Commuter Behavior and Greenhouse Gas Emissions at the University of Rhode Island

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URITC PROJECT NO. 0001943

PREPARED FOR
UNIVERSITY OF RHODE ISLAND
TRANSPORTATION CENTER

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Commuter Behavior and Greenhouse Gas Emissions at the University of Rhode Island		5. Report Date 12/31/09 6. Performing Organization Code
7. Author(s) Frederick A. B. Meyerson, Ph.D. and Rachel Sholly		8. Performing Organization Report No.
9. Performing Organization Name and Address University of Rhode Island Department of Natural Resources Science 1 Greenhouse Road, Room #109 Kingston, RI 02881		10. Work Unit No. (TRAIS) 11. Contract or Grant No. 500-2004-0000-0001943
12. Sponsoring Agency Name and Address URI Transportation Center Carlotti Administration Building 75 Lower College Road Kingston, RI 02881		13. Type of Report and Period Covered Research Grant Final Report 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

Of the 16,000 students at the University of Rhode Island, about 55% percent commute to campus. Between students, staff and faculty there could be up to 11,000 commuters at the University, most of which drive alone. A high volume of single-occupancy vehicles traveling to and from campus creates parking issues, traffic congestion on campus and in surrounding communities and greenhouse gas emissions. The goals of this study were to baseline energy consumption and greenhouse gas emissions from commuting at URI and develop a commuter survey that can be repeated annually to measure any changes in behavior or emissions. Six web-based and four visual surveys conducted between Spring 2006 and Spring 2009 collected data on demographics, commuting characteristics and awareness of and attitudes toward alternative transportation. URI commuters combined emit about 22,700 metric tons CO_2 equivalent, travel about 62.5 million miles and consume about 2.5 million gallons of gasoline each year. The majority of commuter trips are made in single-occupancy vehicles. Regular commuting by bus is very low among students, faculty and staff, but occasional bus use is significantly higher among faculty and somewhat higher among students. Carpooling is also low among staff and faculty, and somewhat higher in students, however, vehicle occupancy increased over the survey period. Survey results indicate that large percentages of commuters would respond to incentives and disincentives aimed at reducing emissions from commuting. This study provides a thorough assessment of URI commuting behavior as well as data collection methods that can be conducted annually to monitor changes in commuter behavior as a result of new policies.

17. Key Word	18. Distribution Statement
Commuter, Behavior, Greenhouse gas, Emissions, University, Alternative Transportation	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
		40	

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ABSTRACT

Of the 16,000 students at the University of Rhode Island, about 55% percent commute to campus. Between students, staff and faculty there could be up to 11,000 commuters at the University, most of which drive alone. A high volume of single-occupancy vehicles traveling to and from campus creates parking issues, traffic congestion on campus and in surrounding communities and greenhouse gas emissions. The goals of this study were to baseline energy consumption and greenhouse gas emissions from commuting at URI and develop a commuter survey that can be repeated annually to measure any changes in behavior or emissions. Six web-based and four visual surveys conducted between Spring 2006 and Spring 2009 collected data on demographics, commuting characteristics and awareness of and attitudes toward alternative transportation. URI commuters combined emit about 22,700 metric tons CO_2 equivalent, travel about 62.5 million miles and consume about 2.5 million gallons of gasoline each year. The majority of commuter trips aremade in single-occupancy vehicles. Regular commuting by bus is very low among students, faculty and staff, but occasional bus use is significantly higher among faculty and somewhat higher among students. Carpooling is also low among staff and faculty, and somewhat higher in students, however, vehicle occupancy increased over the survey period. Survey results indicate that large percentages of commuters would respond to incentives and disincentives aimed at reducing emissions from commuting. This study provides a thorough assessment of URI commuting behavior as well as data collection methods that can be conducted annually to monitor changes in commuter behavior as a result of new policies.

INTRODUCTION

The University of Rhode Island (URI) has roughly 16,000 students and its main campus is set in the rural/suburban town of South Kingstown, which has about 30,000 residents.[1],[2]About 55% percent of the student population commutes to campus.[1]Universities are typically major trip generators, and in the case of URI it is also a major traffic generator.[3]With students, staff and faculty combined, URI could have up to 11,000 individuals commuting to campus regularly. The majority of these commuters drive alone, creating high demand for on-campus parking, traffic congestion on campus and in surrounding communities and greenhouse gas (GHG) emissions.

One of the reasons for such high congestion is that URI is not located in a typical “college town” where a large number of students live within a few blocks of campus. In fact, approximately 3,000 students rent single-family beach homes in the nearby town of Narragansett. Depending on the neighborhood, students living in Narragansett commute anywhere from six to ten mileseach way.

Another factor that may be encouraging congestion is the relatively low cost of parking on campus.[4]Student commuters currently pay $160 for an annual parking pass, while students living on campus pay $235. Staff and faculty do not pay for parking.URI has approximately 8,000 parking spaces in surface lots and along roads.

In 2008, oceanography professor Dr. S. Bradley Moran completed a GHGemissions inventoryfor URI and found that commuting accounts for about one quarter of URI’s total greenhouse gas emissions.[5] As a result, commuting has been identified as a target area for emissions reductions.

Transportation is also a major source of energy use and GHG emissions at state, national and global scales. In

Rhode Island, transportationaccounts for more than 38% of the state's total emissions.[6] Between 1990 and 2007, emissions from transportation in RI increased by 2%.[6]In the US, transportation is responsible for nearly a third of our carbon dioxide emissions.[6]It currently accounts for 21% of world energy-related CO_2 emissions and is expected to account for up to 23% by 2030.[7]

Although Rhode Island ranks among the lowest carbon dioxide emissions per capita of any state in the country, it has below average alternative transportation use.[6] About 80% of Rhode Island and 75.7% of US work trips are made in single-occupancy vehicles.[8] The carpool rate is 10.4% in RI and 12.2% in the US.[8]The public transit rate is 2.5% in RI and 4.7% in the US.[8]Rhode Islanders travel 10 miles each way during their work commutes and collectively travel approximately 25 million miles each day.[8]

In the fall of 2007, URI initiated a program that provides a 50% subsidized bus pass to all students, staff and faculty at URI. This type of program, generally known as a U-Pass program, has been adopted in some formby a number of institutions across the country. At many schools, the U-Pass is fully subsidized and often includes unlimited access to other available modes such as light rail and a guaranteed ride home. Also in the fall of 2007, RIPTA expanded its service into Narragansett where many students live. Bus ridership has increased since these initiatives began, but it is still relatively low compared to single-occupancy commuting.

Currently, there are few incentives to carpool at URI. In the Spring 2009 and Fall 2009 semesters students organized a carpool parking lot trial program, which allowed students who carpooled to park in a desirable (i.e., close to academic buildings) lot that is normally designated for faculty and staff only but is rarely filled. During the first trial, students were offered meal coupons to area restaurants as incentive. Considering the limited promotion and duration of these trials, participation has indicated that establishing a permanent carpool lot may encourage carpooling among commuters.

URI is poised to take more aggressive action to address transportation issues on campus, therefore, the timing for a baseline estimate of commuting emissions provided by this report is ideal. This baseline will allow us to measure future emissions and report what we hope will be increased use of alternative transportation and decreased emissions in the coming years as a result of new policies.

PURPOSE

The purpose of this study was threefold:

1) To baseline energy consumption and greenhouse gas emissions from commuting at URI
2) To develop a commuter survey that can be repeated annually to measure any changes in emissions, behavior or attitudes toward alternative transportation
3) To produce a set of conclusions that can inform policy aimed at reducing greenhouse gas emissions from commuting at URI

METHODS

Estimating greenhouse gas emissions from university commuting is typically done as part of a comprehensive greenhouse gas inventory where time and resource constraints often mean that data are derived from assumptions rather than surveys.[10]At many universities, especially those in urban settings, commuting represents a small portion of the total carbon footprint so it is less important to obtain detailed information on commuting habits. At URI, in its suburban setting, it is estimated that commuting is responsible for approximately one quarter of the University's carbon footprint.[5] Because commuting makes up such a large portion of total emissions at URI, it is important to understand commuter behavior at a relatively detailed level. For this reason, the surveys presented here were designed to collect a variety of information relating to

commuting characteristics and awareness of and attitudes toward alternative transportation, which can be used to estimate greenhouse gas emissions and inform future transportation policies at URI.

Web-based surveys were conducted during each of the following semesters: Spring 2006, Summer 2006, Spring 2008, Summer 2008, Fall 2008 and Spring 2009 (Appendix B). In attempts to improve accuracy and collect a wider variety of data, survey design evolved with each repetition. In 2008 and 2009 surveys, the web application SurveyMonkey was used and allowed more sophisticated surveys to be created more easily. Because the results of the survey were to be available to the public, it was necessary to obtain approval from the URI Institutional Review Board. Selected students, staff and faculty with varying commuting habits were asked to test the surveys and provide feedback.

The web-based survey was distributed by emailing the link and an accompanying message to all URI students, faculty and staff. This method of distribution is associated with a self-selecting bias, but was chosen for its ability to reach a large number of people in a short period of time and with minimal effort (see discussion). Time and resource constraints did not allow individual bus rider interviews to take place; however, in Fall 2008 and Spring 2009 surveys, additional questions were added to collect information from regular bus riders. These surveys also collected information from students living on campus.

Visual surveys of vehicle occupancy and vehicle type were conducted in Spring 2006, Fall 2008 and Spring 2009 and allowed comparison of observed and reported data. After detecting possible seasonal behavior differences that may have skewed the data, we decided to compare the three spring surveys conducted in 2006, 2008 and 2009 to look for trends over time.

For the purposes of this study, alternative transportation includes carpooling, riding the bus, biking and walking. Other modes may be considered alternative transportation in a general sense, but do not make up a significant portion of commuting modes at URI. For example, commuting by rail is possible but very few commuters use it. Hybrid vehicles were considered high fuel efficiency vehicles, not alternative transportation. Alternative fuel vehicles, such as those that run on biodiesel, were also not included in the alternative transportation category because they do not make up a significant portion of URI's commuting modes. Emissions from these vehicles are included in the SOV or carpool emissions estimates. This study does not take into consideration greenhouse gas emissions from on-campus shuttles, which may be used by commuters as part of their commute to class.

To calculate greenhouse gas emissions from commuting, it was necessary to estimate the number of gallons of gasoline that are consumed by this activity annually. Number of gallons was derived from estimates of total vehicle miles traveled and average fuel efficiency, which were two of the survey questions.

A metric tonof carbon dioxide equivalent ($MTCO_2e$) is a common unitused to quantify emissions and, therefore, allow for benchmarking URI's emissions against those of other institutions. Gallons of fuel consumed annually was converted to $MTCO_2e$ using conversion factors of 0.0090312 for gasoline and 0.01021 for diesel, which were taken from a reportpublished in 2007 by the US Environmental Protection Agency.[11]Carpooling and bus emissions were calculated separately in order to account for emissions from alternative mode trips.The formulas are as follows:

Single Occupancy Vehicle Annual $MTCO_2e$[11]

= Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) ÷ Miles/Gallon x 0.0090312

Carpool Annual $MTCO_2e$[11]

= Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) ÷ Miles/Gallon x Average People Per Car x 0.0090312

Bus Annual $MTCO_2e$[11]

= Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) ÷ Miles/Gallon xAverage People Per Bus x 0.01021

ASSUMPTIONS

In order to calculate these equations a few assumptions were made. First, students were assumed to commute 30 weeks during the academic year,based on a 16-week semester minus one week of vacation per semester, and 8 weeks during the summer.

It was assumed that faculty members commute an average of 37 weeks per year. About 84% of faculty are on 9-month contracts and 16% are on 12-month contracts.[12] Assuming they take about 2 weeks of vacation and sick days, it averages to 37 weeks per year.

It was assumed that staff members commute an average of 49 weeks per year. About 92% of staff are on 12-month contracts while 8% are on 9-month contracts.[12] Assuming they take about 2 weeks of vacation and sick days, it averages to 49 weeks per year.

RESULTS

Toavoid any seasonal differences and for simplicity, this report presents the results of the three spring surveys only.

Table 1. URI demographics and sampled demographics.[1,12,13]

Students	**2006**	**2008**	**2009**
Total Population	15,095	15,650	15,904
Commuters	7,978	8,608	8,747
% Commuters	53%	55%	55%
Individuals Sampled	157	721	477
% Sampled of commuters	2%	8%	5%
% Males in Population	n/a	40%	43%
% Females in Population	n/a	60%	57%
% Males in Sample	n/a	32%	36%
% Females in Sample	n/a	68%	64%
Faculty	**2006**	**2008**	**2009**
Total Population	710	732	741
Individuals Sampled	63	170	91
% Sampled	9%	22%	12%
% Males in Population	n/a	60%	57%
% Females in Population	n/a	40%	43%
% Males in Sample	n/a	46%	45%
% Females in Sample	n/a	51%	55%
Staff	**2006**	**2008**	**2009**
Total Population	1,744	1,758	1,705
Individuals Sampled	87	282	146
% Sampled	4%	16%	9%
% Males in Population	n/a	n/a	n/a
% Females in Population	n/a	n/a	n/a
% Males in Sample	n/a	28%	26%
% Females in Sample	n/a	72%	74%

Sample Demographics

Over the study period, URI'sstudentand faculty populations increased while staff numbers decreased (Table 1). Increased enrollment combined with a slight increase in the percentage of commuters (53% to 55%) resulted in a notable increase in commuter students (9.5%) between 2006 and 2009. During these years, students made up about 74% of the commuting population, while staff and faculty accounted for about 20% and 4% respectively (Appendix A: Table 1).

When comparing the composition of URI's commuting population to that of the samples, students are consistently underrepresented and faculty and staff are overrepresented (Appendix A: Table 1). This is addressed in the discussion section of the report.

Sample sizes were lower in 2006, when only 2% of the student commuting population and 4% of the staff population were sampled. For this reason and others explained later, 2006 survey results are probably less accurate than 2008 and 2009 survey results.

Females consistently responded to surveys in higher proportions than males across all commuter groups (Table 1). Overall, the University is composed of more females than males, but the female proportion of responses was always greater than their proportion in the URI population (except

for staff, for which gender percentages were not available). Analysis of commuting characteristics by gender did not indicate the presence of any gender specific behaviors, which suggests that the lack of a proportionate male sample size is not an issue.

