITIES

BIKE PARKING

Bike parking – especially secure and sheltered, quality parking – is necessary for encouraging bicycle use and integrating bikes with other forms of transportation. The modal share of transportation by car has an estimated elasticity of -0.01 with respect to bicycle parking, and the frequency of bicycle commuting has been found to have a positive association with bicycle facilities and their perceived quality. Studies suggest that the availability of safe bike parking has a significant impact on the perception of convenience, and can greatly increase bicycle commuting to work.[15]

The Shared Use Path Plan calls for the installation of 29 bike racks which will be able to accommodate approximately 50 to 60 bicycles at capacity. Bicycle parking will be provided at the locations that provide the highest level of connectivity to and within the park.

5 units at the Main Parking Lot

2 units at the Diversified Farm

5 units at the Visitor Center

2 units at the Gate House

5 units at the Mansion/Retreat Center

2 units at the Sun Singer

2 units at the Evergreen Lodge

2 units at the Lost Garden

2 units at the Buck Schroth Parking Area

2 units at the House in the Woods

SHOWER FACILITIES

Studies indicate that employees are more likely to commute by bicycle if their employers provide end-of-trip facilities (e.g. bike parking and showers). The Retreat Center, House in the Woods, Gatehouse, and Evergreen Lodge currently have shower facilities, but the showers are located in rooms that are sometimes rented out for visitor lodging. To encourage commuting by bicycle, running, and jogging, Allerton Park should create one or more dedicated end-of-trip shower facilities for employee use.[15]

An analysis of the UK National Travel Survey revealed that outdoor bicycle parking increased bicycle mode share from 5.8 percent for work commute trips to 6.3 percent. Located bicycle parking inside increased bicycle mode share by another 0.3 percent to 6.6 percent, and adding showers raised the bicycle mode share to 7.1 percent.[15]

BIKE SHARE PROGRAM

In the last decade, bike share programs have experienced a meteoric rise in popularity. Bikes from these programs are used frequently and usually result in increased bike ridership.[18] Bike share rental programs also significantly increase public transportation usage.

A bike share at Allerton Park would allow visitors to take advantage of the recreational trails and paths in the park and to move quickly from one point of interest to another. Providing bicycle access to Allerton Park employees could also help to reduce the number of trips made by motorized vehicles, which contribute to internal transportation emissions.[15] According to Noland and Kunreuther (1995), the convenience of bicycling shares an elasticity of -0.02 with car mode share.[15]

The University of Illinois plans to implement a bike share program for campus employees. The University's program, which will be coordinated by the Transportation Demand Management (TDM) department within the office of Facilities and Services (F&S), will allow interested departments to purchase a small number of new or used bicycles that can be loaned free of charge to departmental employees during work hours. Allerton Park could participate in this program to avoid purchasing and maintenance negotiations and to encourage bicycle travel between the park and campus, or develop a program exclusive to the park that is modeled after the proposed campus bike share.[19]

An employee bike share program at Allerton Park could easily and affordably be extended to the public through the use of a bicycle library or bike kiosk. Students and visitors would be required to deposit a debit or credit card, or some other guarantee of payment, in exchange for access to bicycles, helmets, and locks. Bicycles may be provided free of charge or for a slight fee, but the cost to rent bikes should not inhibit their usage. Additionally, to diminish maintenance and replacement costs, bicycles should be stored where they are safe from inclement weather and theft.

RIDESHARING

Informal ridesharing, or carpooling, occurs regularly at Allerton Park. Among carpoolers, saving money is perceived to be the greatest incentive for participating, but the social opportunities and secure access to vehicles that carpooling provides also encourage the practice. Additional incentives include reduced depreciation from vehicle exertion (wear and tear) and increased personal time (to sleep, read, or eat while commuting).

Carpooling is beneficial to employers, because it reduces parking demand and has the potential to increase productivity and morale. Formal, employer-based carpooling programs use a variety of incentives to encourage participation, including free or reduced cost parking, preferred parking, and commute awards programs (prize drawings, discounts at local businesses, free merchandise, etc.).[15]

To ensure success, Allerton Park should designate an employee or group of employees to serve as rideshare program coordinator(s). The coordinator could use the addresses and schedules provided by interested employees to create a list of potential carpool matches. Most Allerton Park employees and volunteers live in or near Monticello and Champaign-Urbana and maintain similar and consistent work schedules; these factors make carpooling feasible.

Employees and volunteers who would like to participate in the Allerton Park Rideshare Program should register with the program coordinator as a driver or passenger or both. The rideshare coordinator should disseminate a survey to determine what incentives would be the most effective at encouraging participation prior to announcing and implementing the carpooling program.

