Micro-Mobility Commuting Patterns

A Baseline Count of Micro-Mobility Users at Western Washington University

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Executive Summary

As part of WWU's commitment to sustainability, it is necessary to be proactive in planning and sharing transportation infrastructure such as roads, walkways, paths, and parking to include all modes of movement and especially encourage formerly ignored or disenfranchised alternate modes such as micro-mobility users and their devices (MMUs/MMDs). MMDs include small wheeled vehicles such as bicycles, skateboards, push/electric scooters (i.e., "Razor" style scooters), and wheelchairs both human powered and electric, but exclude larger vehicles such as traditional motor bikes, "Vespa" style scooters, and motorcycles. Counting micro-mobility users en-route to campus is something that has never been done before at WWU. This is particularly pertinent endeavor now, as the university has plans to construct four new buildings in the next few years. There is no data tracking these transportational modes, and without data it is impossible to plan for their needs.

The purpose of this project is to count micro-mobility users and devices entering, exiting, and passing through campus. The first steps were to establish counting zones on campus, create a data collection sheet, and gather volunteers. The short-term goals of the project were to create a repeatable data collection method and gather data to establish baseline numbers indicating levels of micro-mobility use on campus. According to WWUs Sustainability Action Plan, "Western will continue to display its leadership in sustainable transportation by expanding development of its pedestrian and bicyclist infrastructure" (p. 61). In order to reduce the university's ecological impact and carbon footprint, it is necessary to encourage alternative forms of transportation and reduce automobile commuting as much as possible.

With the help of Jillian Trinkaus from the Office of Sustainable Transportation, and Huxley professors Patrick Buckley and Paul Stangl, in addition to several student volunteers, data was collected at four locations on campus on Monday, May 13th and Wednesday, May 15th from 7:30am to 11:30am. While this enabled the establishment of baseline figures for MMUs/MMDs, it would be preferable to collect data on more occasions than only two days within one week of one quarter. Recommendations for the future of this project include the following: 1) reimburse volunteers (apply for SAF grant if necessary), 2) create a transportation questionnaire to learn about factors influencing mode choice for MMUs and other commuters, 3) add additional data collection zones, and 4) repeat the data collection numerous times over several weeks to minimize the influence of factors like weather. Most importantly, it is recommended that this count be repeated quarterly and yearly to allow for the observation of long-term trends and variations in levels of micro-mobility use.

Introduction

Statement of Need:

This project was first envisioned by Jillian Trinkaus from the Office of Sustainable Transportation, the main stakeholder and correspondent throughout this process. She explained that there are current plans to construct four new buildings on campus. A regular cyclist herself, Jillian was concerned with how this construction will affect bicycling and wheel-friendly routes on campus and inquired about what is being done to plan for these people to ensure equitable accessibility. She discovered that WWU's campus currently has a complete lack of data regarding micro-mobility travel modes, primarily including bicycles, skateboards, scooters, and wheelchairs. Without data indicating a high level of micro-mobility commuters, it is impossible to assert that these people make up a significant number of the campus community and demand that they be taken into consideration. This data can be used by the Office of Sustainable Transportation to provide concrete evidence to campus planners that cyclists and other micro-mobility users must be provided with equal accessibility. Planning decisions today affect commuting patterns well into the future, so it is imperative that these travelers be considered now in order to ensure that future commuters will have the agency to freely pick their mode of travel without being impeded.

Project Goals:

Given the short time frame of one quarter, it was necessary to keep the scope of this project narrow. The goals for this quarter included:
1) selection of counting locations based on predicted busiest routes for MMDs,
2) development of a repeatable data collection method,
3) gathering data using this method,
4) analysis of data to determine current levels of MMD usage, and
5) assessment of the process for potential improvements in future counts to maximize data relevance and usefulness.

The relative simplicity and easily repeatable nature of the counting method was a deliberate decision made to enable this research to be continued far into the future. Ultimately, as stated in WWUs Sustainability Action Plan, the goal is to increase the use of bicycles for commuting as much as possible across all social groups on campus, in order to reduce local carbon emissions and WWUs ecological footprint as much as possible. These initial micro-mobility counts are a necessary first step to creating a campus that is more equitable to all modes of transportation. Without data indicating the number of micro-mobility travelers on campus, it is impossible to plan for greater safety and convenience for MMUs.