Commuting Characteristics

Both reported and observed vehicle occupancy increased from 2006 to 2009, which would suggest that carpooling has increasedto some extent (Table 2). Reported vehicle occupancywas consistently greater than observed, indicating that commuters may exaggerate their carpooling. On the other hand, percent trips per mode does not indicate an increase in carpooling (Appendix A: Table 5)

Single-occupancy vehicle (SOV) trips comprise the vast majority of commuter trips at URI (Figures 1a-c). Between 2006 and 2008, a $0.90 increase in the price of gas did not appear to affect the percentage of SOV trips significantly (Figures 1a-c &2).[14]Between 2008 and 2009, SOV trips increased among students, faculty and staff, when gas prices dropped by $1.75. It is possible that this may reflect a negative association between SOV trips and the price of gas, but it is more likely a product of a technical error that is described further in the discussion section.

When comparing among the commuter groups, staff members consistently reported the highest percentages of SOV trips and, therefore, the lowest percentages of carpool and alternative transportation trips. Staff members also reportedthe lowest people per car and the highest commuting days per week (Appendix A: Table 2). Faculty members reported the highest percentages of bus and walk trips and students reported the highest percentages of carpool trips (Appendix A: Table 5).

Reported miles per trip increased significantly between 2006 and 2008 and decreased significantly between 2008 and 2009 (Appendix A: Table 2). This result is also illustrated by a significant increase in the number of faculty membersresiding in South Kingstown, the town in which the main campus is located (Figure 3). Between 2008 and 2009, the percentage of faculty respondents living in South Kingstown increased by over 19% (Appendix A: Table 6). A shift of this magnitude is unlikely; possible explanations are provided in the discussion section.

Student SOV commuting days per week decreased over the study period (Appendix A: Table 2). Staff members travel to campus more days per week, which one might expect given their relatively regular schedules compared to students and faculty.

Table 2. Reported and observed vehicle occupancy.

Spring 2006		People Per Car (Reported)	People Per Car (Observed)
	Students	1.32	1.12
	Faculty	1.24	1.15*
	Staff	1.08	1.15*
	Average	1.21	1.12
Spring 2008			
	Students	1.27	n/a
	Faculty	1.13	n/a
	Staff	1.06	n/a
	Average	1.15	n/a
Spring 2009			
	Students	1.51	1.30**
	Faculty	1.31	1.30**
	Staff	1.20	1.30**
	Average	1.34	1.30**

* Observed values for staff and faculty are the same because common parking lots were surveyed with no way to distinguish between staff and faculty.
** In 2009, observations were not taken from individual commuter lots, only from Upper College Road.

In each survey, students reported that they make more trips to campus per day on average that faculty and staff, which may occur, for example, when a student decides to go home between an early morning class and a late afternoon class on the same day (Appendix A: Table 2).

Faculty members consistently reported higher fuel efficiencies than students and staff, but allthree commuter groups reported higher fuel efficiencies than national averages. Over time, average miles per gallon and trips per day have not changed significantly.

In general, commuters are geographically clustered around URI's main campus in South Kingstown (Figure 3). Roughly 40% of students live in the nearby beach town of Narragansett, which is by far the largest cluster of students (Appendix A: Table 6). To a lesser extent, staff members are also clustered in South Kingstown and Narragansett. Providence, North Kingstown and Richmond also house relatively large numbers of URI commuters.

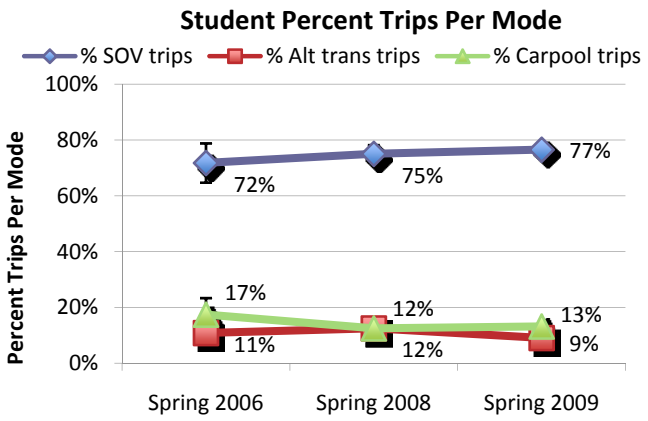


Figure 1a. Students percent trips per mode over time.

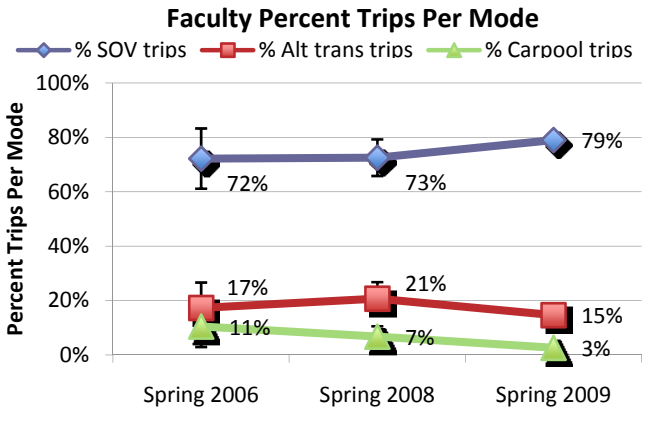


Figure 1b. Faculty percent trips per mode over time.

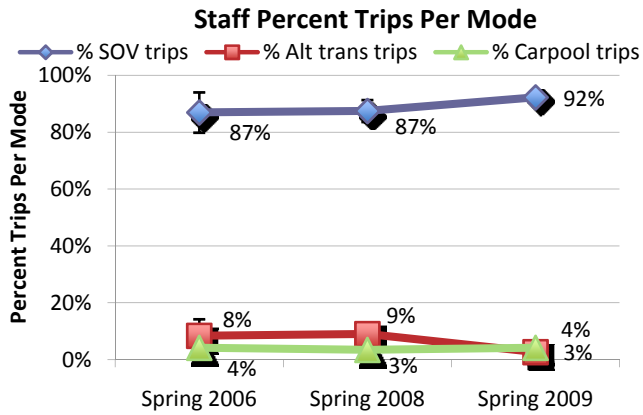


Figure 1c. Staff percent trips per mode over time.

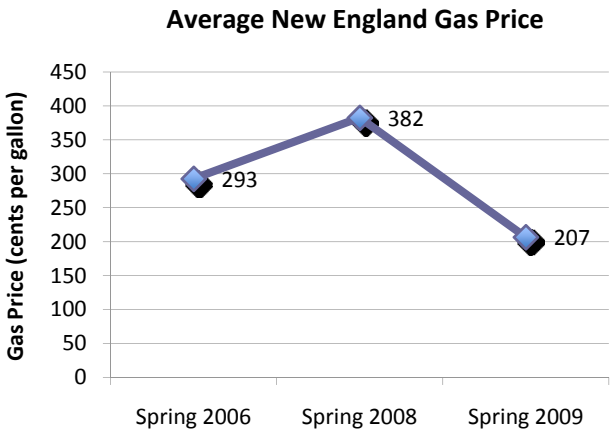


Figure 2. Average price of gasoline in New England during each survey period.[13]

Greenhouse Gas Emissions

Single-occupancy vehicle (SOV) commuting is responsible for about 91% of URI's total emissions from commuting, while carpooling and bus commuting account for about 5% and 4% respectively(Table 3 and Figure 4). Using the average of Spring 2008 and Spring 2009 data, which are the most reliable years, URI commuters emit roughly 25,000 Metric Tons CO_2 Equivalent ($MTCO_2e$), travel 70 million miles, and consume about 2.8 million gallons of fuel per year (Appendix A: Tables 2-4).

Based on survey results, total estimated annual emissions from SOV, carpool and bus trips increased by 29% between 2006 and 2008, followed by an 8% decrease in the next year (Table 3 and Figure 4). The primary factor influencing the increase in SOV emissions was a significant increase in miles per trip (Appendix A, Table 1). Between 2006 and 2008, miles per trip increased in all categories – by 47% for faculty, 20% for students and 10% for staff. In 2009, miles per trip decreased in all categories – by 22% for faculty, 8% for students and 9% for staff. These fluctuations are almost certainly not accurate (see discussion for probable sources of error).

The 2008 emissions spike is echoed in the pounds CO_2 per roundtrip metric, which is based on miles per trip and miles per gallon (Figure 5).Between 2006 and 2008, bus emissions decreased by 27% andcarpool emissions increased by 9% between 2006 and 2008. Additional contributors to variations in total emissions include large fluctuations in SOV, carpool and bus days per week as well as increases in the student commuting population.

Data collected to estimate total emissions was also used to calculate emissions by mode per roundtrip (Figure 6). Based on reported fuel efficiency and assuming 2 people per carpool and 22 people per bus (Spring 2009 observations), SOV trips emit on average 22 pounds of CO_2 per roundtrip, carpool trips emit 11 pounds of CO_2 per roundtrip and bus trips emit 6 pounds of CO_2 per roundtrip. This calculation uses reported miles trip and assumes that all bus riders travel from Providence to URI Kingston.

Total emissions for each commuter group are roughly proportional to their populations; however, staff have slightly higher emissions per capita than faculty and students (Figures 7 and 8). This result aligns with the commuting characteristics of staff, namely lower alternative transportation rates, lower fuel efficiency and higher commuting days per week.

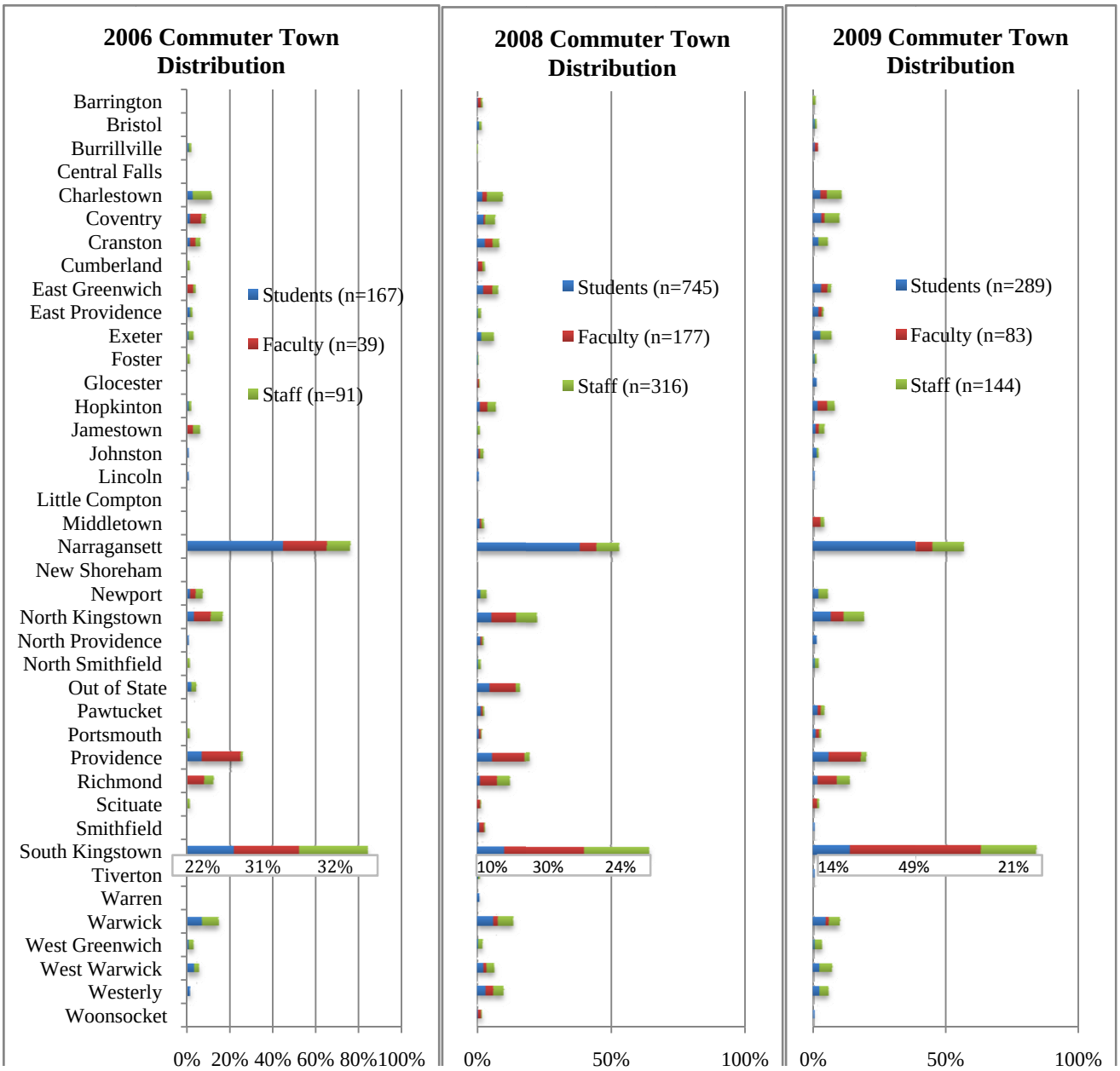
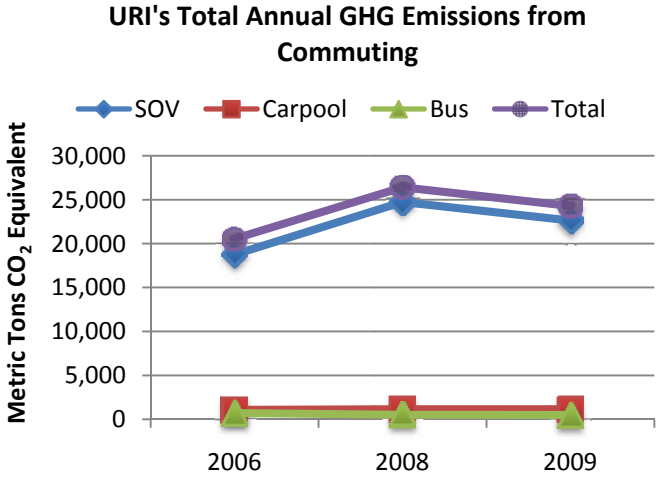


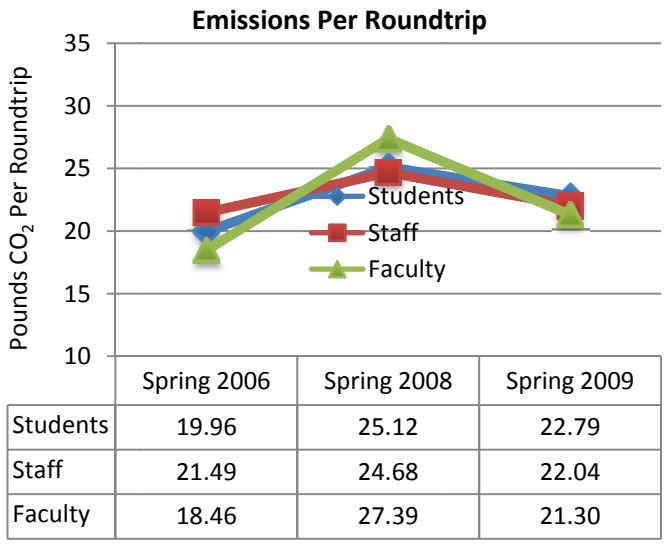
Figure 3. Commuter town distributions.