Nine Allerton Park & Retreat Center employees expressed interest in participating in a rideshare program. The residences of those interested are dispersed throughout Urbana, Champaign, North Heath, Ivesdale, Hammond, and Monticello. Employees were grouped together based on geographic location in order to achieve the largest reduction of VMT and shortest commute times. The nine employees were placed into groups of three and assigned routes. Group A's commute route lasts 33.9 miles and takes 67 minutes to complete each way. Group B's commute route lasts 36.2 miles and takes 60 minutes. Group C's commute route lasts 33 miles and takes 52 minutes to complete. By carpooling, these nine employees can reduce their total commuting VMT from 342.4 to 206.2. The reduction of 136.2 VMT per day translates to an annual GHG emissions reduction of approximately 12.7 MT CO2e, or just under 1 percent of the total GHG emissions from visitor and staff commuting. Carpool vehicles with higher fuel efficiencies and an increase in number of passengers per vehicle can help to further reduce emissions.

Ridesharing Commute Distances and Times

	Group I	
	Miles	Minutes
A - B	16.6	29
B - C	13.1	29
C - *AP*	4.2	9
Total	*33.9*	*67*

	Group II	
	Miles	Minutes
D - E	18.7	23
E - F	10.9	21
F - *AP*	6.6	16
Total	*36.2*	*60*

	Group III	
	Miles	Minutes
G - H	6.9	16
H - I	0.8	3
I - *AP*	25.3	33
Total	*33*	*52*

Table 2.0 - Proposed ridesharing groups

According to the literature on carpooling behavior, saving money and accessing priority parking are the most effective incentives for encouraging ridesharing.[20] The ample parking at Allerton Park does not allow for preferential parking policies; therefore, carpooling should be encouraged with money-saving benefits and by highlighting the intrinsic advantages of carpooling. The Associate Director of Allerton Park, Derek Peterson, has expressed interest in using park merchandise as incentives to carpool. Peterson also suggested giving away or discounting products from the Allerton Park coffee shop, which is currently in development.

The details of cost sharing are generally decided within the carpool groups themselves, but guidelines may be necessary to encourage fair pricing for drivers and passengers. If arrangements are to be determined by individual carpools, the rideshare coordinator should make this clear to participants. Some potential guidelines include:

- Select the carpool route or routes and designate pickup points
- Determine arrival and departure times
- Select a location to gather prior to departure
- Determine who will drive and how often
- Determine commuting costs to be paid by non-drivers
- Collect contact information for carpool members
- Avoid making personal trips during the commute
- Maintain adequate auto insurance[21]

Smartphone users may take advantage of these free ridesharing apps:

iCarpool

iCarpool can be used from desktop computers or as a smartphone app. iCarpool uses cascading matching to facilitate ridesharing for regular commutes and one time trips.

Avego

The Avego app allows users to view driver information and schedule pick-up times. Avego is designed as a cost recovery tool for drivers. Riders pay $1 for the first mile, 20 cents for every subsequent mile, and a 15 percent service charge for each trip.

The University of Illinois has an agreement with Zipcar which allows students, faculty, and staff to join the car-sharing service for the discounted price of $25 and receive $35 of free driving. Zipcars can be rented by the hour or day by any University-affiliated individual 18 or older. Car sharing reduces the number of trips by discouraging vehicle ownership. According to the Zipcar website, each Zipcar removes at least twenty personally-owned vehicles from use. 90 percent of Zipcar members reported driving 5,550 miles or less per year after joining. Allerton Park will advertise Zipcar on the park's website to encourage shared cars and carpooling as means of transportation.[22]

