# 2017 Fort Lewis College Commuting Report
## Opportunities and Barriers for Alternative Transportation

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**Report compiled and edited by:**
Kathy Hilimire
Assistant Professor and Sustainability Coordinator
Environmental Studies, Fort Lewis College
kehilimire@fortlewis.edu

**Data collection, analysis, and writing by Environmental Studies students:**
Bauer, Zack; Benally, Jeremy; Cottingham, Rachel; Doucleff, David; Gaber, Brenna; Goddu, Elliot; Gould, Ben; Guciardo, Sam; Henry, Jess; Kayton, Rhiannon; Lomaomvaya, Trevor; Peaches, Ty; Pletnikoff, Paula; Ronan, Madeline; Sisler, Matt; Squirrell, Sara; and Wolsleben, Charlotte

AT = Alternative transportation (walking, biking, taking the bus, carpooling, etc.)

## Summary

### OUR RECOMMENDATIONS

Based on this research, these steps could increase use of AT at FLC:

- **Offer discounted daily parking passes and free parking on days when it's raining or snowing** so that campus users can choose which days to drive.
- **Pilot an e-bike program** to address the challenges of the hill.
- **Offer a compressed work week** for staff.
- **Develop a ride-sharing app** to improve carpooling.
- **Create a tour of the bus sytem** for incoming students to improve familiarity.
- **Work with the city to assess adding bus routes** in more distant locations.

### OUR RESEARCH

We measured ***use of AT*** among 184 faculty, staff, and students at FLC.

- Overall, 55% of respondents reported using AT at least once per week.
- By role, 66% of faculty, 63% of students, and 44% of staff used AT at least once per week.
- Staff used AT the least and live furthest from campus (~ twice as far as faculty and students).

We assessed a number of hypothesized ***deterrents to the use of AT***:

- **Time efficiency** was named by 54% of respondents as why they used a vehicle to commute.
- **The hill** was a deterrent to about 1/3 of respondents. Arriving sweaty was a bigger problem than the physical demand of walking/biking up the hill.
- **Lack of bus routes** was an important deterrent to bus use for staff (35%) and respondents living >2 miles from campus (31%).
- **Trip chaining** (e.g., linking multiple stops to a commute such as dropping a child at daycare) was a reason given by 29% of respondents for driving to commute.
- **Weather** was a deterrent to using pedestrian modes for 29% of respondents.
- **Lack of familiarity with the bus** was an important deterrent to bus use for students (15%).
- **Safety** was a deterrent to just 15% of respondents.

We analyzed support for several mechanisms to ***increase use of AT***:

- **A gondola up the hill** was named by 34% of respondents as likely to increase their use of AT.
- **Discounted daily parking passes** that can be purchased in bulk were named by 32% of respondents.
- **E-bikes** were named by 30% of respondents.
- **Prizes for using AT** were named by 30% of respondents.
- **More trails/sidewalks** were named by 29% of respondents.
- **Free parking on days when it's snowing or raining** was named by 26% of respondents.
- **An increase in the cost of the annual parking passes** was named by 26% of respondents.
- **Banning first year students** from having a car on campus was named by 26% of respondents.
- **A carpooling/ridesharing program** was named by 25% of respondents.
- **A compressed work week** was named by 22% of respondents.
- Other variables we tested that did not seem likely to increase the use of sustainable transportation were peer persuasion and environmental education.

The following popular interventions require ***further investigation***:

- **A gondola up the hill** may not be time efficient, so why was it so popular?
- **Prizes for using alternative transportation** are already offered by the city, so why were they named?
- **More trails/sidewalks**; where should new trails/sidewalks go?

# 1. Introduction

In 2015, there were 263,610,219 registered vehicles on U.S. roads (USDOT 2015). These personal vehicles contributed to nearly one-fifth of all U.S. emissions of carbon dioxide (UCSUSA 2017). The United States accounts for 15% of the world's total carbon dioxide emissions, meaning that personal vehicles in the U.S. contribute to 3% of all the carbon dioxide emissions on the planet (EPA 2017). This statistic is meaningful, because the total global carbon dioxide emissions was 32.1 gigatonnes in 2016, translating to 64.2 trillion pounds of $CO_2$ released into the atmosphere every year for the past three years (IEA 2017). A three percent reduction in $CO_2$ worldwide would result in the prevention of 1.9 trillion pounds of $CO_2$ from entering the atmosphere. This reduction would help reduce the planet's warming, which in turn could decrease the rate of global sea rise, reduce storm strengths, and reduce other side effects of global warming.

There are several contributing factors to why someone may choose to drive a private car over an alternative mode of transportation. One way to predict and discuss why someone may choose one mode of transportation over another is by using the Theory of Planned Behavior (TPB) (Ajzen 1991). The TPB asserts that intention to practice a behavior can be predicted by subjective norms, attitude toward the behavior, and perceived behavioral control. The concept of subjective norms suggests that people are more likely to start a new behavior if they feel social pressure to do so. Attitude toward behavior is the idea that people may choose to begin a new behavior if they have favorable views towards it. The last concept of TPB is perceived behavioral control, which suggests that if people believe they can effectively complete an action, then they are more likely to do so. All of these ideas can be used to predict if someone is likely to use alternative transportation (Heath and Gifford 2012).