Table 3. Estimated total annual commuting emissions from single-occupancy vehicle, carpool and bus trips.



Metric Tons CO_2 Equivalent	2006	2008	2009
SOV	18,743	24,732	22,626
Carpool	1,076	1,153	1,147
Bus	724	533	506
Total	20,543	26,418	24,278

Figure 4. Estimated total annual commuting emissions from single-occupancy vehicle, carpool and bus trips.



	Spring 2006	Spring 2008	Spring 2009
Students	19.96	25.12	22.79
Staff	21.49	24.68	22.04
Faculty	18.46	27.39	21.30

Figure 5. Estimated emissions per single-occupancy vehicle roundtrip.

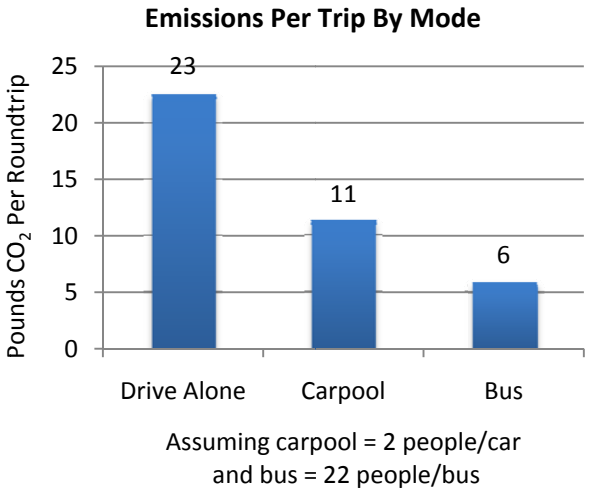


Figure 6. Estimated emissions per roundtrip by mode.

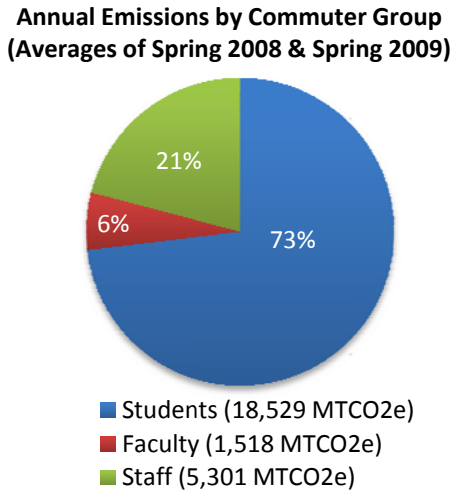
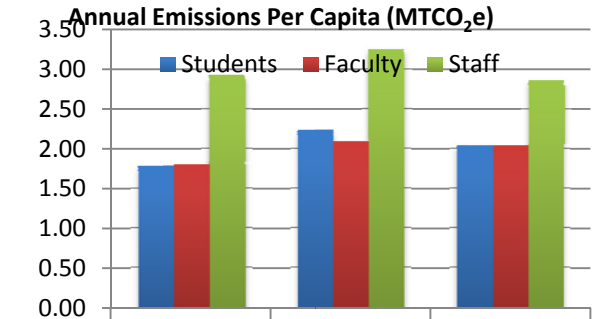


Figure 7. Annual emissions by commuter group.



	2006	2008	2009
Students	1.78	2.23	2.05
Faculty	1.80	2.09	2.03
Staff	2.92	3.25	2.86

Figure 8. Annual emissions per capita in metric tons CO_2 equivalent.

Knowledge, Attitudes & Policy

This section includes the results of the qualitative, policy-related questions that were added to the surveys in 2008 and 2009. These questions were designed to collect information on commuter awareness of existing alternative transportation options at URI, willingness to switch modes given certain incentives and effects of the price of gas on mode choice.

As one might expect, considering that students pay for parking but faculty and staff do not, almost all staff (98%) and faculty (97%) and fewer commuting students (83%) report to have parking passes. Percentages are almost identical in Spring 2008 and Spring 2009. Awareness of bus stop locations is relatively low among faculty and higher among students and staff in both Spring 2008 and Spring 2009 (Figure 9). Awareness of Narragansett bus service (initiated in Fall 2007) on the part of Narragansett residents increased between 2008 and 2009 for students and faculty but decreased among staff (Figure 10). Spring 2009 results show that while knowledge of the service has increased, ridership is low.

The number of commuters who reportedly would opt to purchase an annual bus pass in lieu of an annual parking pass decreased between Spring 2008 and Spring 2009 (Figure 11). This question was presented with the stipulation that the bus pass would cost less than a parking pass and commuters who chose to forgo a parking pass would receive a few one-time parking permits for days when taking the bus is impossible. Responses include a large number of commuters that do not live on bus routes or near a park and ride and, therefore, do not have the option of bussing.

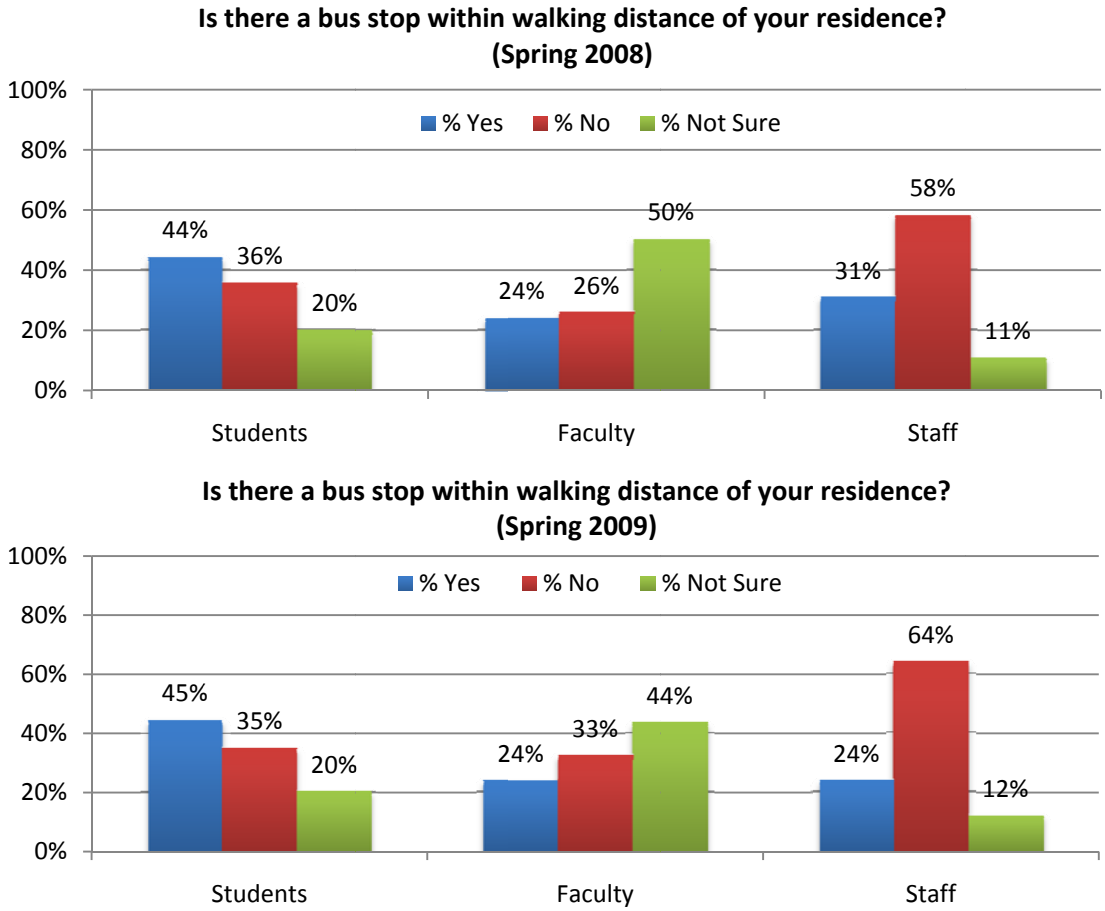


Figure 9. Percent of commuters who are aware of proximity of bus stops to their residence.

Awareness of the free Flex 212 bus service to local amenities and entertainment is reportedly high, but ridership was virtually non-existent at the time of the survey (Figure 12). This service was newly implemented at the time; it is expected that ridership will increase during the Fall 2009 semester.

Regular commuting by bus is very low among students, faculty and staff, however, 22% of faculty report to ride the bus occasionally (Figure 13).

The price of gas and parking will likely influence the commuting habits of students more than faculty and staff (Figure 14). However, many staff members and some faculty members used the comment box of the parking question to strongly oppose and argue against charging them for parking. Students, on the other hand, were largely in favor of charging faculty and staff for parking.

For respondents who said that the price of gas could affect their commute, $4.00 per gallon seems to be a common threshold above which commuters might start to carpool, bus, bike or walk to campus more often (Figure 15). Forty two percent of staff respondents and 27% of faculty respondents indicated that they having to pay $125 (the commuter permit price in Spring 2008 and Spring 2009) for an annual parking pass would encourage them to use alternative transportation more often.

In 2008, 46% of staff, 39% of faculty and 20% of students indicated that an online carpool matching system would encourage them to carpool to campus more often (Figure 16). Such a system would allow commuters to easily find other commuters with similar schedules in their neighborhood. Students also reported that a discounted carpool parking permit and the ability to park close to academic buildings would encourage them to carpool more.

In 2008, a large number of respondents chose “Other” in 2008, and many of the reasons for choosing that option were that a“Nothing” option was added in 2009 based on 2008 comments. In Spring 2009, a large number of commuters indicated that nothing would encourage them to carpool for a variety of reasons, many of which involved having to transport children to school, having other off-campus obligations or having irregular or unusual schedules.

Commuters that usually drive alone to campus reported that convenience, defined as independence, flexibility and reliability, was the primary aspect that they liked about their commute as compared to carpooling, riding the bus, biking or walking (Figure 15). The cost associated with driving alone (i.e., gas, parking and maintenance) was reported to be the greatest negative aspect of this type of commute (Figure 16). Also voted as top negative aspects were parking availability, environmental impact and parking proximity.

According to the Spring 2009 survey, student, faculty and staff commuters consider convenienceto be the most important aspect of their commute by far (Figure 17). Respondents also felt that a short commute time, parking proximity and availability and keeping costs low were among the most important factors of their commutes.

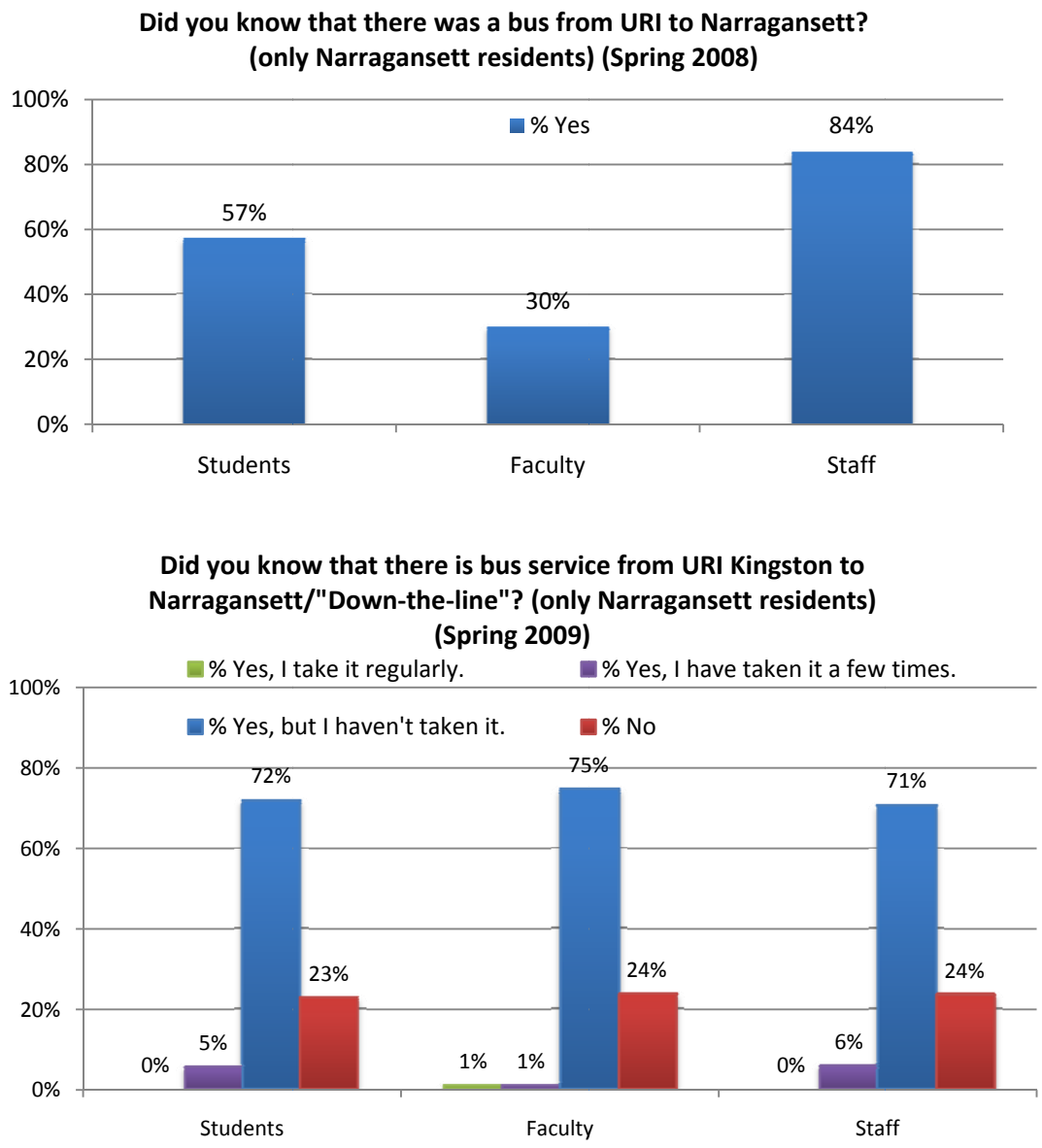
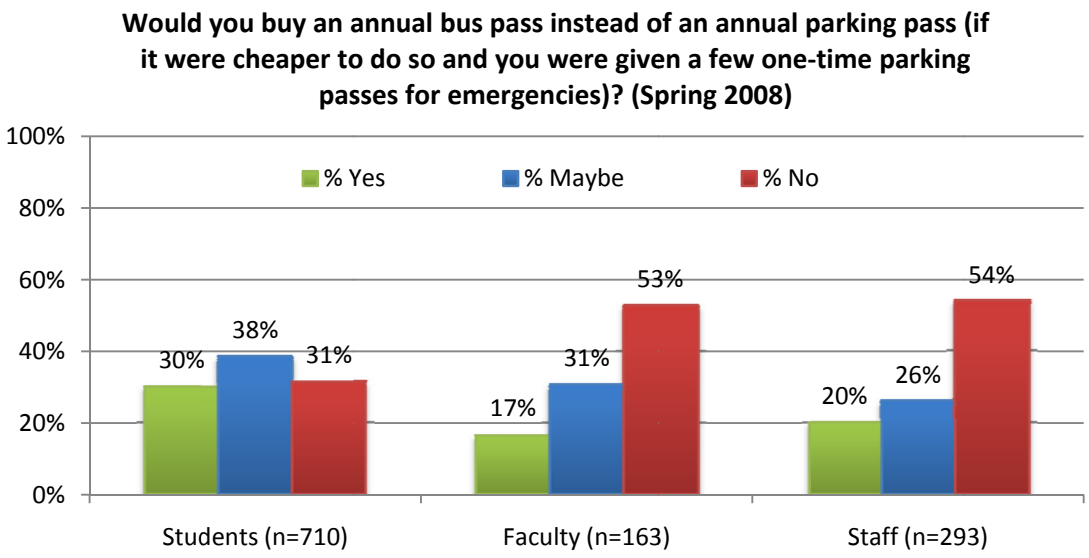