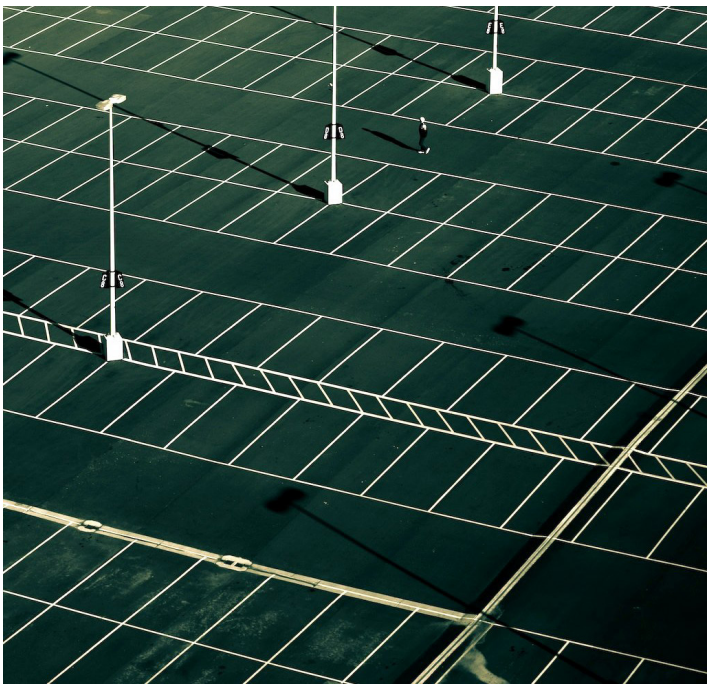
PARKING POLICY

The strongest predictor of travel behavior is the perceived convenience, or inconvenience, of driving, and the most significant factor of driving convenience is parking accessibility. Ample free parking works as an incentive to encourage visitors and employees to choose driving over other modal choices. Additionally, surface parking lots tend to be visually unattractive, due to their expansive size and utilitarian appearance. The placement and design of the Schroth Trail Parking Lot at Allerton Park detracts from the awareness of place which the park seeks to foster, and creates a barrier for pedestrian movement.

The development and maintenance costs of parking spaces vary extensively, but are almost always underestimated. Parking lot construction costs may vary from $177 per space to as much as $1,768. Annual operating costs are just as variable, ranging between $300 and $2,268 per space. (Martin & Hurrell, 2013) Some businesses or agencies are able to recoup construction and maintenance costs for parking lots through parking fees, but free parking is the common practice throughout the country and at Allerton Park. In his seminal work, The High Cost of Free Parking,
Donald Shoup (2002) estimates the total cost of free parking in the United States in 2002 to be between 127 and 374 billion dollars. The financial losses from providing free parking are passed on to and subsidized by society.[23]

The cost of parking is not always obvious; thus, drivers are not always able to make market-based choices. Instead, parking fees are bundled into building and operation costs at workplaces, where they are deducted from employee salaries. The availability and price of parking is the single greatest factor in employees' choice of transportation: in one study, employees who were required to directly pay for parking drove alone 33 percent less than the employees whose parking costs were hidden.[24]

Unbundling the costs of parking would allow Allerton Park to offer employees the choice to keep a parking space at work or to "cash out" (accept payment to give up their parking space). These programs have shown great success where implemented; unfortunately, a cash out program at Allerton Park would not be as effective as elsewhere for a number of reasons:[25]



1) Allerton Park already has ample parking for employees and visitors, with little incentive to remove spaces. Few options exist for parking lot re-use that do not conflict with Allerton Park's "no new construction" policy and historic preservation guidelines.

2) Rather than encouraging alternative modes of transportation, removing parking spaces could discourage park patronage.

3) Allerton Park needs current levels of parking for peak times and special events.

4) Parking at Allerton is owned, rather than leased. Debundling parking provides the greatest financial gains when lots are rented or leased.

5) The parking lots at Allerton Park are not utilized as often as the lots in the studies previously cited; therefore, operation and maintenance costs will be significantly less than estimated.

These factors diminish the power of preferred parking as an incentive for ridesharing, car sharing, and driving high-efficiency vehicles. Developing alternative incentives will require innovation and collaboration with Allerton staff.

FLEXIBLE SCHEDULING & TELECOMMUTING

Telecommuting (sometimes referred to as teleworking) and flexible scheduling should be explored as strategies to reduce VMT. Advances in computer and internet technology have allowed employees to accomplish work tasks in a variety of locations. No longer limited by geography, both employers and employees are recognizing the benefits of moving work to the worker instead of moving the worker to work. Telecommuting is a form of Travel Demand Management (TDM), because it reduces the number of trips made and the total VMT for internal commuting. The US Department of Transportation offers feasibility studies and technical training for telecommuting projects as part of the Congestion Mitigation and Air Quality (CMAQ) Improvement Program.[26]

Telecommuting is not encouraged for all employees of Allerton Park because of the nature of their work, but at least two individual employees are capable of working from home on a semi-regular basis. According to these employees, telecommuting would be possible at least one day per week. The combined VMT of the commutes of these employees equals 58.4 miles each way. Eliminating these trips reduces total annual VMT by 5,840 miles. Assuming a fuel efficiency of 23.8 miles, telecommuting has the potential to reduce GHG emissions by 2.2 MT, or 1.67 percent of the total emissions from visitor and staff commuting.

DRIVING EFFICIENTLY

Park employees and visitors should be encouraged to exercise the most fuel-efficient driving practices.

• In addition to increasing the likelihood of serious accidents, aggressive driving can lower gas mileage by 5 percent (town) to 33 percent (highway).