The TPB, as well as awareness of environmental degradation, was used in this study to predict alternative transportation behaviors at Fort Lewis College (FLC). The FLC campus is in Durango, a mountain town in Southwest Colorado. The campus sits on a mesa at a higher elevation than the rest of the town and is also prone to having snow and ice on trails in the winter, which pose challenges to pedestrian modes of alternative transportation. At FLC, commuters driving in private vehicles to and from campus made up twenty four percent of the college's total carbon footprint in 2015 (SN 2015). The questions we sought to answer with this research were: Why do FLC campus members drive to campus in single-occupancy vehicles? What actions would increase the use of alternative transportation methods, such as biking, walking, and taking the bus?

## 2. Methods

We distributed a survey in-person as well as on-line that asked students, faculty, and staff for details about their commute to the Fort Lewis College campus. The survey asked a total of 24 questions, two of which were open-ended, and 22 were multiple choice or generic rating scale questions. We asked participants about their transportation behaviors along with their attitudes towards sustainability and social influence. We spent one week distributing 90 surveys in-person in each of the academic buildings on campus to the first people encountered that agreed to participate. We defined "academic building" as any facility on campus that had classrooms being regularly used throughout the academic week. All researchers were randomly assigned to each of their designated buildings and were asked to receive completed surveys from five different respondents. We also sent an online version of the survey through the campus e-mail listserv, available to all students, faculty, and staff, with the subject line "How did you get to campus today?" This survey was available for two weeks between the months of October and November 2017. We kept all responses anonymous. We received Institutional Review Board (IRB) approval for this research on October 1, 2017 by the Fort Lewis College IRB (IRB-2017-123).

## 3. Results

### 3.1. RESPONDENT CHARACTERISTICS AND COMMUTING HABITS

There were 184 respondents to the survey; 41% were students, 44% were staff and 16% were faculty. Average commute length differed among these groups. FLC staff commuted furthest on average at 8.9 miles, followed by students (4.3 miles), then faculty (3.9 miles) (figure 1). Faculty and students both used alternative transportation on average 2.6 days per week and staff 1.8 days per week (figure 1). Overall, 55% of respondents reported using alternative transportation at least once per week, and 45% reported never using alternative transportation to commute. By role, 66% of faculty, 63% of students, and 44% of staff used alternative transportation at least once per week (table 1).

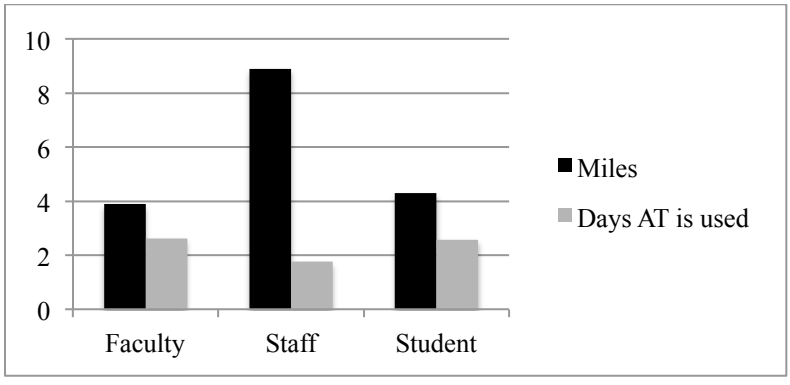


**Figure 1: Average, daily, one-way commute in miles and number of days per week that alternative transportation (AT) was used. Results are self-reported averages for the academic year.**

**Table 1. Alternative transportation (AT) use by role on campus.**

| | Never use AT | Use AT at least 1 day/week |
|---|---|---|
| **Faculty** | 34% | 66% |
| **Staff** | 56% | 44% |
| **Student** | 37% | 63% |

## 3.2. DETERRENTS TO USE OF ALTERNATIVE TRANSPORTATION

### *3.2.a. Is driving just too easy?*

We asked a series of questions to better understand the needs of drivers. Specifically, we assessed time-efficiency, trip chaining (e.g., linking multiple stops to a commute such as dropping a child at daycare), and having a car accessible to leave when needed. Time efficiency was the top response, followed by the need to leave campus (figure 2). Trip chaining was the least important response.