Figure 10. Percent of commuters who live in Narragansett and are aware of the bus service to Narragansett.



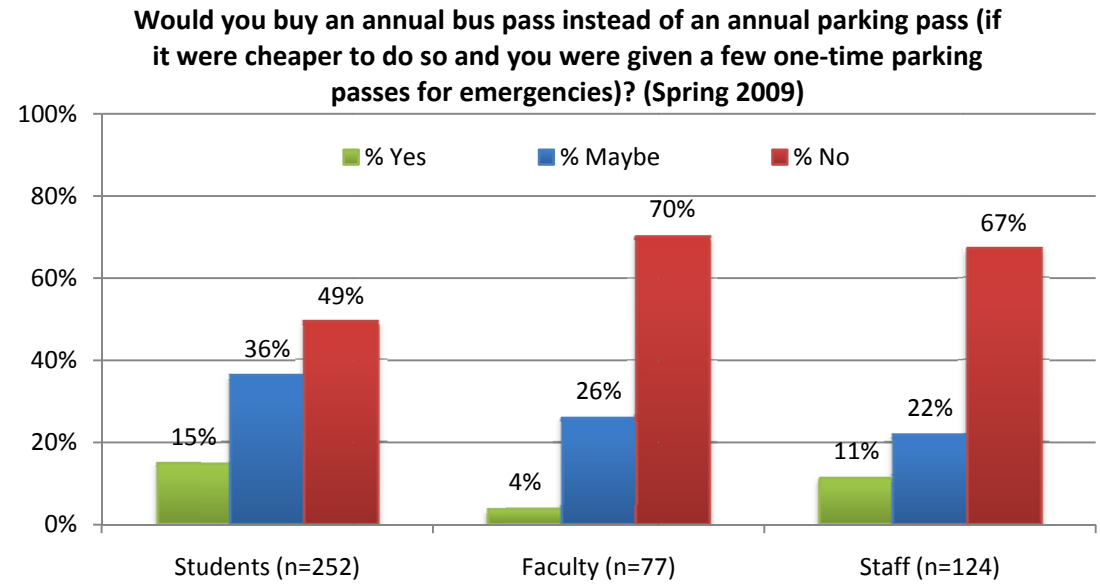


Figure 11. Percent of commuters who would potentially buy a bus pass instead of a parking pass.

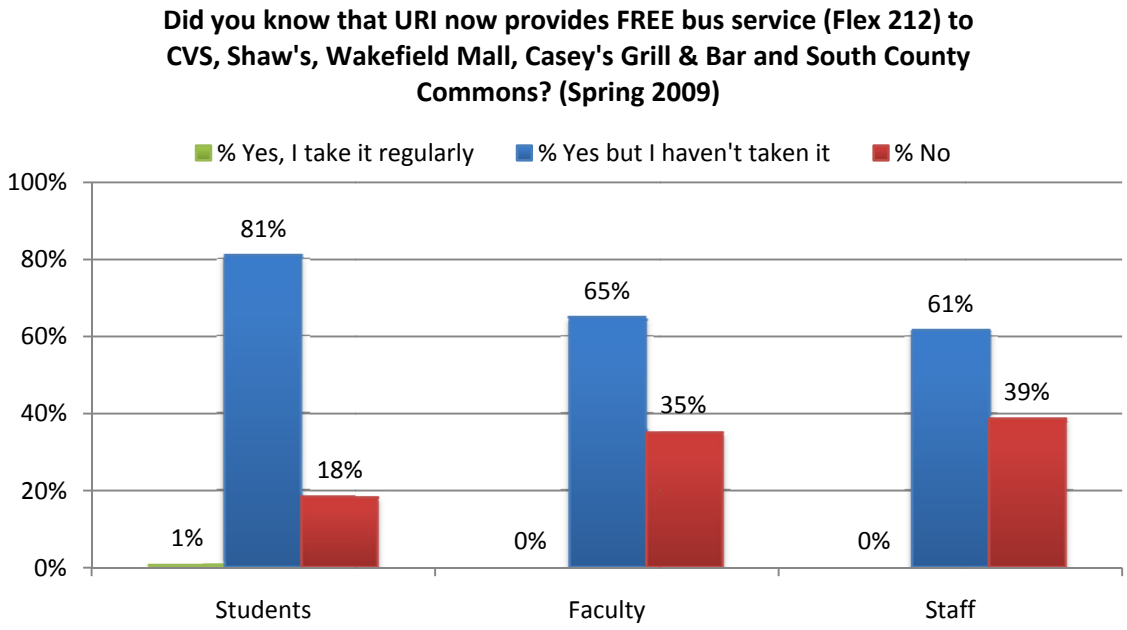


Figure 12. Percent of commuters who are aware of the free Flex 212 bus service.

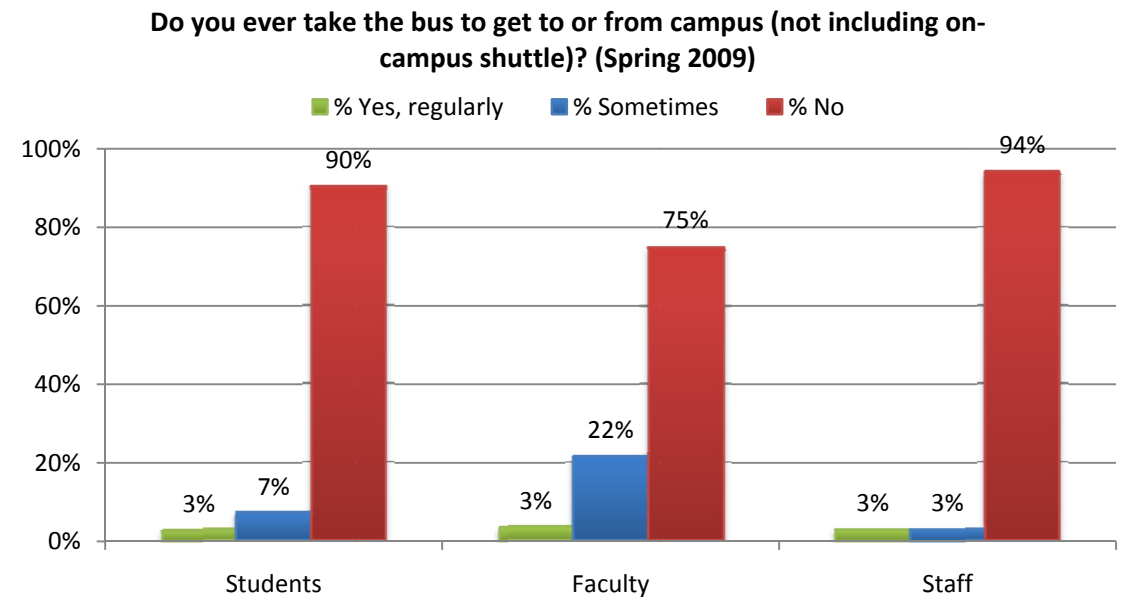


Figure 13. Percent of commuters who ride the bus to and from campus.

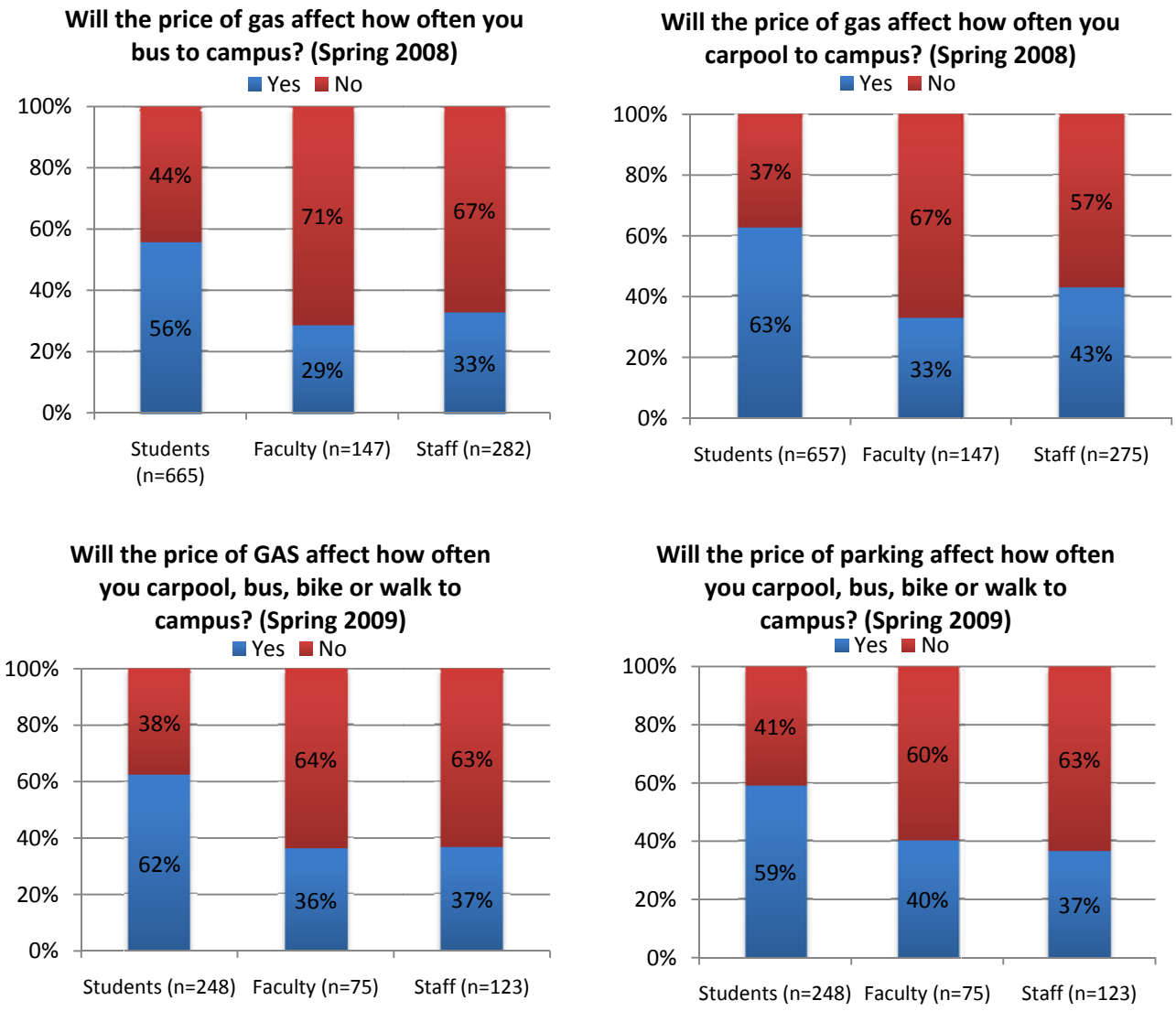


Figure 14. Potential effects of gas prices on commuting habits.