• Excess cargo can also reduce gas mileage; the effects of carrying unnecessary weight are intensified in smaller vehicles.

• An idling engine can consume up to a half gallon of fuel per hour. A common belief among drivers is that turning off and restarting the engine will consume more fuel than allowing the engine to idle, but it only takes a few seconds worth of fuel to re start a vehicle. Allerton Park staff should regularly practice turning off idling personal and fleet vehicles.

• Vehicles should utilize overdrive gearing, except when towing a load.

• Cruise control should be used for highway driving to maintain a consistent speed, which uses less gas and causes fewer emissions. Cruise control should be avoided in hilly areas.

• The tire pressure of all fleet vehicles should be assessed and corrected regularly to lower rolling resistance, which increases fuel economy.

• Gas mileage decreases rapidly at speeds exceeding 50 miles per hour. Maintaining speed at or below 50 mph will generate a 7 to 14 percent increase in fuel efficiency.[27]

GUARANTEED RIDE HOME SERVICE

A common concern of employees and visitors considering using alternate modes of transportation is that they will be unable to return home in the case of an emergency. Allerton Park could alleviate those fears and remove the incentive to commute by SOV by introducing a “Guaranteed Ride Home” program. With Guaranteed Ride Home (GRH), employees and visitors could contact a designated person in or near Allerton Park who would then be responsible for arranging transportation. Various GRH policies have proven to be successful at encouraging carpooling practices. The GRH program at Allerton Park should be designed to accommodate the needs of the park’s patrons, with recognition of the limitations presented by the park’s location.[28, 29, 30, 31]

GRH programs are usually provided free of charge to employees who register for the service. In metropolitan areas, GRH programs primarily consist of reimbursement guarantees for taxi fares or car rentals, but the number of licensed employees with personal automobiles living in the near vicinity of Allerton Park creates an opportunity to provide GRH service directly. If this arrangement is not possible, the GRH program could utilize any of the three taxi companies providing service to the Monticello area: Quasi Taxi, Quality Limo and Taxi, and City Transit Taxi Cab.

Common stipulations for GRH service:

GRH may be used in cases of:
-Personal or family emergency
-Personal or family illness
-Unscheduled overtime
-Unexpected early departure or delay of rideshare partner
-Missed bus due to required overtime
-Inclement weather (applies to walkers and bicyclists only)

GRH may not be used for:
-Personal/pre-scheduled appointments, such as doctor visits
-Weather emergencies or unexpected acts of nature
-Business-related travel
-Rides to work
-Trips originating from outside of the commuter's work location
-More than # ride(s) in the allotted period

ALLERTON FLEET

GASOLINE-POWERED VEHICLES

In 2011, the Allerton Fleet consumed 1,055 gallons of gasoline, emitting 9.4 MT of CO2e emissions, and 842.4 gallons of diesel fuel, emitting 8.5 MT of CO2e emissions. Additionally, the Allerton Fleet's electric carts consumed 2,228 kWh of electricity, distributing approximately 2.0 MT of CO2e emissions into the atmosphere.

The Allerton Fleet consists of ten gas-powered vehicles produced between 1965 and 2008, six electric motorized carts, and various utility vehicles. As the vehicles continue to age, they will need to be replaced by newer, more fuel-efficient models. Replacement vehicles for the Allerton Fleet should be either electric, hybrid, flex fuel, or biodiesel compatible. The Illinois Sustainable Technology Center (ISTC) at the University of Illinois researches and pro-

duces biodiesel fuels, which have been used to power biodiesel compatible trucks. The ISTC is an excellent resource for biofuel education, and because of its affiliation with the University of Illinois, a probable source of biodiesel fuel.

The fuel tracking system at Allerton Park needs to be standardized and enforced. The forms currently used for monitoring gasoline and diesel purchases lack sufficient detail, which results in nebulous vehicle descriptions (Appendix B). Additionally, it is unknown which vehicles are the destinations for fuel stored in gas cans. Fuel consumption is only measured at the time of purchase, so purchases ascribed to "Gas Can" or "5-gallon Can" cannot be traced to specific vehicles. A wide range of products is available for monitoring fuel usage, but costs may be prohibitive. Fuel usage and gas mileage can be calculated quickly by hand or with the aid of online calculators.

The park's 1976 Dodge Ram possesses the second highest fuel-efficiency (15 MPG) of the Allerton Fleet, next to the 2001 Chevy 3500 Express Van (15.5 MPG). The '76 Dodge consumed 529 gallons of gasoline and emitted 4.7 MT CO2e, or 26 percent of the total internal transportation emissions, in 2011. Replacing the '76 Dodge with a similar vehicle with a slightly better fuel economy of 20 mpg - maintaining all other variables – would reduce emissions from gas-powered vehicles by approximately 1.2 MT CO2e, or 12.77 percent of all emissions from gasoline use.