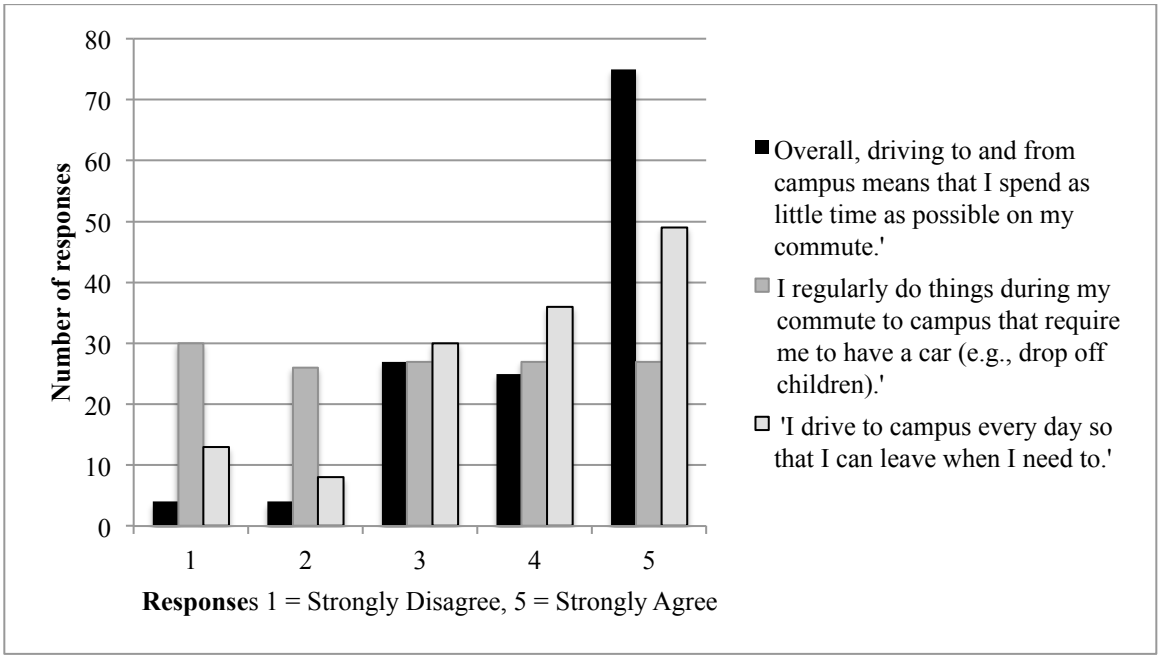


**Figure 2: Reasons for using a personal vehicle to commute to FLC.**

### *3.2.b. Is the hill a deterrent to pedestrians?*

FLC is located atop a mesa approximately 90 meters (300 feet) above downtown. In our research, we wanted to understand if ascending this hill to campus posed a barrier to pedestrian modes of alternative transportation. We asked two related questions, one about whether ascending the hill was physically demanding and another about arriving to campus sweaty. The rationale for this was that FLC is known to be a physically active community, so the exercise required to ascend the hill might not be a deterrent, but arriving sweaty could be. We found mixed results; the hill was a deterrent to about 1/3 of

respondents in both categories of physical demand and arriving sweaty. The hill was not a deterrent to nearly equal numbers of respondents. Respondents were more strongly deterred by the idea of arriving sweaty than by the physical demand (figure 3).

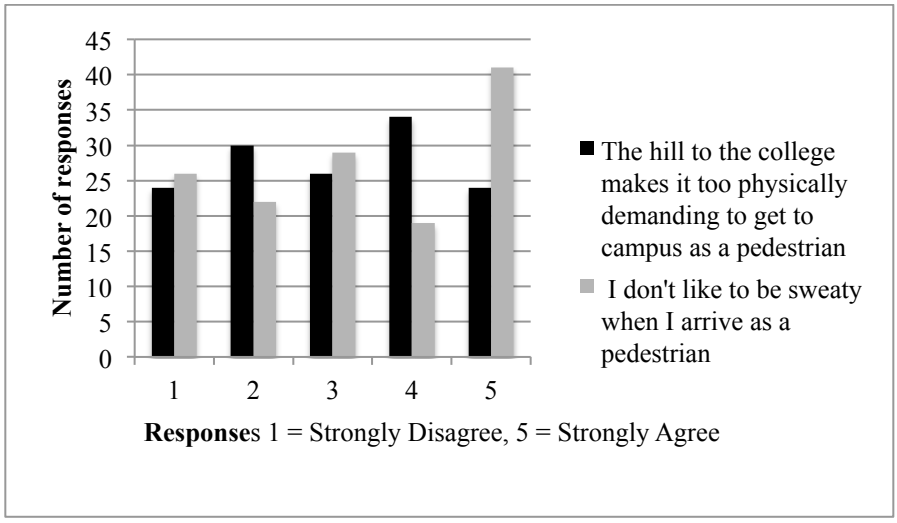


**Figure 3. Responses to questions about the hill as a deterrent to pedestrians.**

### *3.2.c. Is weather a deterrent to pedestrians?*

We asked if weather was a deterrent to the use of pedestrian modes. Many respondents were neutral, but the top response was for subjects to strongly disagree that they only use pedestrian modes when the weather is nice (figure 4).

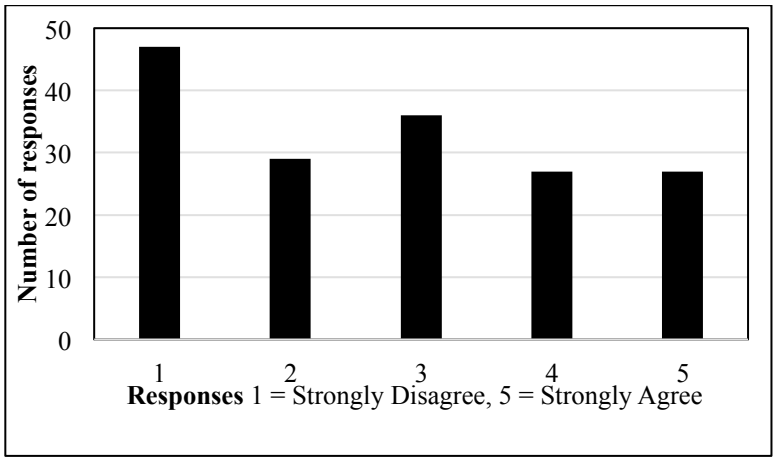


**Figure 4. Response to: "I use pedestrian modes only when the weather is nice."**

### *3.2.d. Is safety an issue for pedestrians?*

Most, but not all, respondents felt safe when using pedestrian modes (figure 5). Subjects who thought of pedestrian modes as safe used alternative transportation more frequently than those who did not (figure 6).