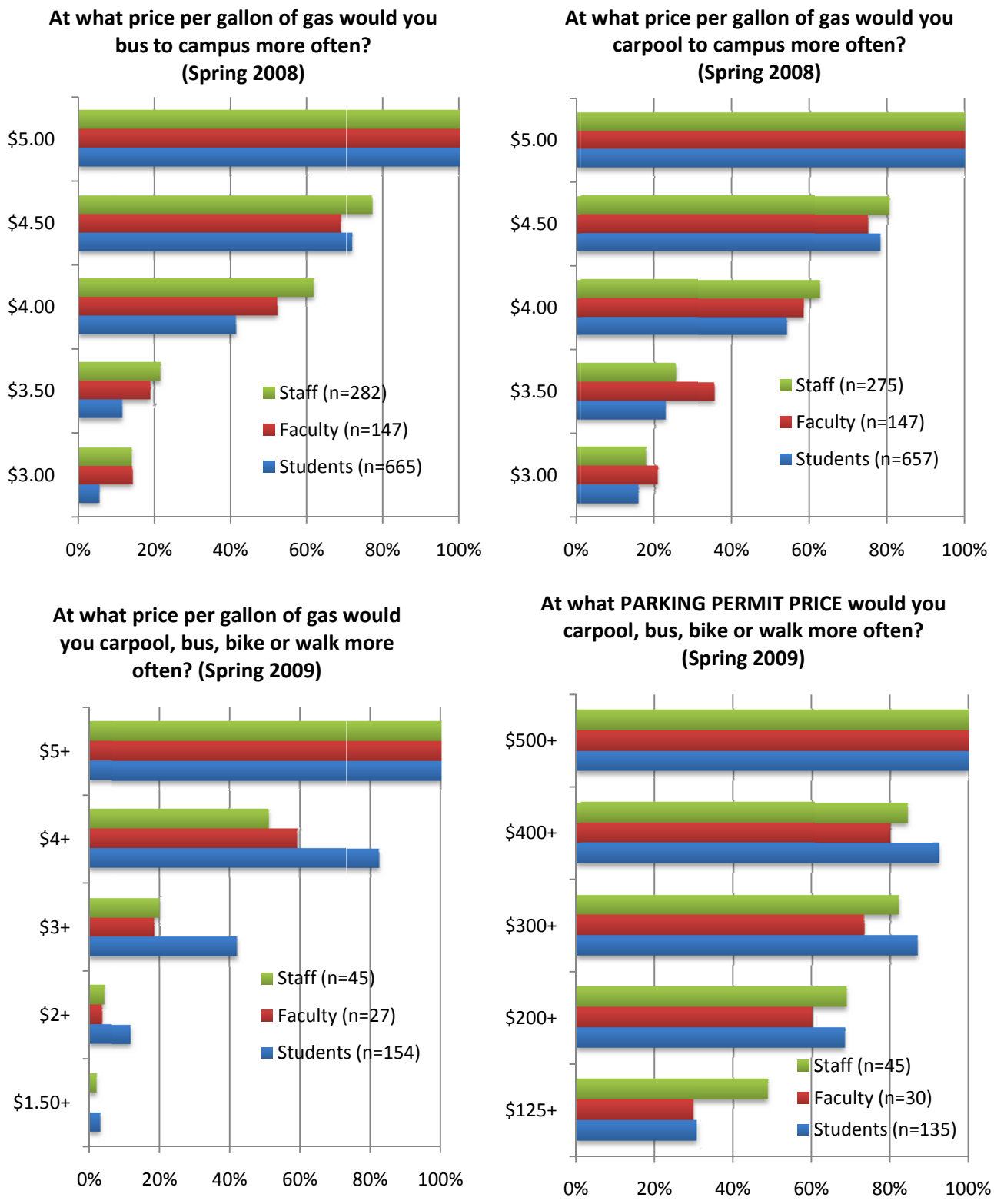


Figure 15. Gas and parking permit prices that may lead to increased alternative transportation use shown as cumulative percentages.

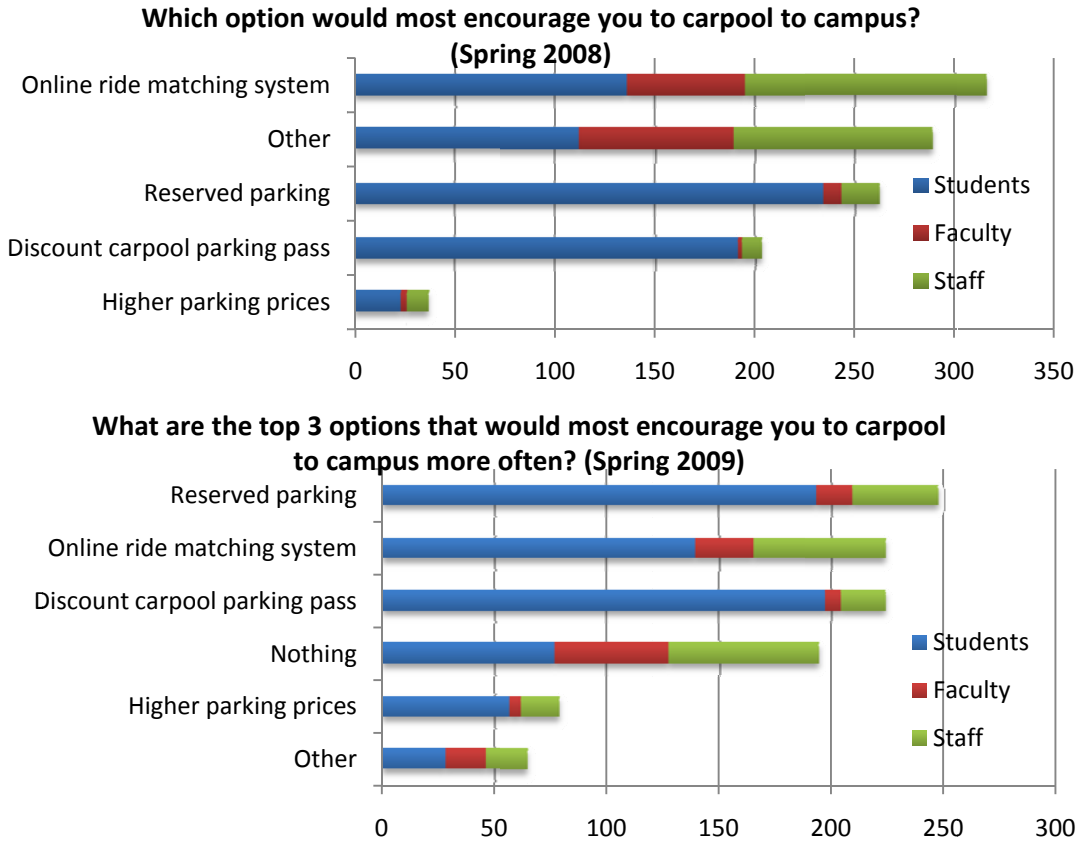


Figure 16. Policies that may encourage commuters to carpool more often.

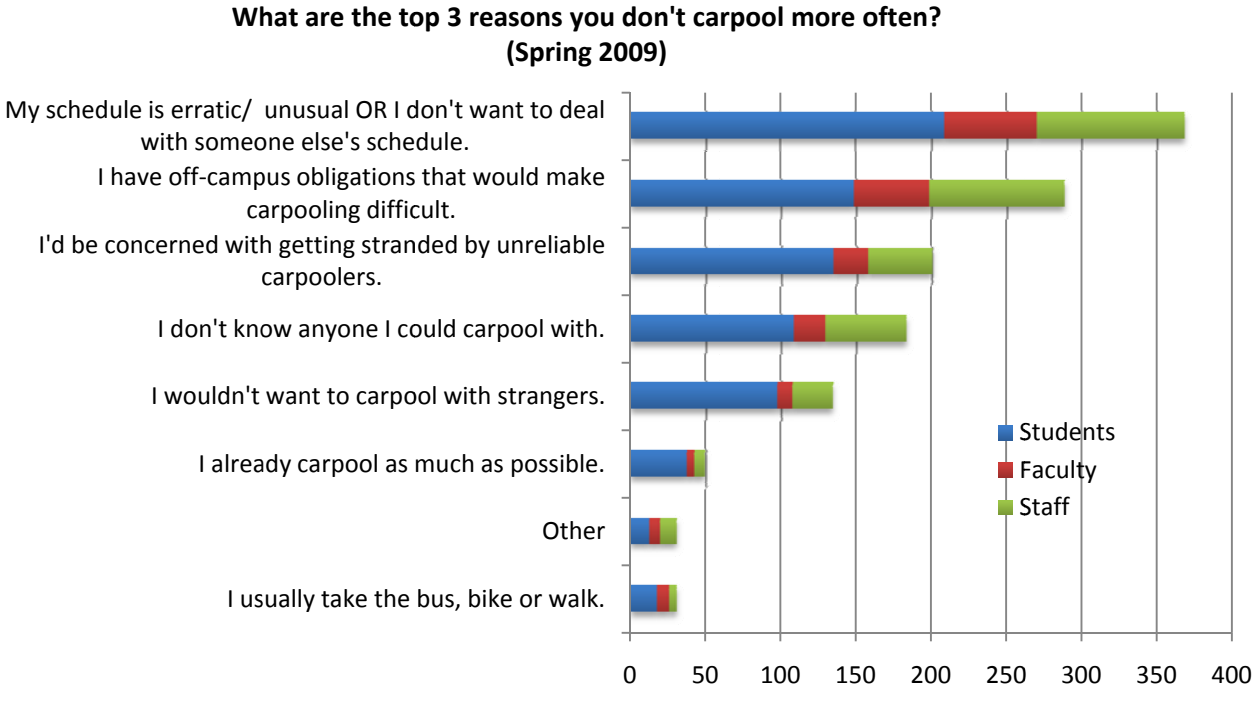


Figure 17. Reasons why respondents do not carpool more often.

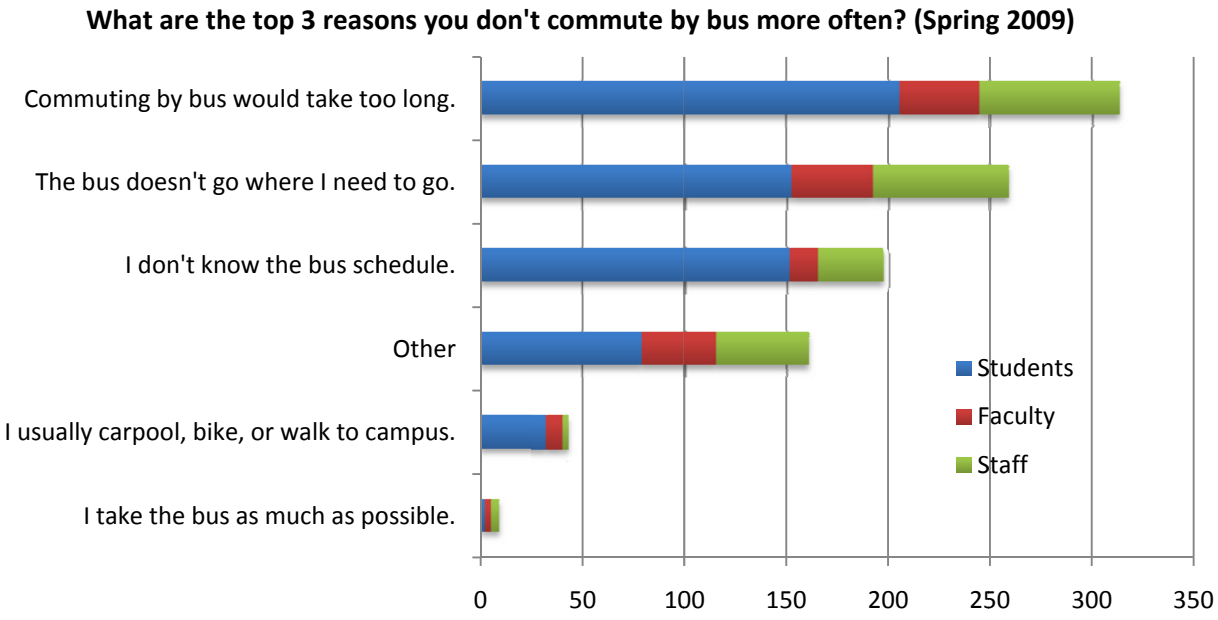


Figure 18. Reasons why respondents do not commute by bus more often.

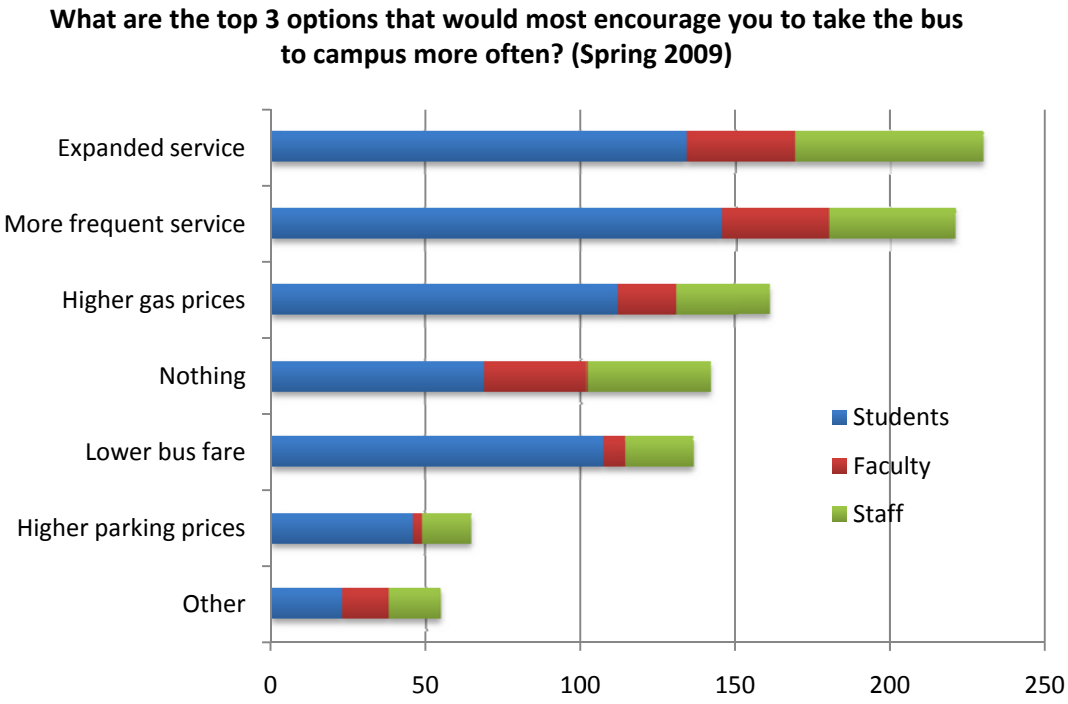


Figure 19. Most important aspects of respondents' commutes.