The 2013 Toyota Tacoma (I-4 2WD Manual) boasts an average fuel efficiency of 23 MPG, which has earned it the title of most fuel-efficient truck of 2013. The higher fuel economy of the Toyota Tacoma would allow the same level of usage while reducing the amount of gasoline consumed by 184 gallons and reducing the associated emissions by 1.6 MT of CO2e. Switching the Dodge Ram for the Toyota Tacoma would reduce emissions from gas-powered vehicles by approximately 17 percent. The difference would be less significant if Allerton Park requires a 4WD replacement vehicle. The two most efficient 4WD trucks available on the market are the 2013 Chevrolet Silverado 15 Hybrid and the 2013 GMC Sierra 15 Hybrid, with fuel economy ratings of 21 MPG.[32]

The John Deere Gator utility vehicle consumed 113 gallons of gasoline and generated 1 MT of CO2e emissions in FY 2011. The fuel efficiencies of utility vehicles are measured in gallons per hour, rather than MPG, and so fuel economy varies widely according to a number of factors including load and speed. The park's Gator operates at 0.7 gallons per hour, at half load and at average speed. The Gator in the Allerton Park fleet is not significantly less fuel-efficient than other, newer models, and replacing it with another utility vehicle, as suggested in the apCAP, would do little to curb emissions.

One potential solution to reduce emissions from the use of the Gator is to use biodiesel as an alternative fuel to power the vehicle. All John Deere engines are equipped to run on

biodiesel blends with concentrations of up to 20 percent (B20). The fleet's Gator uses an exhaust filter, and therefore should not exceed biodiesel blends with concentrations higher than B20.[33] The biofuel with the smallest amount of life cycle GHG emissions is Ethanol made from Switchgrass. Researchers at UIUC have been investigating the properties of switchgrass as a fuel source with positive results.[34] According to a Congressional Research Service Report for Congress, replacing petroleum fuels with switchgrass-based ethanol can reduce life-cycle emissions by over 100 percent, if some switchgrass remains in place and is allowed to sequester carbon.[35]

Replacing petroleum-based fuel with switchgrass-based biodiesel would reduce emissions by 1 MT CO2e, or approximately 10.6 percent of the total GHG emissions from gasoline-powered vehicles. These strategies combined would reduce emissions from gasoline consumption by roughly 28 percent, less than half of the reduction goal outlined in the apCAP.

Meeting the reduction target of 60 percent by 2016 will require curbing emissions from burning gasoline by an additional 32 percent (equivalent to a reduction of 337 gallons of gasoline). This can be achieved by making fewer trips with gas-powered vehicles and increasing the share of trips made by electric vehicles and forms of active transportation. One potential solution has already been implemented successfully by Eugene, Oregon's Parks and Open Spaces Department. The department's workers attach trailers to bicycles which they use to conduct park maintenance. The change in transportation mode has significantly reduced the department's total VMT, and the parks' employees and volunteers report satisfaction from using the equipment, which allows them to get exercise, easily maneuver through congested areas, and interact with their environments more effectively.[36]

The second largest offender of greenhouse gas emissions from gasoline consumption in 2011 is the 1965 Ford F250 Firetruck, which consumed 151 gallons of gasoline with the lowest fuel economy of the Allerton Fleet, 9 miles per gallon. The Firetruck was responsible for almost 14 percent of GHG emissions from gasoline.
Gas cans, categorically, received 180.6 gallons in FY 2011. The ultimate destination of that fuel is unknown and unrecorded. Those 180.6 gallons potentially emitted 1.6 MT of CO2e gases, approximately 17 percent of emissions from gasoline burning. In order to continue refining fuel usage data, petroleum products should be monitored after purchase.

DIESEL-POWERED VEHICLES

The apCAP recommends replacing the Kubota B7800 with a more fuel-efficient tractor to help to reduce emissions from diesel usage by 4.24 MT CO2e, or 50 percent of all diesel emissions. The fuel efficiency of tractors, like utility vehicles, is measured in either gallons per hour or horsepower hours per gallon (hp-hrs/gal), and is contingent on a variety of factors, including oil and air filtering systems, bore and stroke, rpm, tire size, and weight.