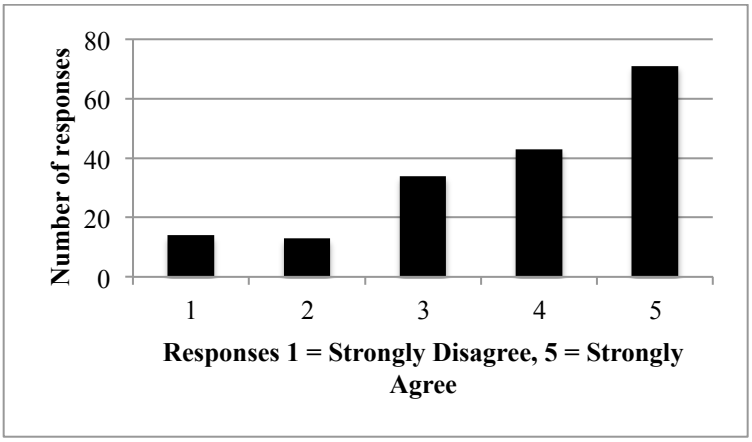


**Figure 5. Response to "Biking, walking, and pedestrian modes are safe ways of getting to campus each day."**

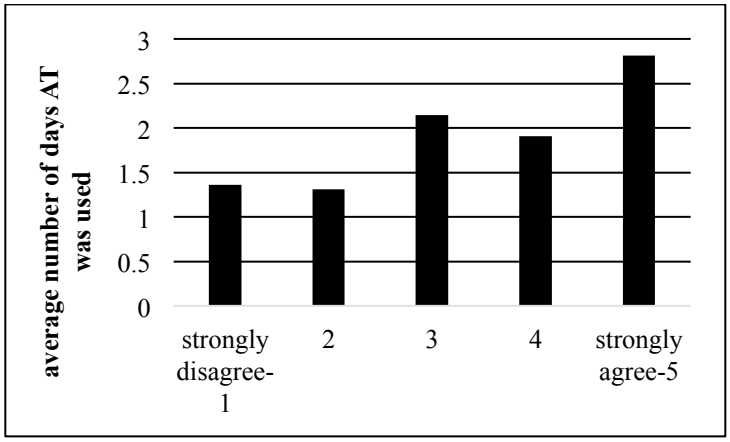


**Figure 6. Average number of days' alternative transportation (AT) was used in relation to the response to the question "Biking, walking, and other pedestrian modes are safe ways of getting to campus each day"**

### *3.2.e. What keeps people from using the bus?*

Students at FLC can ride the bus for free; part of their semesterly fees go towards this service. Faculty and staff can purchase deeply discounted annual passes. Yet many campus members do not use the bus. The top reason that faculty gave for not using the bus was that they prefer to walk (28%), followed by not living near a bus stop (21%) (table 2). For staff, not living near a bus stop was an important deterrent (35%), followed by trip chaining (15%), and a preference for driving (14%). For students, main deterrents were the desire to have their car on campus to get to another destination if

needed (16%), followed by 15% who said they have just never tried the bus systems, and 13% who said there was a scheduling mismatch (table 1).

**Table 2. Responses to "What might limit your likelihood of taking the bus to campus?"**

| Role on Campus | Responses by role |
|---|---|
| **Faculty** | 29 |
| **I prefer to walk, bike, etc.** | 28% |
| **I don't live near a bus stop.** | 21% |
| **I need my car on campus to get somewhere else (e.g., pick up a child, get to work).** | 14% |
| **The bus schedule doesn't match my class/work schedule.** | 14% |
| **The bus doesn't run frequently enough.** | 10% |
| **The bus doesn't run early or late enough.** | 7% |
| **The bus takes too long.** | 7% |
| **Staff** | 80 |
| **I don't live near a bus stop.** | 35% |
| **I need my car on campus to get somewhere else (e.g., pick up a child, get to work).** | 15% |
| **I prefer to drive.** | 14% |
| **I prefer to walk, bike, etc.** | 10% |
| **The bus doesn't run frequently enough.** | 5% |
| **The bus takes too long.** | 4% |
| **The bus doesn't run early or late enough.** | 3% |
| **The bus schedule doesn't match my class/work schedule.** | 3% |
| **I've just never tried it.** | 1% |
| **The bus isn't safe.** | 1% |
| **Students** | 75 |
| **I need my car on campus to get somewhere else (e.g., pick up a child, get to work).** | 16% |
| **I've just never tried it.** | 15% |
| **The bus schedule doesn't match my class/work schedule.** | 13% |
| **I prefer to drive.** | 12% |
| **The bus takes too long.** | 12% |
| **I don't live near a bus stop.** | 11% |
| **I prefer to walk, bike, etc.** | 11% |
| **The bus doesn't run early or late enough.** | 5% |
| **The bus doesn't run frequently enough.** | 5% |

### *3.2.f. Is distance a barrier?*

We sought to understand how barriers to use of alternative transportation differed for subjects who lived greater than two miles from campus and those who lived closer. A map of the region reveals greater topographical challenges associated with living >2 miles from campus (figure 7). Furthermore, there are no designated bike lanes along the highways, and bus stops are fewer and further between with increasing distance from campus.