Background research:

Reducing automobile use is a practical goal for city governments and university administrations alike. There are a variety of reasons behind this goal - environmental degradation through carbon emissions, pressures of rush-hour traffic, and the spatial wastefulness of numerous parking lots are all examples of problems that would be alleviated by reducing automobile use.[1, 2]

A great deal of research has been done comparing the bicycling rates and conditions of the United States with those of European nations. Bicycling accounts for less than 2 percent of trips in this country. In Germany, 10 percent of trips are made by bicycle; in Denmark, 18 percent; and in the Netherlands, a staggering 27 percent.[3] This gulf in bicycling rates can be explained by the undeniably superior bicycling infrastructure of the European nations. The aforementioned nations all have extensive networks of separated pathways for bicyclists,[3] eliminating the most serious safety concern for cyclists in the United States: sharing the road with automobiles. Separated bicycling facilities, when combined with other measures such as signal priority* for cyclists at intersections, can create an environment where the bicycle becomes more attractive and convenient than the automobile.[2, 3]

There are, however, places in the United States where cycling is a common mode of transportation - for example, Davis, California, provides evidence that bicycling can flourish as a mode of transportation when safe infrastructure is present. An interview study compared the motivations of cyclists in Davis with those in the city of Delft, Netherlands. In both cities, cycling accounts for over 25 percent of all trips. The study found that in both cities, the most important factor influencing the decision to cycle was the rider's perceived level of safety.[1] In Davis, many respondents indicated feeling safe while cycling within the city of Davis, but expressed hesitance to cycle outside of city limits, citing unsafe traffic conditions.[1]

The European nations which have taken deliberate steps to bolster the attractiveness of cycling have proven that providing separated bicycle pathways does effectively increase cycling. Safety concerns greatly limit cycling as a form of transportation in the United States because people are uncomfortable riding in close proximity with automobiles.[1] The data Davis, California has shown that cycling can be popular in the United States when people are provided with facilities that make them feel safe on their bicycles.

*Signal priority: Sensors in the road detect when cyclists approach traffic lights, prompting the lights to change and allow the cyclists through.[2] In the United States, traffic lights are timed to maximize convenience for drivers, allowing them to pass through several green lights at a time. Changing signal priority to favor bicycles simultaneously increases convenience for cyclists and decreases the attractiveness of driving.