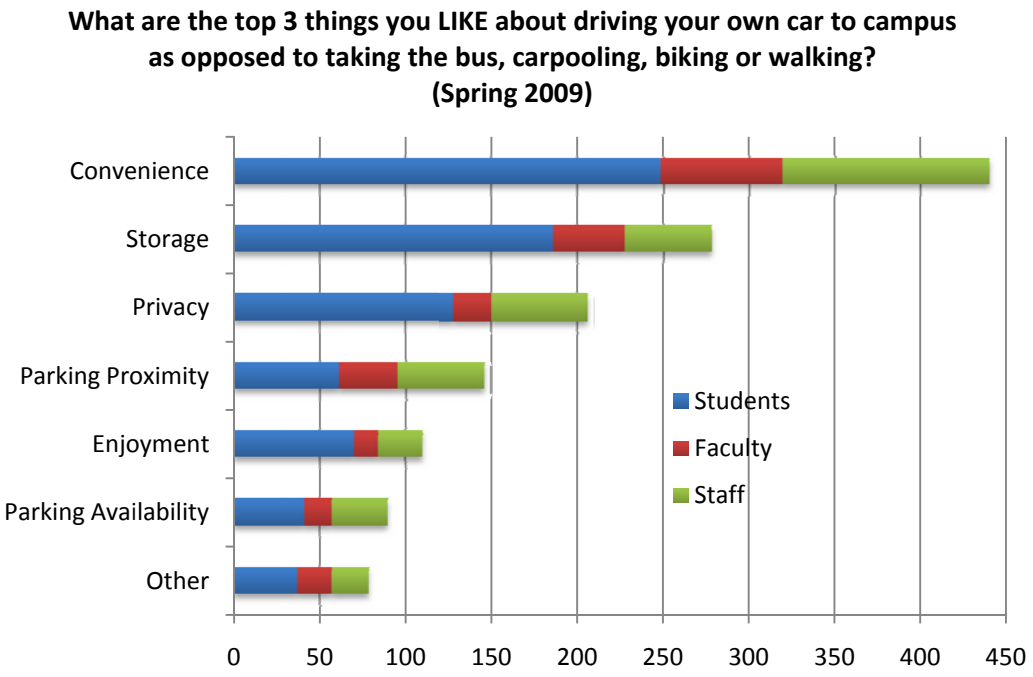


Figure 20. Aspects commuters like about driving alone to campus.

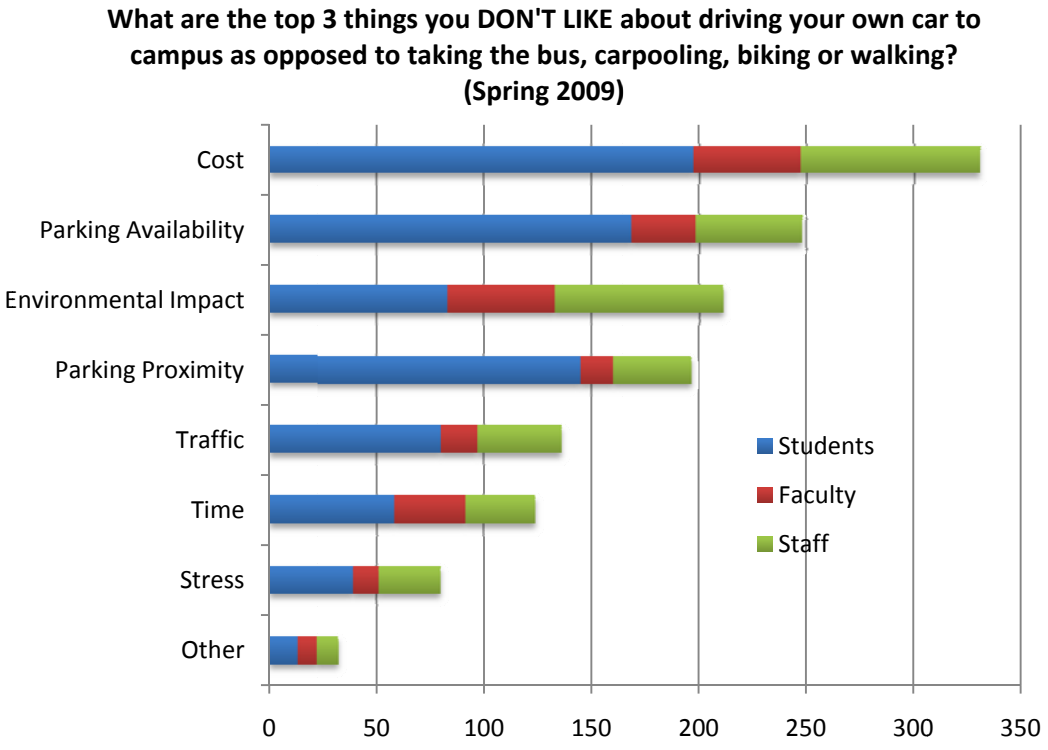


Figure 21. Aspects commuters do not like about driving alone to campus.

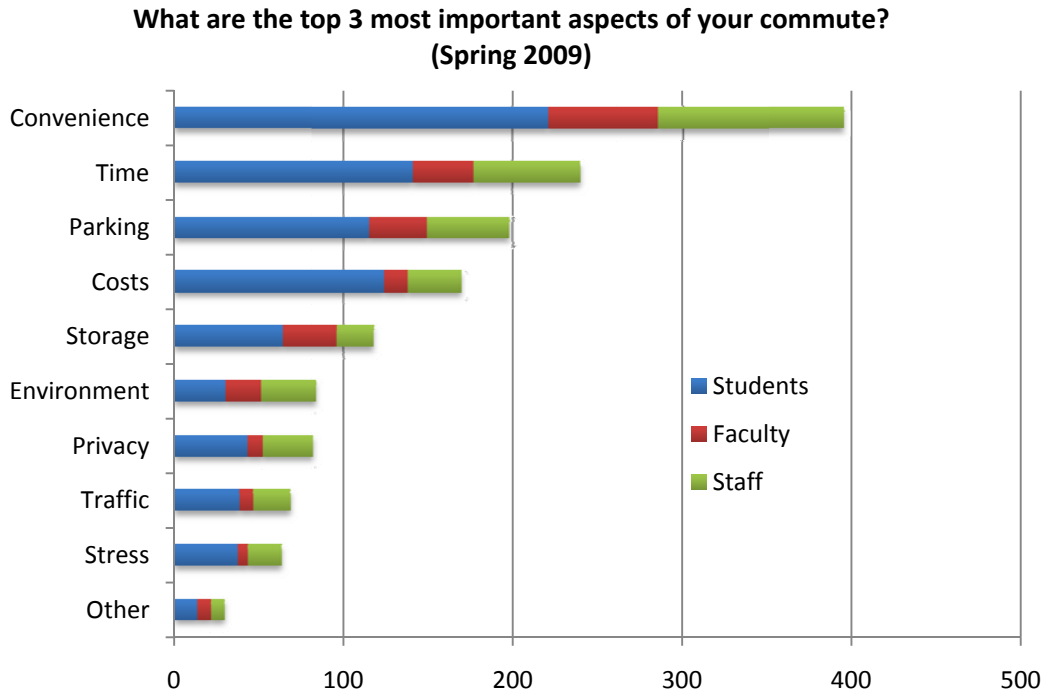


Figure 22. Most important aspects of respondents' commutes.

DISCUSSION

Potentially Non-Representative Samples

One of the major limitations of this study is the sampling method. Inherent in online surveying is a form of sampling bias known as self-selection bias, which occurs when survey respondents are able to choose whether or not to participate. Those who choose to complete an online survey may be more likely to have strong opinions about the survey topic. Therefore, self-selection bias can result in a non-representative sample and inaccurate results. It is possible to correct for a sample bias by weighting the underrepresented responses to estimate results of an unbiased distribution. However, doing this requires the degree of under-representation to be quantified. While we know that we are missing a certain percentage of the male population, comparison of female and male responses did not indicate any gender-specific behavior. Thus, weighting male responses would probably not produce more accurate results. Other potential under-representation (e.g. SUV drivers) or over-representation (e.g. bikers) is much harder to quantify.

In Spring 2009, a technical error resulted in the loss of the first 300 responses. Early responders may have different characteristics than participants that respond later. Thus, the samples being compared between 2009 and the other two years may not be the same. This is also a likely explanation of some changes in qualitative responses, for example, the decrease in respondents reporting that they would purchase a bus pass in lieu of parking pass decrease between 2008 and 2009.

When comparing the composition of URI's commuting population to that of the samples, students are consistently underrepresented and faculty and staff are overrepresented (Appendix A: Table 1). Weighting the underrepresented samples could have compensated for this imbalance.

Limited Statistical Analyses

Analyses that could be performed to test for correlation of multiple parameters require a certain set of conditions, most importantly a random sample. Because this was an online survey emailed to all URI students, staff and faculty, the sample is non-random. This method was used for convenience and because of time and resource constraints. A similar commuter study conducted at the University of Western Australia in the city of Perth used a combination of mail and online methods to achieve a random sample and thorough analyses.[15] The authors obtained names, addresses and email addresses of students and staff through the University and generated a random sample assuming a 50% response rate. Letters were sent to those individuals inviting them to participate in an online survey. This method could be used in future URI commuter surveys to allow for a more rigorous analysis.

Additionally, this study was designed to gather information on commuter behavior, not to test hypotheses. While the authors may have had basic hypotheses in mind when designing the questions (e.g. the price of gas will affect how often students use alternative transportation), such hypotheses were not were not clearly defined or consciously used to design the surveys. If added scientific rigor is desired in the future, surveys should clearly state hypotheses before the design process begins.

Changes in Survey Design

Significant changes were made to the survey between 2006 and 2008, which is probably the primary cause of the dramatic increase in emissions. The 2008 and 2009 surveys were much more similar and total emissions varied much less. Again, the primary factor influencing total emissions is miles per trip, which showed an unexplained increase from 2008.

Based on these results, proximity of residence to campus is a major factor influencing the shift in total commuter emissions at URI, although it is unclear whether this effect is an actual change in behavior or a product of sampling error. In the 2006 survey, respondents were asked to estimate their distance from campus as a range (and the midpoints were averaged), whereas in the Spring 2008 survey, we added the ability to calculate the exact distance by embedding a Google Maps link into the survey. In theory, the miles per trip values for 2008 and 2009 should be the most accurate values we have because of this addition. Questions that rely on the respondent to know or recall a specific number such as the fuel efficiency of their vehicle are generally more prone to error. One explanation could be that because the total sample size increased substantially, we captured a different set of respondents. There are a host of reasons that might explain the significantmiles per trip variation, all of which are difficult to confirm. One way of crosschecking miles per trip would be to obtain commuter addresses stored in the University's records to find an actual average distance from campus over time. GIS maps created from this information could illustrate any shifts clearly.

In addition to miles per trip, commuting days per week varied dramatically over time. This is likely due to changes in the way this information was gathered from the surveys (Appendix B). In 2006, commuters were simply asked to provide the average number of days per week they travel to campus and which mode they used most often. It was assumed that respondents used their primary mode every day they traveled to campus. The number of carpool commute days was obtained in a separate question. In 2008, the survey was refined to capture commuters who use different modes during the week and the number of carpool days was derived from a separate question. In 2009, the questions were combined so that respondents were asked how many days per week they drive alone, carpool, bus, bike and walk. These changes also influenced modal split results (Appendix A: Table 5); Spring 2009 data probably illustrate URI's modal split most accurately.

In the future, every effort should be made to use the same question formats and response options and to collect a large number of responses. Consistency is needed to provide accurate trend data.

Discussion Summary

Using surveys to estimate greenhouse gas emissions is complex and may not always produce more accurate results than simply using assumptions. Changes in survey design, question wording, response options, etc. can produce artificial and misleading trends. Several years of data collection using identical survey design and distribution methods are needed to show definitive trends. While trend data is crucial for measuring emissions reductions, a single year of reliable data is also valuable. When commuting is responsible for a large part of a university's emissions, it is useful to have a thorough understanding of travel characteristics as well as knowledge and attitudes toward alternative transportation. This information will allow a university to develop policies and programs that are catered to the unique commuting profile of the institution.

Despite its limitations, this study was successful in developing a baseline of energy use and greenhouse gas emissions from commuting at URI. We have also developed a methodology for collecting annual data to monitor any changes in emissions over time and any impact alternative transportation programs may have.

CONCLUSIONS

Annual Emissions Estimate

Commuting to and from URI produces roughly 25,000 $MTCO_2e$ per year.

Modal Split

The majority (between 75% and 90%) of commuter trips are made in single-occupancy vehicles, which is the source of most of URI's commuter greenhouse gas emissions. Carpool, bus, bike and walk trips are very low and have not changed significantly over the past four years.

Student, Staff, Faculty Comparison

Staff members take the highest number of SOV trips, have the lowest vehicle occupancy and have the highest commuting days per week. Faculty members take the most alternative transportation trips (mostly bike trips) while students carpool the most.Colorado State University also found that staff have the highest rates of single-occupancy vehicle commuting, followed by faculty.[16]

Awareness of Alternative Options

Awareness of bus stop locations is relatively low among faculty and higher among students and staff. Significant percentages of students, staff and faculty would reportedly consider purchasing a bus pass instead of a parking pass if it were cheaper to do so and if they were given a few one-time passes for occasions when taking the bus is impossible. Among Narragansett residents, knowledge of Narragansett bus service is high while ridership is low. Awareness of the free Flex 212 shuttle service to local conveniences and entertainment is also high, but ridership was virtually non-existent at the time of the 2009 survey. Regular commuting by bus is very low among students, faculty and staff, but occasional bus use is significantly higher among faculty and somewhat higher among students.

Parking Price vs. Gas Price

The price of parking may have a stronger influence on commuting than the price of gas. Large percentages of staff and faculty indicated that having to pay for parking, even a relatively small amount, would encourage them to use alternative transportation more often.For respondents who said that the price of gas could affect their commute, $4.00 per gallon seems to be a common threshold above which commuters might start to carpool, bus, bike or walk to campus more often.

Carpool Incentives

While a large number of respondents reported that nothing would persuade them to carpool to campus, many felt that if the University offered an online carpool matching system, the ability to park close to academic buildings and a discounted carpool parking pass, they might carpool more often.Results indicate that URI commuters may be more likely to carpool than to ride the bus. In commuter study conducted at another university, respondents indicated that they would be more willing to carpool if the school provided resources to help find carpool partners, a guaranteed ride home program and designated, prime parking spaces for carpoolers.[3]

Bus Incentives

Many commuters reported that they would ride the bus more often if service were expanded and trip frequency were increased. One of the most reported reasons for not riding the bus was that it would increase travel time, a result found in other similar studies.[3, 9] Thus, converting SOV trips to alternative transportation trips is to continue making alternatives more convenient and make driving alone less convenient to the point where it is more convenient to use an alternative mode than to drive alone.