The Kubota B7800 achieves a fuel efficiency of 1.52 gallons per hour, at peak power, but the Kubota B7800 does not have a significant impact on emissions from diesel fuel, as it uses the least fuel of all of the diesel-powered vehicles within the fleet. The Toro Z-Turn mower, the Toro 580D mower, and the Kubota Grand L40 all consume more fuel annually than the Kubota B7800. Additionally, Allerton Park expends a significant amount of diesel fuel on rental equipment, such as the Backhoe, the Bobcat, the Vermeer Wood Chipper, the Drip Torch, Jack Hammer, and Scissor Lift. (Appendices D & E)

Increases in fuel efficiency from the purchase of newer equipment would be negligible; therefore, emissions reduction strategies should revolve around energy conservation and biodiesel fuel replacement. Switching to switchgrass-based biodiesel would essentially eradicate emissions from diesel fuel usage.

ELECTRIC VEHICLES

The Allerton Fleet currently contains six electric carts used for maintenance and visitor transportation. The vehicles consumed 2,228 kWH of electricity in 2011, and contributed 2.0 MT CO2e emissions. Funding has been secured for the installation of a solar-powered electric vehicle charging station in 2013, which will reduce emissions by 100 percent.

CONCLUSION

This plan is intended to serve as a guide for making transportation decisions. The information presented here is representative of the best and most recent research concerning transportation and emissions reduction strategies. The iCAP, apCAP, and this document (Allerton Park Climate Action Plan: Transportation) should be updated regularly in order to provide accurate assessments of Allerton Park's progress toward climate neutrality.

The effectiveness of each of the strategies listed in this plan is difficult to assess for the following reasons: the relationship between VMT and changes to transportation infrastructure and policies at Allerton Park is not direct, changes are often only noticeable after an extended period of time, the current systems of data collection do not allow for precise estimations of the effects of individual changes, there is no control group for experimentation, and other variables affecting VMT are changing alongside those outlined above.

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APPENDIX A

TRAFFIC COUNT SUMMARY

By Month and Fiscal Year (FY), 1991 - 2011

Fiscal Year (FY)	July	August	September	October	November	December	January	February	March	April	May	June	FY TOTAL	EST VISITOR
FY 1991	12,574	11,337	11,229	13,392	6,549	3,415	3,094	2,259	2,538	7,023	6,416	5,798	85,624	123,299
FY 1992	5,635	3,591	4,134	6,237	4,133	3,017	4,043	2,779	3,884	6,749	8,926	8,250	61,378	88,384
FY 1993	6,442	7,456	8,506	9,967	4,652	2,439	3,152	3,096	4,168	8,619	8,969	8,909	76,375	109,980
FY 1994	10,982	8,674	8,657	11,257	3,581	3,481	2,575	4,678	5,752	11,916	12,400	13,029	96,982	139,654
FY 1995	11,655	6,401	9,933	14,248	4,545	6,332	3,700	3,803	7,021	7,969	14,896	12,581	103,084	148,441
FY 1996	9,304	8,807	8,979	12,185	3,614	2,010	2,497	1,914	4,616	6,334	11,544	11,742	83,546	120,306
FY 1997	8,014	9,337	8,562	12,054	4,219	3,626	3,275	3,784	6,732	12,508	14,013	13,812	99,936	143,908
FY 1998	14,956	10,150	7,152	6,542	1,946	1,954	2,078	2,326	4,490	5,030	7,021	7,491	71,136	102,436
FY 1999	7,597	6,592	6,332	7,136	3,718	2,106	1,720	1,975	3,379	5,214	4,596	5,007	55,372	79,736
FY 2000	4,970	4,002	6,469	8,131	3,511	1,344	1,902	1,806	3,281	4,435	6,193	7,091	46,043	66,302
FY 2001	5,839	5,359	5,394	5,500	3,059	1,591	1,760	2,668	2,953	5,471	6,400	6,854	52,848	76,101
FY 2002	5,821	5,635	4,915	6,030	3,794	1,600	1,650	2,047	2,974	4,401	6,732	6,517	52,116	75,047
FY 2003	6,856	4,987	3,146	6,397	4,691	2,535	1,894	2,263	3,458	4,813	5,559	6,143	52,742	75,948
FY 2004	6,539	5,127	4,838	5,975	3,403	1,444	1,732	1,709	2,874	5,809	6,190	6,737	52,377	75,423
FY 2005	5,163	3,977	4,238	5,055	3,348	1,168	1,741	1,569	3,102	2,191	3,030	4,970	39,552	56,955
FY 2006	8,324	4,697	3,427	2,884	3,517	1,700	1,837	2,114	2,862	5,590	7,087	8,894	52,933	76,224
						estimated 06	*estimated 06*	*estimated 06*	*estimated 06*					
FY 2007	7,381	5,331	5,011	7,894	4,136	1,756	2,169	2,979	2,906	5,368	7,826	9,183	61,940	89,194
FY 2008	7,793	5,847	5,934	6,618	3,046	2,371	2,571	2,968	3,814	6,283	7,241	7,466	61,952	89,211
								traffic counter was damaged from feb 08 to june 08 - estimated traffic based on fy 91 to fy 08						
FY 2009	8,966	6,304	5,402	7,439	3,774	1,528	3,957	2,852	3,278	3,282	6,939	9,525	63,246	91,074
FY 2010	10,251	7,072	8,396	7,023	2,812	2,418	2,533	1,440	5,528	8,018	9,078	10,900	75,469	108,675
FY 2011	9370	6,687	8,248	7,331	4,298	334	433	2,613	4,102	6,362	8,185	8,741	**66,704**	96,054