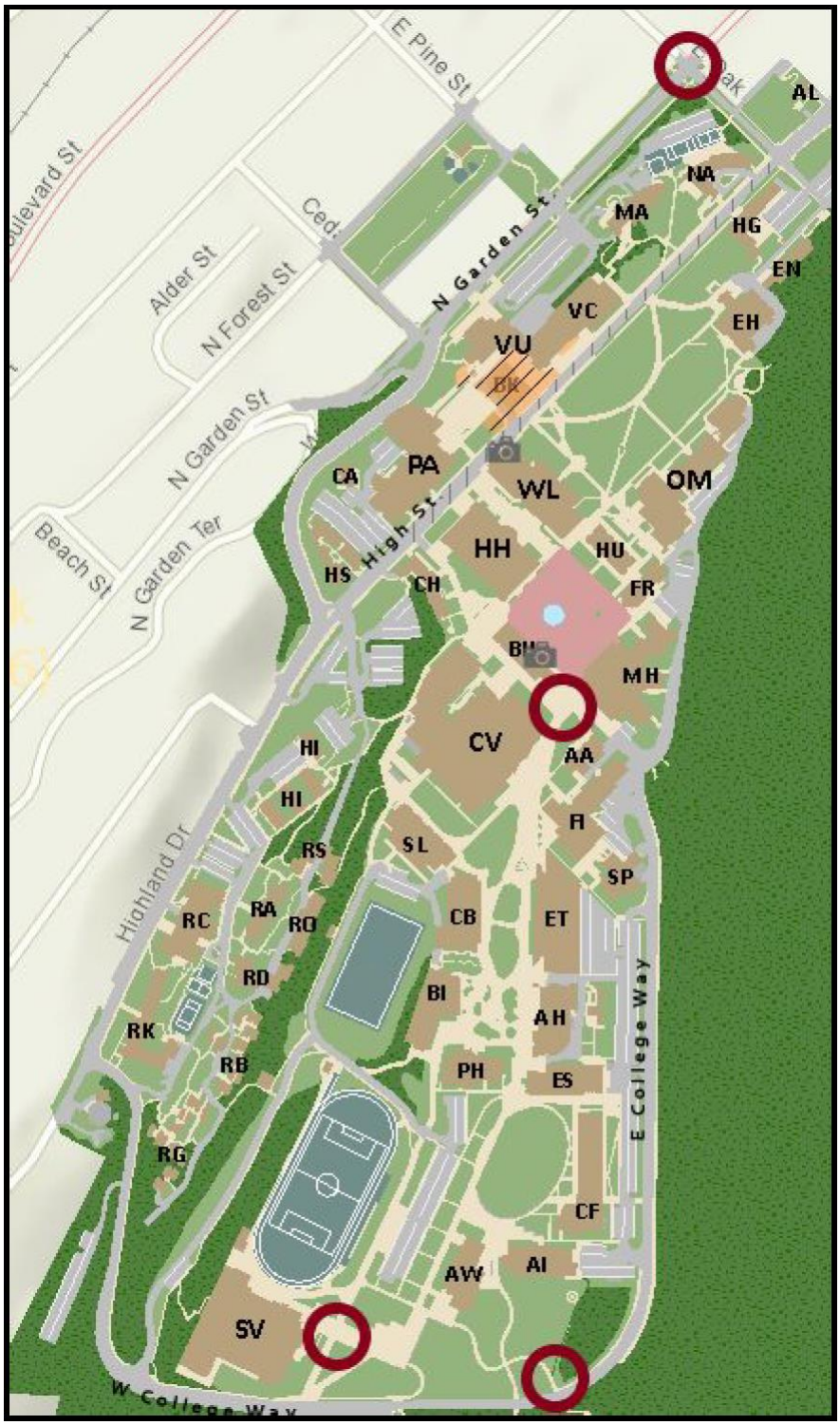

Figure 1: WWU campus with chosen counting zones indicated by red circles.

Methodology

A visual count of MMUs and their MMDs was conducted on Monday, May 13th and Wednesday, May 15th from 7:30am to 11:30am. Due to university scheduling blocks, Monday and Wednesday are the busiest days for classes on campus, and this particular time frame allows for the vast majority of commuters to be counted. As shown in Figure 1, the four most common entry and exit points for MMUs were identified as Fairhaven, Wade King Student Recreation Center, the Intertie, and High Street. The Intertie is one of only two East-to-West corridors connecting High Street and East College Way. Currently, East College Way is the recommended route for bicyclists on campus to allow pedestrians freedom in the other zones, yet with current campus infrastructure, cyclists must either dismount and walk, or ride through the pedestrians. Because some bikes on campus are left on racks untouched for days at a time and skateboards are not usually left unattended, conducting a count of commuters en-route is the only way to obtain accurate data for a variety of micro-mobility users on campus.

Certain characteristics of commuters were tracked to determine the current demographic of MMUs on campus. The following characteristics were tracked in the data collection phase: direction of travel, mode choice, sex of the user, helmet use, student or non-student, use of electric power, and the presence of any passengers. Determining characteristics like the sex of the user or their student/non-student status was left to the observer's best guess in the short window of opportunity as the MMU passes by. For this reason, these characteristics are prone to potential inaccuracy.

The counting tool with the above characteristics can be found in the appendix of this paper. These characteristics were chosen in order to gain a better understanding of the MMU demographic on campus. By obtaining a more thorough understanding of the current demographic, it will be possible to determine which social groups are underrepresented and theorize about how to bolster their use of MMDs for commuting. The university should strive to make MMDs equally appealing to people of all ages, ethnicities, gender identities, income levels, etc. Without making note of these characteristics, it would be impossible to suggest changes that cater to underrepresented groups.

Results

The results of this study are shown below in the following data tables and graphs. Some baseline trends can be immediately observed. For example, MMUs at WWU are predominantly male.

This is reflective of national bicycling trends, which indicate that men are more likely to cycle than women, and the elderly are the least likely to cycle.[3] The most popular MMD on campus, by far, is the bicycle. The numbers also show that the busiest commute times for MMUs occur in the 15 minutes before the top of the hour; for example, 9:45am-10:00am. This particular time was the busiest across all locations, except on May 15th at High Street, where there is no data for that particular 15-minute block. This could be due to lateness or absence of a volunteer or an inadequate explanation of the data collection process. In addition, the results show that just over half of the MMUs chose to wear helmets. Helmet use was by far the most common among cyclists. Interestingly, the numbers from the Intertie show that helmet use is lowest at the center of campus. This could indicate that MMUs feel safe enough to remove their helmets riding through campus, compared to entering and exiting campus at the north and south ends, where helmets are more commonly worn by cyclists who presumably are riding among automobiles in their commutes. Electric-powered MMDs are still uncommon on WWUs campus, but electric scooter rentals are just over the horizon for the city of Bellingham, so an increase of electric MMDs is predicted in the near future.