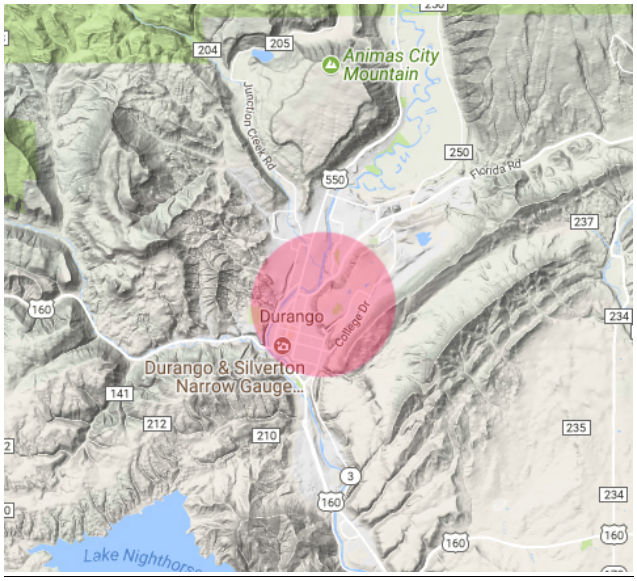


**Figure 7: A 2-mile radius around Fort Lewis College.**

We then analyzed barriers participants gave for not using alternative transportation relative to this variable of living >2 miles from campus. The top barrier to alternative transportation use for participants who lived >2 miles from campus was that there was not enough time to use alternative transportation and there was a lack of alternative transportation infrastructure; for those who lived <2 miles, the top response was that there were not any barriers (figure 8).

| What are the barriers for you taking alternative trasportation? | Percentage chosen |
|---|---|
| **Miles from campus: >2** | |
| Awareness - I am unaware of what commuting alternatives are available locally. | 2.8 |
| Emergencies - I need a vehicle in case I have to go somewhere unexpectedly. | 14.8 |
| Lack of infrastructure - Lack of bicycle lanes, sidewalks, bus routes, etc. | 30.6 |
| Personal reasons - My health, taking children to school/daycare, safety, etc. | 22.2 |
| There aren't barriers. | 13.0 |
| Time/convenience - Using alternative transportation would take too long. | 56.5 |
| Work - I need a vehicle to get from campus to work. | 15.7 |
| Other | 28.7 |
| **Miles from campus: <2** | |
| Awareness - I am unaware of what commuting alternatives are available locally. | 2.6 |
| Emergencies - I need a vehicle in case I have to go somewhere unexpectedly. | 9.2 |
| Lack of infrastructure - Lack of bicycle lanes, sidewalks, bus routes, etc. | 1.3 |
| Personal reasons - My health, taking children to school/daycare, safety, etc. | 13.2 |
| There aren't barriers. | 55.3 |
| Time/convenience - Using alternative transportation would take too long. | 27.6 |
| Work - I need a vehicle to get from campus to work. | 13.2 |
| Other | 19.7 |

**Figure 8. Barriers to use of alternative transportation by commute length.**

## 3.4. ASSESSING WAYS TO INCREASE ALTERNATIVE TRANSPORTATION

### *3.4.a. Would e-bikes help?*

Related to the idea that the hill could be a deterrent, we sought to assess interest in e-bikes. Many participants (40%) disagreed that e-bikes would increase their likelihood to bike to campus; however 30% of respondents agreed, meaning that e-bikes could increase bicycle use for nearly 1/3 of the campus community (figure 9).

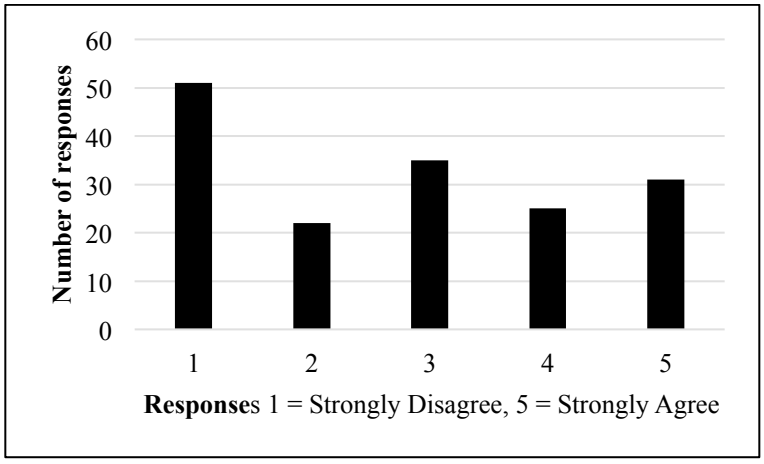


**Figure 9. Response to "If I had an electric bike (a bicycle with a motor so you don't have to pedal uphill), I'd be more likely to bike to campus."**

### *3.4.b. Can a solution be found in parking?*

At many educational institutions, land is hard to come by and is expensive. This results in the lack of funds or space to create more parking lots for private car users. When this happens, it can create an opportunity to promote alternative transportation as less expensive than building new parking structures to accommodate private vehicles (Toor 2009). This method of incentivizing, known as demand side management, is only practical if students, faculty, or staff find a need for more parking. At FLC, we hypothesized that demand side management would not work at this time, because parking is relatively easy to find on campus. We found mixed results. Faculty and staff somewhat disagreed that parking is difficulty to find, and students somewhat agreed that parking was difficult to find (Table 3).

**Table 3. Average responses to "It is difficult to find parking on campus."**

| **Role on Campus** | **Average Response** 1= strongly disagree, 3 = neutral, 5= strongly agree |
|---|---|
| Faculty and Staff | 2.6 |
| Students | 3.6 |

We also asked respondents to rate ideas for reducing how much people drive to campus. Discounted daily parking passes that can be purchased in bulk (e.g. instead of buying an annual parking pass, you could buy 20 day passes for $75) was the top choice for reducing the amount people drive to campus, after option choice "none of the above" (Table 4).