Barriers to Alternative Transportation Use

This study found that convenience and time are the most important factors in choosing a mode choice among all URI commuters, a result which is echoed in similar studies.[9]

POLICY IMPLICATIONS

Targeting students is probably the most efficient way of reducing emissions from commuting because students represent the largest population. Efforts

On a basic level, there are four ways to reduce greenhouse gas emissions from commuting: 1) reduce travel distance; 2) reduce number of trips; 3) convert single-occupancy vehicle (SOV) trips to carpool, transit, bike or walk trips; and 4) increase fuel efficiency. Universities cannot directly control these factors, but they can implement a suite of programs that offer incentives and disincentives to promote these outcomes. Few programs will be successful without adequate marketing and behavior change campaigns.

Reduce Travel Distance

Increasing on-campus living opportunities for students will guarantee emissions reductions from commuting. Offering incentives for staff and faculty to live near campus would reduce travel distance. It would be useful to identify what factors motivate individuals to change locations.

Reduce Number of Trips

Reducing the number of trips could be achieved by requiring freshmen to live on campus. The University could go a step further and not allow freshmen to bring cars to campus. In addition to expanding and improving transit service in the Kingston area, a car-share (e.g. ZipCar) program could be established to ensure that students without cars have sufficient access to off-campus locations. A more radical option for reducing trips is switching to a 4-day work/school week, which would mean that students, faculty and staff would travel to campus one day less per week.Increasing the number of courses offered online could also reduce the total number of commuter trips.

Increase Fuel Efficiency

Since parking proximity has been shown to be an important issue to commuters, especially to students, high fuel efficiency vehicles could be rewarded with reserved parking spaces in more desirable locations. The University could also implement a "Cash for College Clunkers" program, modeled after the federal program, which would give students funds to trade in their low efficiency vehicles for higher efficiency vehicles. While the federal program's impact is questionable, a program at the University scale would likely have more direct effects.

Convert SOV Trips to Alternative Transportation Trips

Survey results indicate that providing reserved parking for carpoolers in desirable locations might convert many SOV trips to carpool trips. This could be combined with a discounted carpool parking pass, an online ride-matching system and a carpool/bus park-and-ride in Narragansett, where student populations are large. Students living in Narragansett are an ideal target audience for carpooling because many students already live together and travel to the same place.

The number of bus trips could be increased by providing an annual bus pass that is less expensive than an annual parking pass, by adding more trips on existing routes and by expanding service to new areas with high commuter densities.Biking can be encouraged by making bike commuting from surrounding neighborhoods safer and easier, installing bike racks at every building and encouraging staff and faculty to bike and dress casually on Fridays. Incentives such as these partnered with disincentives such as increased parking fees may persuade commuters to use alternative modes more frequently. An important supplement to these policy implementations would be a campaign to increase awareness of incentives and available bus service as well as a campaign to change negative attitudes toward alternative transportation, especially bus commuting.

Parking policies should not be overlooked as a tool to convert SOV trips to alternative transportation trips. A common method of influencing behavior is to increase the cost of SOV commuting by while simultaneously decreasing the cost of alternative transportation.[3] One study found that a 10% increase in parking costs discouraged vehicle trips up to 1-3%.[4]Many universities are also installing meters, creating tiered pricing structures based on distance from campus core, banning or limiting freshman parking and capping the number of parking spaces.

Another policy option is what is known as a parking cash-out, which is essentially paying commutersto not drive. Typically, some form of financial incentive is offered to commuters who forgo a parking permit. A parking cash-out option becomes feasible when the school is considering increasing the supply of parking through construction of surface lots or parking structures, because it is generally less expensive to give commuters a cash incentive to use an alternative mode than building and maintaining more parking spaces.

RECOMMENDATIONS

Annual Data Collection

In order to measure future changes in commuter behavior and greenhouse gas emissions, this survey should be conducted each spring using identical question formats and response options foremissions parameters.

The lack of complete and centralized University demographic data was a challenge during this study. The process would be facilitated by the increased collection, organization and availability of commuter data through the University website. Some schools have required that all students, faculty and staff requesting a parking permit fill out a questionnaire to provide this data (i.e. round trip commute mileage, number of trips per week, etc.). This method would only collect information on commuters who drive most of the time, but currently that is the majority of commuters.

Additional qualitative questions can be included in future surveys to assess the acceptance of other potential policies. Based on continued survey results, policies should be implemented that aim at reducing greenhouse gas emissions from commuting. Future surveys will show any changes in commuting behavior, knowledge or attitudes as a result of new policies and programs.

Transportation Demand Management Plan

URI would benefit from implementation of a comprehensive transportation demand management (TDM) program. TDM is a concept whichimplements programs and policies to decrease the demand for parking rather than increasing parking supply to meet demand.[9]

URI's TDM plan should include policies that reduce demand for parking, traffic congestion and greenhouse gas emissions while increasing the use of alternative transportation. Adequate staffing and program support is necessary to ensure the success of such a plan.

Based on the results of this study, it is important that a TDM plan for URI prioritize these components:

1) Increase on-campus housing as quickly as possible, make existing on-campus housing more desirable, and make the campus community a more desirable place to live.
2) Establish parking policies that do not incentivizedriving alone to campus.
3) Develop a carpool incentive program that target students living in Narragansett.
4) Develop bus incentive program which strives to make riding the bus as or more convenient than driving alone.
5) Develop bike and walk incentive programs that target commuters who live nearby.
6) Implement an on-going large-scale social marketing campaign to increase awareness and use of alternative transportation options at URI.

Additional analyses would assist the University in developing a TDM plan. First, a GIS map analysis of commuter addresses overlaid with transit routes, stops and park and rides would provide us with a visual depiction of geographic regions to target public transit service. Second, a thorough comparison of commuting parameters, alternative transportation opportunities and incentives and on and off-campus living situation, between URI and its peer public research institutions, especially those in similar land use characteristics would allow URI to benchmark itself against its peers. Third, URI should conduct a study (perhaps a survey or focus group) to determine what could be done to increase the desirability of on-campus living to students.

ACKNOWLEDGEMENTS

We would like to acknowledge the following organizations and individuals for their generous contributions and assistance on this project: URI Transportation Center; National Wildlife Federation; Lucas Lussier, URI Business Services; Tim McCormick and Mark Therrien, RIPTA; Deb Rosen, Nancy Murphy and GemaViñuales, URI Transportation Center; Marion Gold, URI Outreach Center; Ken Payne, URI; Gary Boden, URI Office of Institutional Research.

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APPENDIX A: Data Tables

Table 1. Number and percentage of faculty, staff and student commuters in population versus in samples by year.

2006				
	Commuting Pop	% Commuting Pop	Sample Pop	% Sample Pop
Faculty	710	6%	63	21%
Staff	2,454	22%	87	28%
Students	8,000	72%	157	51%
TOTAL	11,164	100%	307	100%
2008				
	Commuting Pop	% Commuting Pop	Sample Pop	% Sample Pop
Faculty	774	6%	170	14%
Staff	2,537	21%	282	24%
Students	8,608	72%	721	61%
TOTAL	11,919	100%	1,173	100%
2009				
	Commuting Pop	% Commuting Pop	Sample Pop	% Sample Pop
Faculty	741	7%	91	11%
Staff	1,705	15%	292	34%
Students	8,747	78%	477	55%
TOTAL	11,193	100%	860	100%

Table 2. Estimated Annual Single-Occupancy Vehicle (SOV) Emissions and Averages of Commuting Characteristics for 2006, 2008 and 2009 surveys.

2006	Commuting Population	Roundtrips Per Day	SOV Days Per Week	Weeks Per Year	Miles Per Oneway Trip	Miles Per Gallon	Total Annual Miles	Total Annual Gallons Gas	Total Annual $MTCO_2E$* (SOV)
Students	7,978	1.22	4.31	30	13.43	26.32	33,781,203	1,283,480	11,645
Summer Students	2,750	1.22	4.31	8	13.43	26.32	3,105,149	117,977	1,070
Faculty	710	1.16	4.60	37	12.85	27.23	3,605,497	132,409	1,201
Staff	1,744	1.16	4.89	49	14.24	25.93	13,792,982	531,927	4,826
Total/Average	13,182	1.19	4.53		13.51	26.49	54,284,832	2,065,793	18,743
2008									
Students	8,608	1.25	4.35	30	16.08	25.04	45,177,432	1,803,875	16,367
Summer Students	2,750	1.25	4.35	8	16.08	25.04	3,848,983	153,685	1,394
Faculty	732	1.08	3.89	37	18.94	27.05	4,304,629	159,134	1,444
Staff	1,758	1.17	4.79	49	15.61	24.75	15,073,214	609,112	5,527
Total/Average	13,848	1.19	4.34		16.88	25.61	68,404,257	2,725,806	24,732
2009									
Students	8,747	1.20	4.55	30	14.85	25.49	42,572,423	1,670,162	15,154
Summer Students	2,750	1.20	4.55	8	14.85	25.49	3,569,117	140,020	1,270
Faculty	741	1.12	4.85	37	14.81	27.20	4,410,224	162,141	1,471
Staff	1,705	1.12	4.95	49	14.28	25.35	13,217,022	521,382	4,731
Total/Average	13,943	1.16	4.72		14.65	26.01	63,768,785	2,493,704	22,626

*Annual Metric Tons CO_2 Equivalent[3] = Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) / Miles/Gallon x 0.0090312.

Table 3. Estimated Annual Carpool Emissions and Averages of Commuting Characteristics for 2006, 2008 and 2009 surveys.

2006	Commuting Population	Roundtrips Per Day	Carpool Days Per Week	Weeks Per Year	Miles Per Oneway Trip	Miles Per Gallon	Average People Per Car (carpoolers)	Total Annual Miles	Total Annual Gallons Gas	Total Annual $MTCO_2E$* (Carpool)
Students	7,978	1.22	0.66	30	13.43	26.32	2.19	2,356,098	89,517	812
Summer Students	2,750	1.22	0.66	8	13.43	26.32	2.19	216,571	8,228	75
Faculty	710	1.16	0.46	37	12.85	27.23	2.38	151,367	5,559	50
Staff	1,744	1.16	0.28	49	14.24	25.93	2.00	396,560	15,293	139
Total/Average	10,432	1.18	0.51		13.51	26.49	2.19	3,120,597	118,598	1,076
2008										
Students	8,608	1.25	0.53	30	16.08	25.04	2.16	2,547,103	101,702	923
Summer Students	2,750	1.25	0.53	8	16.08	25.04	2.16	217,006	8,665	79
Faculty	732	1.08	0.29	37	18.94	27.05	2.00	160,650	5,939	54
Staff	1,758	1.17	0.17	49	15.61	24.75	2.00	267,456	10,808	98
Total/Average	11,098	1.17	0.38		16.88	25.61	2.08	3,192,214	127,114	1,153
2009										
Students	8,747	1.20	0.61	30	14.85	25.49	2.13	2,662,767	104,463	948
Summer Students	2,750	1.20	0.61	8	14.85	25.49	2.13	223,237	8,758	79
Faculty	741	1.12	0.13	37	14.81	27.20	2.09	58,194	2,139	19
Staff	1,705	1.12	0.21	49	14.28	25.35	2.04	279,403	11,022	100
Total/Average	11,193	1.15	0.39		14.65	26.01	2.10	3,223,600	126,382	1,147

*Annual Metric Tons CO_2 Equivalent[3] = Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) / Miles/Gallon / Average People Per Car x 0.0090312.

Table 4. Estimated Annual Bus Emissions and Averages of Commuting Characteristics for 2006, 2008 and 2009 surveys.

2006	Commuting Population	Roundtrips Per Day	Bus Days Per Week	Weeks Per Year	Miles Per Bus Trip*	Miles Per Gallon	Average Number of People on Bus**	Total Annual Miles	Total Annual Gallons Diesel	Total $MTCO_2E$*** (Bus)
Students	7,978	1.22	0.29	30	30	4.5	22	230,760	51,280	524
Summer Students	2,750	1.22	0.29	8	30	4.5	22	21,211	4,714	48
Faculty	710	1.16	0.15	37	30	4.5	22	12,592	2,798	29
Staff	1,744	1.16	0.20	49	30	4.5	22	54,617	12,137	124
Total/Average	10,432	1.18	0.23		30	4.5	22	319,180	70,929	724
2008										
Students	8,608	1.25	0.19	30	30	4.5	22	165,136	36,697	375
Summer Students	2,750	1.25	0.19	8	30	4.5	22	14,069	3,126	32
Faculty	732	1.08	0.18	37	30	4.5	22	14,245	3,166	32
Staff	1,758	1.17	0.15	49	30	4.5	22	41,362	9,192	94
Total/Average	11,098	1.17	0.18		30	4.5	22	234,813	52,181	533
2009										
Students	8,747	1.20	0.21	30	30	4.5	22	177,857	39,524	404
Summer Students	2,750	1.20	0.21	8	30	4.5	22	14,911	3,314	34
Faculty	741	1.12	0.08	37	30	4.5	22	7,060	1,569	16
Staff	1,705	1.12	0.09	49	30	4.5	22	23,199	5,155	53
Total/Average	11,193	1.15	0.15		30	4.5	22	223,027	49,562	506

* One-way; Assuming all bus riders take the 66 to Providence.

** Average number of people on a bus was derived by daily observational counts on the 66 from the main campus in South Kingstown to Providence.

***Annual Metric Tons CO_2 Equivalent[3] = Commuting Population x Weeks/Year x Days/Week x Trips/Day x (2)(Miles/Trip) / Miles/Gallon / Average People Per Bus x 0.01021.

Table 5. Mode comparison in percent trips per mode among students, faculty and staff over time.

		Students	Faculty	Staff
2006	Drive Alone	67%	69%	90%
	Carpool	18%	10%	4%
	Bus	7%	3%	3%
	Bike	2%	10%	2%
	Walk	6%	7%	0%
2008	Drive Alone	78%	79%	90%
	Carpool	13%	7%	4%
	Bus	4%	4%	3%
	Bike	2%	3%	1%
	Walk	2%	4%	1%
	Other	1%	2%	0%
2009	Drive Alone	77%	79%	92%
	Carpool	13%	3%	4%
	Bus	4%	2%	2%
	Bike	1%	8%	0%
	Walk	3%	5%	0%
	Other	1%	4%	1%

Table 6. Commuter Town Distribution for 2006, 2008 and 2009.