APPENDIX B

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

ROBERT ALLERTON PARK

DATE _____ TICKET # 00250

DISPENSED TO VEHICLE # _____

DISPENSED BY (EMPLOYEE): _____

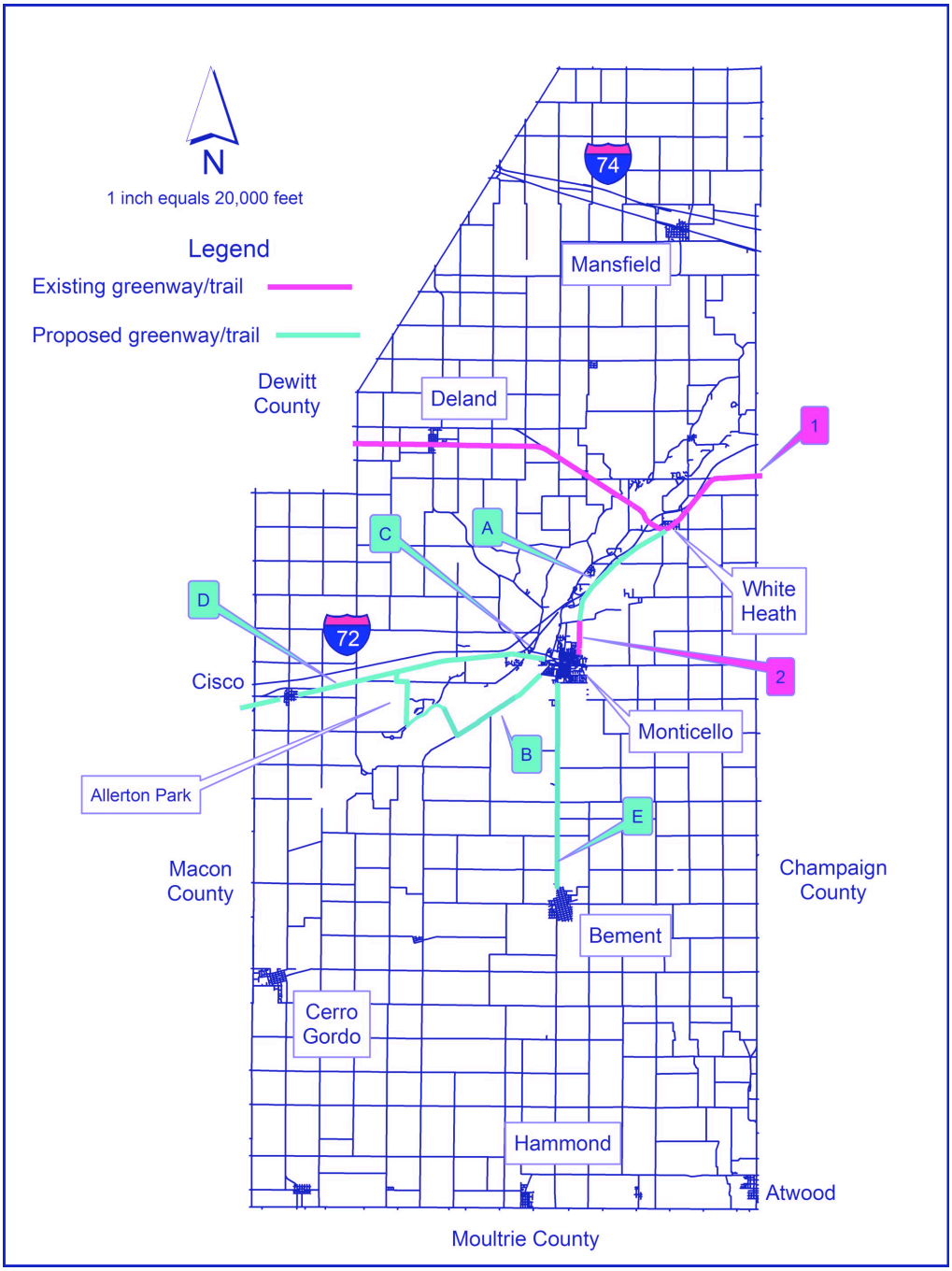
NONHIGHWAY HOURS _____

(Data taken from hourmeter)