**Table 4. Responses to "Which of the following are realistic ideas for reducing how much people drive to campus? CHOOSE ALL THAT APPLY."**

| **Response Options** | **Percentage of Responses** |
|---|---|
| None of the above. | 36% |
| Discounted daily parking passes that can be purchased in bulk (e.g., instead of buying an annual parking pass, you could buy 20 day passes for $75). | 32% |
| An increase in the cost of the annual parking passes. | 26% |
| Banning first year students from having a car on campus. | 26% |
| If parking became so scarce on campus that people had to walk from the opposite side of campus to get to their destination. | 21% |

### *3.4.c. Would a culture of alternative transportation help?*

The conceived acceptable behaviors of an individual regarding a certain situation are known as social norms. In other words, the social norms concept suggests that a person may decide to behave in a way that they believe others want them to. A distinction between "others" can be made as follows: one's local community and one's close social circle. The behaviors desired by neighbors and greater community are known as "descriptive local norms," while the behaviors an individual believes to be desired by their

friends and relatives are referred to as descriptive subjective norms. Both have an impact on the way an individual behaves and the choices they make, and both are necessary to consider when discussing the issues connected to one's decisions.

The first subjective norms question we asked was designed to assess the influence of descriptive local norms on participants. In other words, we wanted to understand if people felt influenced to change their behavior to match what others on campus do. We found a slightly positive response that was stronger for faculty than for staff and students (table 4). We also asked a question to assess descriptive subjective norms, which is the idea that behavior is influenced by the perception of what a loved one wants a subject to do. We did not find strong evidence that this mattered (table 4).

**Table 4. Responses to subjective norms questions**

| | Responses **1= strongly disagree, 3 = neutral, 5= strongly agree** | |
|---|---|---|
| **Role on campus** | **Responses to "A recent survey found that greater than 50% of the FLC community takes alternative transportation to campus. Does that statistic make you feel more or less motivated to take alternative transportation?"** | **Responses to "Rate your level of agreement with the following statements: 'If a friend asked me to bus, walk, or bike to campus more often than I currently do, that would motivate me.'"** |
| **Faculty** | 4.0 | 3.3 |
| **Staff** | 3.2 | 2.8 |
| **Students** | 3.4 | 3.3 |

### *3.4.d. Would environmental education help?*

We hypothesized that respondents who felt a level of concern for the environmental impact of driving personal vehicles would be more inclined to use forms of alternative transportation than those who did not feel concern for the environmental impacts of personal vehicle usage on a daily basis. The results from the survey shows that a large portion of campus members did feel concern for the environmental impacts of their commuting habits, but this was not strongly reflected in the level of sustainable transportation used. The strongest relationship was for participants who used alternative transportation 2-3 days per week. These subjects reported the greatest awarness and concern about the environmental impacts of driving (figure 10).

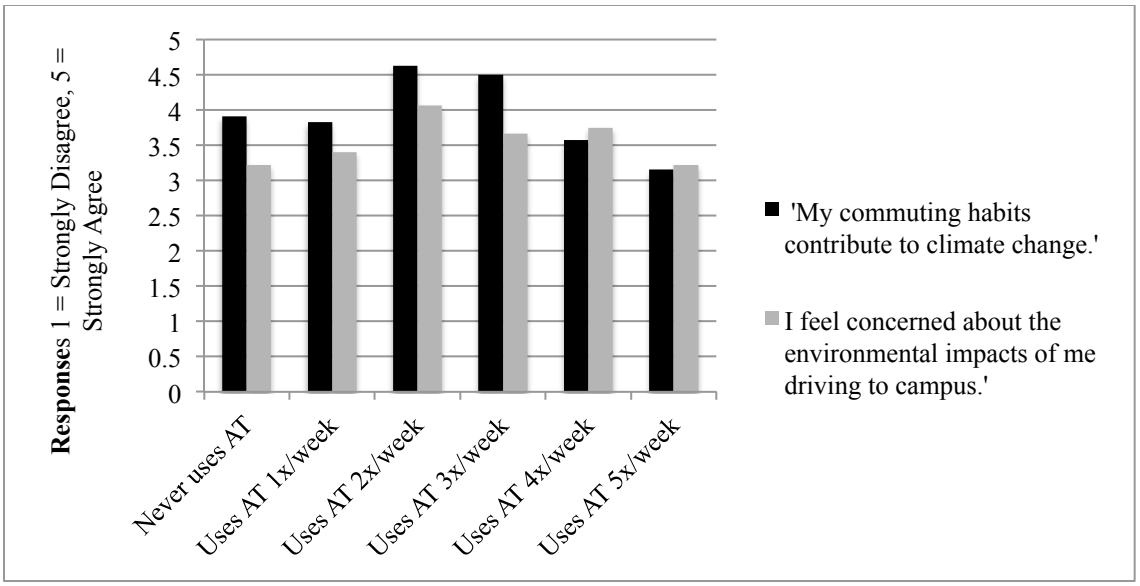


**Figure 10. Levels of awareness and concern about environmental impacts of driving to campus among respondents who use alternative transportation at varying degrees.**

### *3.4.e. Different solutions for close and far commuters*

To conclude the survey, we asked a broad, multiple choice question: "Which of the following would increase your use of alternative transportation?" The top response was "a gondola up the hill" (34%), followed by "prizes for using alternative transportation" (30%), "more trails/sidewalks" (29%), "free parking on days where it's snowing or raining" (26%), "a carpooling/ridesharing program" (25%), and a "a compressed work week" (22%) (figure 11). We also analyzed these same results by the distance respondents lived from campus. The data conveyed that campus members who traveled greater than 2 miles to FLC favored the top three transportation interventions of a car pooling/riding sharing program (32%), a gondola up the hill (29%) and a compressed workweek (28%) (Figure 12). For respondents who lived 2 miles or less, the top responses were a gondola up the hill (43%), more trails/sidewalks (40%), and prizes for using alternative transportation (40%) (Figure 12).