	2006				2008				2009		
	Students (n=167)	Faculty (n=39)	Staff (n=91)		Students (n=745)	Faculty (n=177)	Staff (n=316)		Students (n=289)	Faculty (n=83)	Staff (n=144)
Woonsocket	0.00%	0.00%	0.00%		0.27%	1.13%	0.32%		0.35%	0.00%	0.00%
Westerly	1.20%	0.00%	0.00%		3.09%	2.82%	3.80%		2.08%	0.00%	3.47%
West Warwick	2.99%	0.00%	2.20%		2.28%	1.13%	2.85%		2.08%	0.00%	4.86%
West Greenwich	0.60%	0.00%	2.20%		0.40%	0.00%	1.58%		0.35%	0.00%	2.78%
Warwick	6.59%	0.00%	7.69%		5.91%	1.69%	5.70%		4.50%	1.20%	4.17%
Warren	0.00%	0.00%	0.00%		0.81%	0.00%	0.00%		0.00%	0.00%	0.00%
Tiverton	0.00%	0.00%	0.00%		0.40%	0.00%	0.63%		0.35%	0.00%	0.00%
South Kingstown	21.56%	30.77%	31.87%		9.93%	29.94%	24.37%		13.49%	49.40%	20.83%
Smithfield	0.00%	0.00%	0.00%		0.81%	1.69%	0.32%		0.35%	0.00%	0.00%
Scituate	0.00%	0.00%	1.10%		0.00%	1.13%	0.32%		0.00%	1.20%	0.69%
Richmond	0.00%	7.69%	4.40%		1.07%	6.21%	4.75%		1.38%	7.23%	4.86%
Providence	6.59%	17.95%	1.10%		5.50%	11.86%	2.22%		5.54%	12.05%	2.08%
Portsmouth	0.00%	0.00%	1.10%		0.67%	0.56%	0.32%		0.69%	1.20%	0.69%
Pawtucket	0.00%	0.00%	0.00%		1.34%	0.56%	0.63%		1.38%	1.20%	1.39%
Out of State	1.80%	0.00%	2.20%		4.56%	9.60%	1.58%		0.00%	0.00%	0.00%
North Smithfield	0.00%	0.00%	1.10%		0.40%	0.00%	0.95%		0.35%	0.00%	1.39%
North Providence	0.60%	0.00%	0.00%		1.21%	0.56%	0.63%		1.04%	0.00%	0.00%
North Kingstown	2.99%	7.69%	5.49%		5.23%	9.04%	7.91%		6.23%	4.82%	7.64%
Newport	1.20%	2.56%	3.30%		1.21%	0.00%	2.22%		1.73%	0.00%	3.47%
New Shoreham	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%		0.00%	0.00%	0.00%
Narragansett	44.91%	20.51%	10.99%		38.26%	6.21%	8.54%		38.75%	6.02%	11.81%
Middletown	0.00%	0.00%	0.00%		0.94%	0.56%	0.95%		0.00%	2.41%	1.39%
Little Compton	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%		0.00%	0.00%	0.00%
Lincoln	0.60%	0.00%	0.00%		0.67%	0.00%	0.00%		0.35%	0.00%	0.00%
Johnston	0.60%	0.00%	0.00%		0.54%	0.56%	1.27%		1.04%	0.00%	0.69%
Jamestown	0.00%	2.56%	3.30%		0.13%	0.00%	0.95%		0.69%	1.20%	2.08%
Hopkinton	0.60%	0.00%	1.10%		1.07%	2.82%	3.16%		1.38%	3.61%	2.78%
Glocester	0.00%	0.00%	0.00%		0.13%	0.56%	0.32%		1.04%	0.00%	0.00%
Foster	0.00%	0.00%	1.10%		0.27%	0.00%	0.32%		0.35%	0.00%	0.69%
Exeter	0.60%	0.00%	2.20%		1.61%	0.00%	4.75%		2.42%	0.00%	4.17%
East Providence	1.20%	0.00%	1.10%		0.27%	0.00%	1.27%		1.73%	1.20%	0.69%
East Greenwich	0.00%	2.56%	1.10%		2.28%	3.39%	2.22%		2.77%	2.41%	1.39%
Cumberland	0.00%	0.00%	1.10%		0.27%	1.69%	0.95%		0.00%	0.00%	0.00%
Cranston	1.20%	2.56%	2.20%		2.95%	2.82%	2.53%		1.73%	0.00%	3.47%
Coventry	1.20%	5.13%	2.20%		2.42%	0.56%	3.80%		2.77%	1.20%	5.56%
Charlestown	2.40%	0.00%	8.79%		2.01%	1.69%	6.01%		2.42%	2.41%	5.56%
Central Falls	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%		0.00%	0.00%	0.00%
Burrillville	0.60%	0.00%	1.10%		0.00%	0.00%	0.32%		0.35%	1.20%	0.00%
Bristol	0.00%	0.00%	0.00%		0.81%	0.00%	0.95%		0.35%	0.00%	0.69%

Barrington	0.00%	0.00%	0.00%		0.27%	1.13%	0.63%		0.00%	0.00%	0.69%

Table 7. What are the top 3 things you LIKE about driving your own car to campus as opposed to taking the bus, carpooling, biking or walking (1 being the most important)?

		Privacy (I have time to myself)		Convenience (Independence, flexibility, reliability)		Storage (I can carry or store things in my car)		Enjoyment (I enjoy driving)		Parking proximity (I can park close to my campus destination)		Parking availability (I can easily find a space)		Other (Please specify in box below)		Total	
Students	1	18	7%	198	73%	15	6%	14	5%	7	3%	3	1%	15	6%	270	100%
	2	54	22%	35	14%	109	44%	12	5%	18	7%	15	6%	7	3%	250	100%
	3	56	22%	15	6%	62	25%	44	18%	36	14%	23	9%	15	6%	251	100%
	Total	128	17%	248	32%	186	24%	70	9%	61	8%	41	5%	37	5%	771	100%
Faculty	1	1	1%	56	68%	6	7%	2	2%	5	6%	1	1%	11	13%	82	100%
	2	12	17%	9	13%	24	33%	4	6%	14	19%	5	7%	4	6%	72	100%
	3	9	14%	6	9%	11	17%	8	13%	15	23%	10	16%	5	8%	64	100%
	Total	22	10%	71	33%	41	19%	14	6%	34	16%	16	7%	20	9%	218	100%
Staff	1	13	9%	97	70%	5	4%	3	2%	6	4%	5	4%	10	7%	139	100%
	2	19	16%	15	13%	27	23%	7	6%	28	24%	13	11%	7	6%	116	100%
	3	24	23%	9	9%	19	18%	16	15%	17	16%	15	14%	5	5%	105	100%
	Total	56	16%	121	34%	51	14%	26	7%	51	14%	33	9%	22	6%	360	100%

Table 8. What are the top 3 things you DON'T LIKE about driving your own car to campus as opposed to taking the bus, carpooling, biking or walking (1 being the most important)?

		Parking Availability		Parking Proximity		Traffic		Stress		Cost		Environmental Impact		Time		Other		Total	
Students	1	81	30%	52	19%	13	5%	8	3%	70	26%	29	11%	13	5%	4	1%	270	100%
	2	50	19%	67	26%	21	8%	7	3%	59	23%	32	12%	22	8%	4	2%	262	100%
	3	37	15%	26	10%	46	18%	24	10%	68	27%	22	9%	23	9%	5	2%	251	100%
	Total	168	21%	145	19%	80	10%	39	5%	197	25%	83	11%	58	7%	13	2%	783	100%
Faculty	1	14	17%	3	4%	12	14%	1	1%	19	23%	24	29%	5	6%	5	6%	83	100%
	2	8	12%	7	10%	10	14%	2	3%	20	29%	17	25%	3	4%	2	3%	69	100%
	3	8	13%	5	8%	1	17%	9	14%	11	17%	9	14%	9	14%	2	3%	64	100%

						1													
	Total	30	14%	15	7%	33	15%	12	6%	50	23%	50	23%	17	8%	9	4%	216	100%
Staff	1	20	14%	10	7%	17	12%	2	1%	48	35%	30	22%	8	6%	4	3%	139	100%
	2	21	18%	16	13%	9	8%	12	10%	25	21%	19	16%	15	13%	2	2%	119	100%
	3	9	9%	10	10%	13	13%	15	15%	11	11%	29	29%	10	10%	4	4%	101	100%
	Total	50	14%	36	10%	39	11%	29	8%	84	23%	78	22%	33	9%	10	3%	359	100%

APPENDIX B: Survey Questions

Spring 2006 Survey

1. What is your status on campus?
2. Do you commute from off-campus?
3. What URI campus do you commute to most often?
4. How many days a week do you commute to campus?
5. Which form of transportation do you use most often?
6. Normally, how many times each day do you commute to campus?
7. On average, how many days a week do you carpool (ride with at least one other person)?
8. If you carpool, how many people (total) are in the car?
9. From where do you commute? (Town and State)
10. About how many miles is it from your home to URI?
11. How long does it take?
12. Approximately how many miles to the gallon does your car get?

Notes: Multiple choice options are not shown here. SurveyMonkey was not used to create this survey.

Spring 2008 Survey

1. Male or Female?
2. What is your age?
3. What is your status on campus?
4. Do you currently live on campus (did you during the Spring 2008 semester)?
5. Which URI campus do you commute to most often?
6. What is the zip code of your residence (where you commute from)?
7. What town do you commute from?
8. How many miles is it from your house to campus? *Find the exact distance by clicking the Google Maps link to the campus you most often commute to and entering your address (your address will not be saved).*
9. About how much time does your commute take one way (in minutes)?
10. How many days a week do you commute to campus?
11. How often do you usually commute using these modes of transportation? (if no answer is selected for a mode, we'll assume you never use it)
12. Do you have a URI parking pass?
13. About how many miles per gallon of gas does your car get?
14. Normally, how many times each day (round trips) do you commute to campus?
15. On average, how many days per week do you carpool to campus (drive with at least one other person)?
16. When you carpool, how many people (including you) are usually in the car?
17. Is there a bus stop within walking distance of your house?
18. Did you know that there is now a bus from URI to Narragansett/Down-the-line?
19. If you drive to campus on most days, at what price per gallon of gas might you start taking the bus more often?
20. Why won't the price of gas affect whether or not you take the bus?
21. Would you buy an annual bus pass instead of an annual parking pass if it were cheaper to do so and you were given a few one-time parking passes for emergencies?
22. Why did you answer no or maybe to the previous question?
23. Which option would most encourage you to carpool to campus?
24. If you drive to campus on most days, at what price per gallon of gas would you consider carpooling?
25. Why won't price affect whether or not you carpool?
26. Do you have any comments regarding this survey?

Notes: In several instances, skip logic was used to by-pass questions depending on the response of a particular question. Multiple choice options are not shown here.

Spring 2009 Survey

1. Are you male or female?
2. What is your age?
3. What is your primary status at URI?
4. Do you live on campus?
5. Which URI campus do you commute to most often?
6. What is the zip code of your residence (where you commute from)?
7. What town do you commute from?
8. Did you know that there is bus service from URI Kingston to Narragansett/"Down-the-line"?
9. Would you use Scarborough Beach parking lot as a Park & Ride (would you drive to the lot to catch a bus or meet carpoolers)?
10. About how many minutes does your commute take one way (using your primary method of travel)?
11. How many miles is it from your residence to campus? *You can find the exact distance by clicking the Google Maps link to the campus you most often commute to and entering your address (your address will not be saved).*
12. On average, how many days per week do you commute to campus?
13. On average, how many times EACH DAY do you commute to campus (how many round trips)?
14. When commuting how often do you use these modes of transportation on average?
15. If no answer is selected for a mode, we'll assume you never used it.
16. When you drive alone to campus, what is your primary mode of transportation?
17. About how many miles per gallon of gas does your vehicle get?
18. Do you currently have a URI parking pass?
19. What are the top 3 things you DON'T LIKE about driving your own car to campus as opposed to taking the bus, carpooling, biking or walking (1 being the most important)?
20. What are the top 3 MOST IMPORTANT FACTORS of your commute to campus (1 being the most important)?
21. When you carpool, how many people (including you) are usually in the car?
22. What are the top 3 options that would most encourage you to carpool to campus more often (1 being the most influential)?
23. What are the top 3 reasons you don't carpool more often (1 being the most influential)?
24. Is there a bus stop within walking distance of your residence?
25. Do you ever take the bus to get to or from campus? This DOES NOT include the on-campus shuttle.
26. What are the top 3 options that would most encourage you to take the bus more often (1 being the most influential)?
27. What are the top 3 reasons you don't commute by bus more often (1 being the most influential)?
28. Would you buy an annual bus pass instead of an annual parking pass if it were cheaper to do so and you were given a few one-time parking passes for emergencies?
29. Did you know that URI now provides FREE bus service (Flex 212) to CVS, Shaw's,
30. Wakefield Mall, Casey's Grill & Bar and South County Commons?
31. The average URI commuter spends about $424 in gas at $2/gal (and about $848 at $4/gal) per year (spring and fall semesters). Given this reference information, at what price per gallon of gas would you (or did you) carpool, bus, bike or walk to campus more often?
32. The annual price of a student commuter parking permit is $125. Faculty and staff receive free permits. At what annual parking permit price would you carpool, bus, bike or walk to campus more often (even if you don't currently pay for parking)?

BUS QUESTIONS

33. Is the bus usually on time?
34. Do you currently have a bus pass?
35. Do you usually use a Park & Ride?
36. Do you currently have access to a car that you could use to drive to and/or from campus?
37. Would you still ride the bus if you did have access to a car?
38. What are the top 3 things you LIKE about taking the bus (1 being the best thing)?
39. What are the top 3 things you DON'T LIKE about taking the bus (1 being the worst thing)?

ON-CAMPUS QUESTIONS

40. Why are you living on campus?
41. On average, how many days per week do you travel off-campus?
42. Did you know that URI now provides FREE bus service (Flex 212) to CVS, Shaw's,
43. Wakefield Mall, Casey's Grill & Bar and South County Commons?
44. How often do you travel to these off-campus locations?
45. How do you usually get to off-campus destinations?
46. About how many miles per gallon of gas does your/your friend's car get?
47. What off-campus destinations do you walk or bike to?
48. How could URI improve conditions for walking and biking to off-campus locations?
49. Do you have any comments regarding this survey?

Note: Skip logic was used on many questions; no respondent was required to answer all questions. Multiple choice options are not shown here.