PETROLEUM PRODUCTS DISPENSED		
Product	Quantity	Price
GASOLINE		
DIESEL		

APPENDIX C

Source: Piatt County Regional Planning Commission.
(2010). Documents. Retrieved 2013, from Piatt County



Piatt County: Existing and Future Greenways and Trails

1. Heartland Pathways Trail
2. City of Monticello Bike & Hike Trail

Future Greenways and Trails

A. Monticello to White Heath Trail - City of Monticello, Monticello Railway Museum
B. Monticello to Allerton Trail - City of Monticello, Allerton Park, IDNR
C. County Farm Trail - City of Monticello, Heartland Pathways
D. Route 47 Trail - Heartland Pathways
E. Bement Trail - City of Monticello, Monticello and Bement Townships, Piatt County, Village of Bement

APPENDIX D

Fuel Usage by Vehicle and Month (2011-2012): Gallons of Gasoline

	76 Dodge Ram	J.Deere Gator	Gas can(s)	65 Ford F250 Firetruck	DNR ATV	Golf Cart	80 Chevrolet C70 Dumptruck	Suburban*	Other Equipment
May-12	25	9.4		9.8		3.3		5	
Apr-12	30.3	3.2	14	17.2					
Mar-12	69.6	13	22.5	11.5					1.5
Feb-12		8.1	19.9	4.8					
Jan-12	30.7	7.9	37.3	3.6	1.3				
Dec-11	48.5	3.9	2.5						
Nov-11	71.7	7.3	28.3	12.9					
Oct-11	81.5	6.6	4						
Sep-11	43.4	10.8	10.5		1.5	2.6			
Aug-11	41.3	18.5	12	52.2			17.6		
Jul-11	26.8	12.7	14.7	16.6		3.6			0.4
Jun-11	60.3	11.7	14.9	22.3		2.8			18.7
TOTAL YTD	529.1	113.1	180.6	150.9	2.8	12.3	17.6	5	20.6

**No longer part of Allerton Fleet*

Fuel Usage by Vehicle and Month (2011-2012): Gallons of Diesel

	Toro Z-Turn	Toro 580D	Kubota Grand L40	Kubota B7800	J.Deere Mower	Bobcat	Backhoe	Vermeer Chipper	Other Equipment
May-12	32.3	17.7	5				35.7		
Apr-12	39.2	16							14
Mar-12			18.7	6.3					
Feb-12						31.6	34.9		5
Jan-12						17		20	7.7
Dec-11						19.7	34.6	16.4	
Nov-11	14.4		18.2	6				22	
Oct-11	15.4		19.4	11.5	4.6	21.6		5.7	
Sep-11	11.6			11.2		20.6		1.5	5.5
Aug-11	8.2			5.2		22.2			
Jul-11	43	44.4	16.4				31.4		
Jun-11	55.4	24.8	22.1	13.1	6.2		32		
TOTAL YTD	219.5	102.9	99.8	53.3	10.8	132.7	168.6	65.6	32.2

APPENDIX E

Fuel Usage by Vehicle (2011-2012): Gallons of Gasoline

76 Dodge Ram	529.1
Gas can(s)	180.6
65 Ford F250 Firetruck	150.9
J.Deere Gator	123.9
99 GMC 3500 HD 1 Ton Flatbed	18.7
80 Chevrolet C70 Dumptruck	17.6
Golf Cart	12.3
Suburban*	5
DNR ATV	2.8
Fulgurator	0.4
Other Equipment	14

**Suburban no longer in Allerton Fleet*

Fuel Usage by Vehicle (2011-2012): Gallons of Diesel

Toro Z-Turn	219.5
Backhoe	168.6
Bobcat	132.7
Toro 580D	102.9
Kubota Grand L40	99.8
Vermeer Chipper	65.6
Kubota B7800	53.3
J.Deere Mower	10.8
Drip Torch Fuel	7.7
Jack Hammer	5.5
Scissor Lift	5
Other Equipment	1.5

Corey J. Buttry
May 2013
University of Illinois at Urbana-Champaign
Advisor: Brian Deal, PhD
Client: Allerton Park & Retreat Center

ALLERTON

PARK & RETREAT CENTER