Results of data collection:

May 13th	**All locations**	**Fairhaven**	**Rec Center**	**High St**	**Intertie**
MM total	670	169	184	135	182
Helmets	347	92	86	100	69
Males	468	111	138	92	127
Females	204	59	48	43	54
Bikes	568	154	137	130	147
Boards	92	12	45	5	30
Scooters	10	3	2	0	5
Electric	20	4	9	4	3

May 15th	**All locations**	**Fairhaven**	**Rec Center**	**High St**	**Intertie**
MM total	733	156	175	179	223
Helmets	379	88	78	132	81
Males	502	111	130	110	151
Females	222	45	47	61	69
Bikes	637	142	139	174	182
Boards	82	12	33	4	33
Scooters	14	2	3	1	8
Electric	36	19	1	7	9

Peak commute times for MMUs:

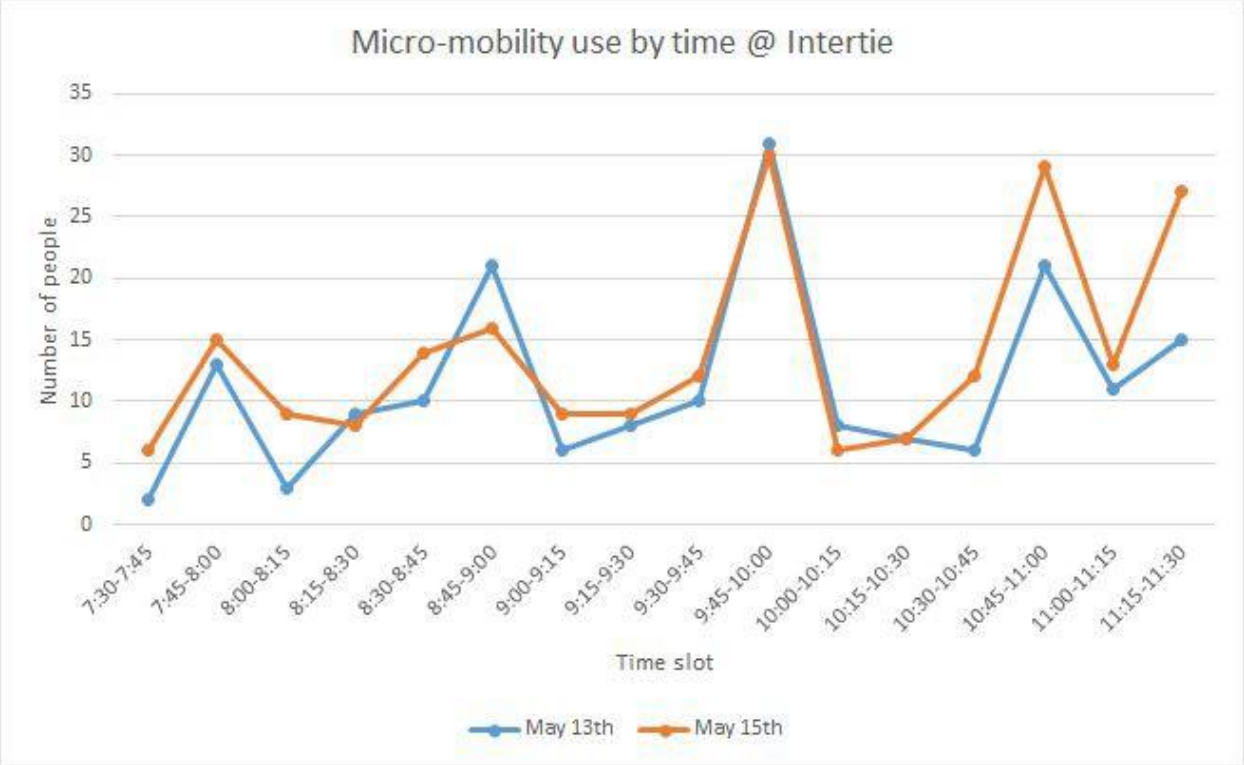

Figure 2

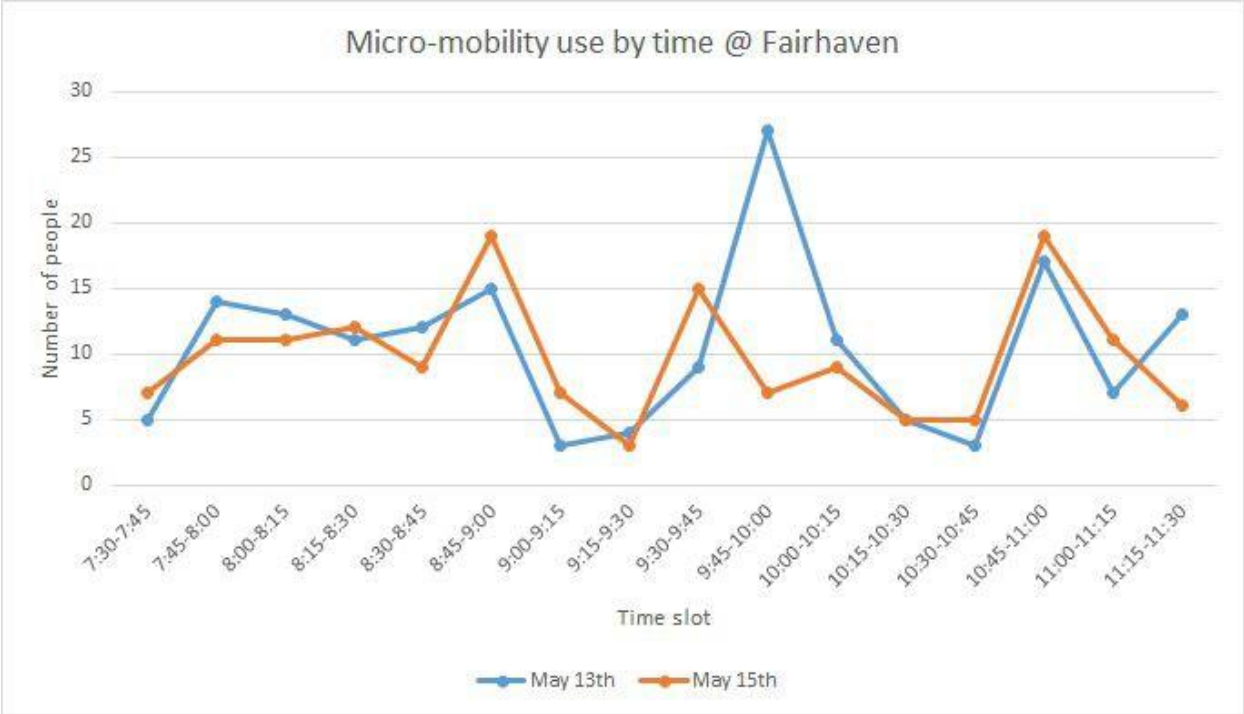

Figure 3

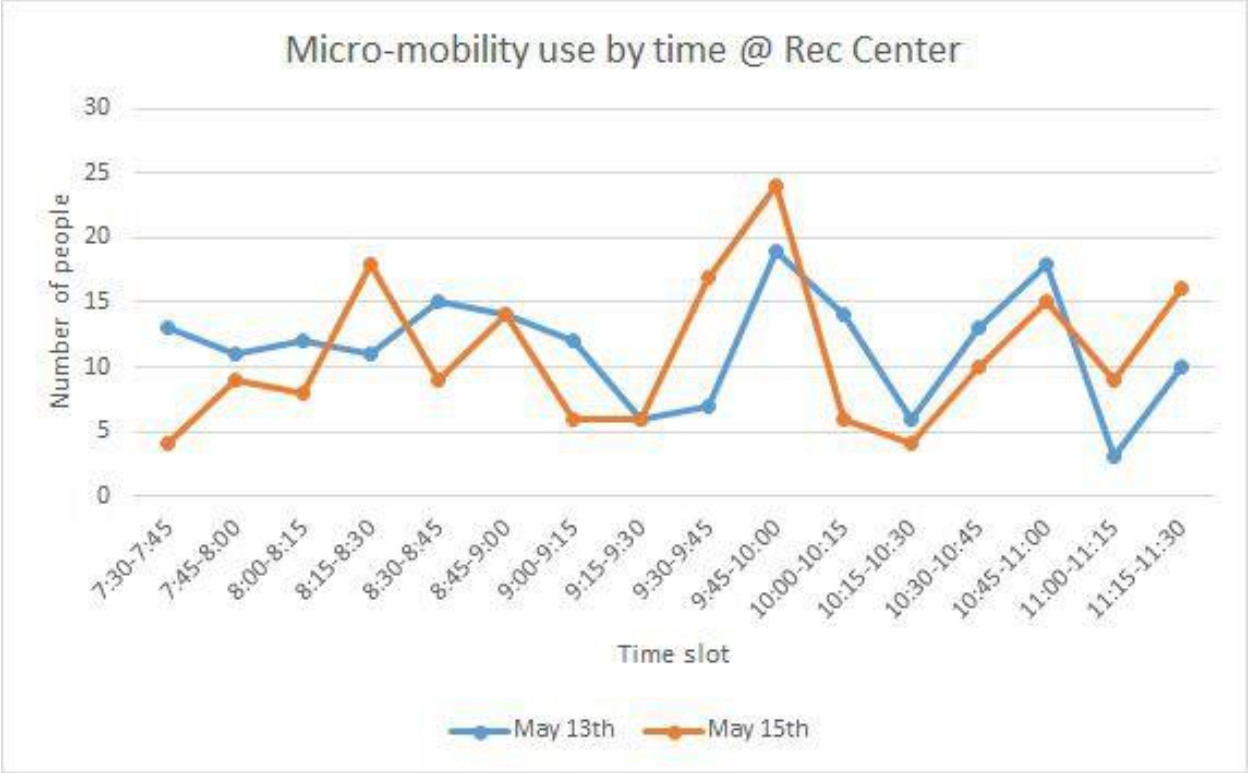

Figure 4

Figure 5

Additional figures illustrating gender differences, helmet use, number of MMUs at each location, and overall mode choice for MMUs can be found in the appendix of this paper.

Recommendations

With the help of Jillian Trinkaus from the Office of Sustainable Transportation and Huxley professors Patrick Buckley and Paul Stangl, in addition to several student volunteers, data was collected at four locations on campus on Monday, May 13th and Wednesday, May 15th from 7:30am to 11:30am. While this enabled the establishment of baseline figures