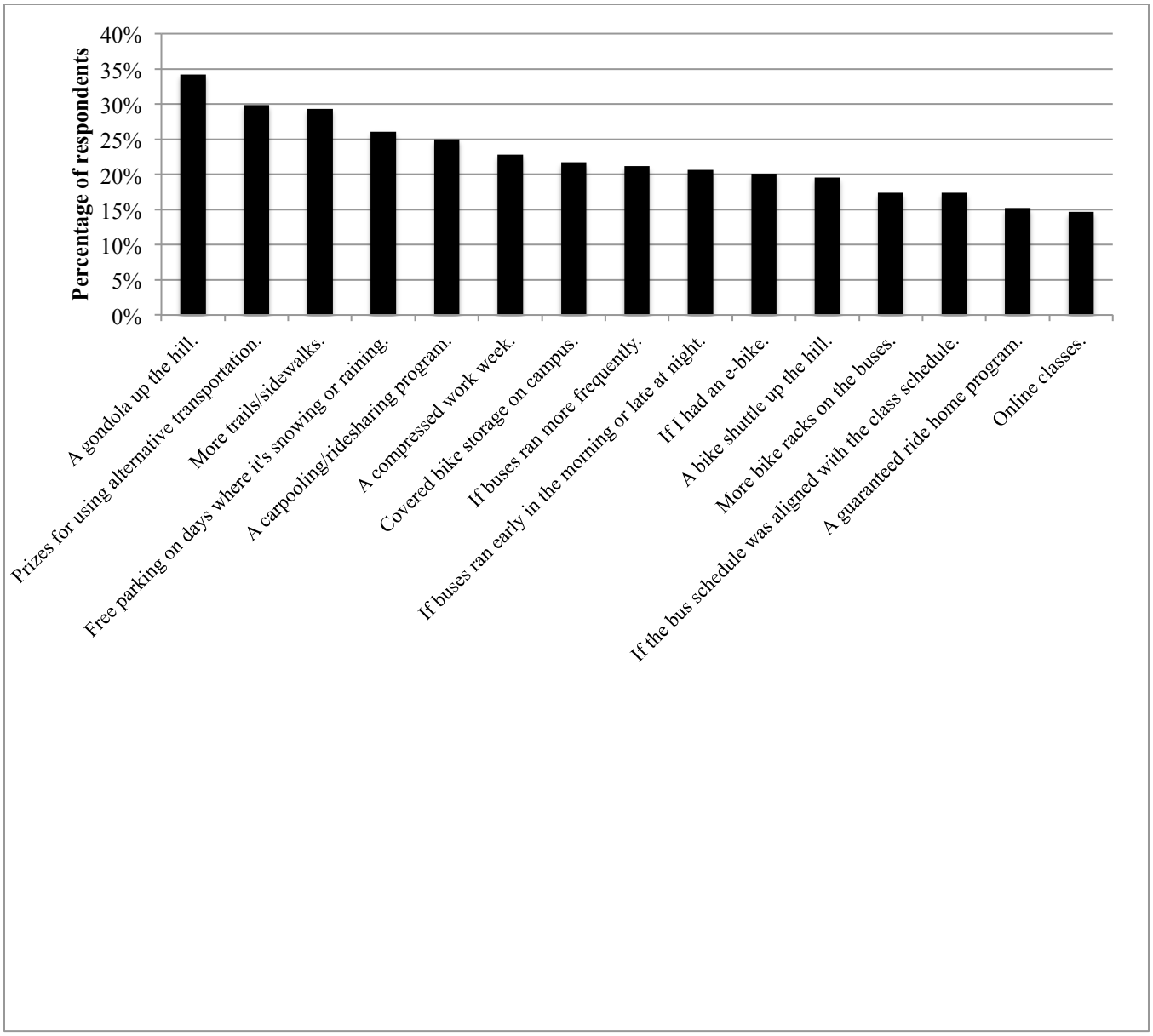


**Figure 11. Responses to the question "Which of the following would increase your use of alternative transportation?"**

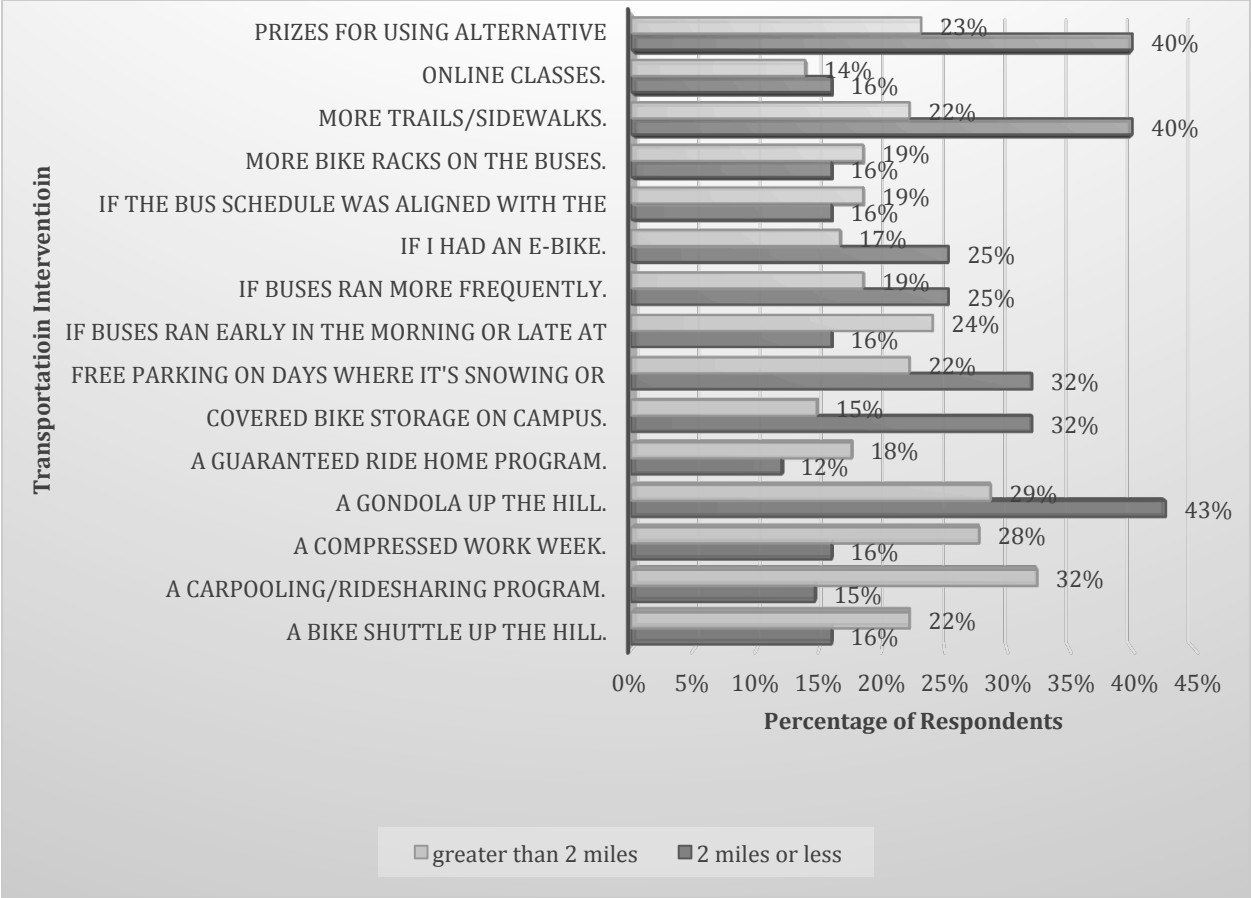


**Figure 12. Responses to the question "Which of the following would increase your use of alternative transportation?" as a function of how far respondents lived from campus.**

## 4. Conclusions

Over half of the respondents in our representative sample reported using alternative transportation at least once a week. This is a positive finding and one that FLC can build on to further encourage use of alternative transportation. For respondents who do drive, time efficiency was the main reason given for driving. This is a difficult obstacle to overcome. Durango's relative lack of traffic congestion and the ease most participants reported with parking on campus mean that it is typically faster to drive than to use alternative transportation. That said, parking does come with a cost, so changing the parking payment system along with increasing support for alternative transportation could produce a desirable effect. Currently, parking passes are purchased for the semester, resulting in a disincentive to use alternative transportation. A simple solution would be to offer bulk day passes. Discounted daily parking passes that can be purchased in bulk (e.g., instead of buying an annual parking pass, you could buy 20 day passes for $75) were a popular option among respondents for increasing use of alternative transportation. Another popular parking intervention was free parking on days when it's snowing or raining.

After time efficiency, the hill was named as a deterrent to respondent use of pedestrian modes of alternative transportation because it makes getting to campus as a pedestrian too physically demanding and because respondents reported not wanting to arriving sweaty. Respondents were more strongly deterred by the idea of arriving sweaty than by the physical demand. A solution to this problem would be the use of e-bikes, which were named by many respondents as likely to increase their use of alternative transportation. Another solution to problem of the hill is to encourage more bus use. This would also help with the issue of weather as a deterrent. Along with the hill, weather was named as a deterrent to using pedestrian modes. To further encourage bus use, a tour of the bus system should be developed for incoming students so that they can learn to better take advantage of their provided bus passes. Bus routes should also be added to more remote locations; lack of bus routes was an important deterrent for respondents living >2 miles from campus. Finally, campus members living >2 miles from campus face greater challenges to their daily commutes than those who live closer to campus; these respondents favored the development of a carpooling/ridesharing program. A ride-sharing app is a potential solution to bring carpooling into the digital age. These respondents also favored a compressed work week.

A few other interventions identified in this research require further investigation. Specifically, a gondola up the hill, prizes for using alternative transportation, and more trails/sidewalks were popular interventions that are somewhat difficult to interpret. The gondola was a very popular option that seems to conflict with the time efficiency and trip chaining needs named by respondents. This suggests the possibility of a "fun factor" associated to the use of alternative transportation, meaning that, respondents may have been likely to favor this option because it was an interesting way to commute to the campus. Prizes for using alternative transportation were also popular, but Durango already offers incentives to participants in the Way to Go Durango program. Further research is needed to determine if campus members do not know about this program, or if it does not meet their needs. Finally, many respondents named more trails/sidewalks to campus as an intervention that would increase their use of alternative transportation. This was an interesting finding because the campus already offers many paths to the institution. It is a portion of our research that needs further research as to where trails/sidewalks could be established up to the campus.

In sum, we recommend that FLC: 1) offer discounted daily parking passes and free parking on days when it's snowing or raining so that campus users can choose which days to drive, 2) pilot an e-bike program to address the challenges of the hill, 3) offer a compressed work week for staff, 4) create a ride-sharing app to improve carpooling, 5) create a tour of the bus sytem for incoming students to improve familiarity, and 6) work with the city to assess adding bus routes in more distant locations.

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