for MMUs and their MMDs, it would be preferable to collect data on more occasions than only two days within one week of one quarter. Recommendations for the future of this project include the following:
1) Reimburse volunteers (apply for SAF grant if necessary). Reimbursing volunteers through the SAF grant can help to ensure a larger number of volunteers willing to collect data, therefore enabling this project to have additional zones on WWUs campus. Reimbursing volunteers could also reduce the chance of errors or forgery of the data, as volunteers would feel fairly compensated for their time.
2) Create a transportation questionnaire to learn about factors influencing mode choice for MMUs and other commuters. The use of a transportation questionnaire can help WWU

understand the needs and wants of students and faculty currently using MMDs, and students and faculty who are interested in making the switch to MMDs to travel to campus. It would also be beneficial to learn the reasons why people choose to use a specific MMD, and perhaps more importantly, the reasons why so many still choose not to. The results of the questionnaire could be compared to other studies which have indicated that perceptions of unsafe conditions are the greatest deterrent of increased MMD usage.

3) Add additional data collection zones. Due to difficulty gathering volunteers, it was necessary to limit the number of data collection zones to four, in order to prepare for the worst-case scenario of no volunteer participation. There are other zones where data collection would be valuable, such as the East-to-West corridor connecting E College Way to High Street just south of Old Main, all on-campus living facilities, and other entrances on the north end of campus (some MMUs enter through northern parking lots before High Street, continuing along the path between Edens North and Higginson Hall).

4) Repeat the data collection numerous times over several weeks to minimize the influence of factors like weather. When counting for one week only, it is difficult to say whether the data collected is indicative of normal levels of MMD usage. The weather was sunny and clear on the data collection days for this project, but if it had been raining and cold, the numbers would have undoubtedly been different. Most importantly, it is recommended that this count be repeated quarterly and yearly to allow for the observation of long-term trends and seasonal variations in levels of micro-mobility use on WWUs campus.

5) Include bicycles on bus racks in future counts. This is particularly important at the north campus counting zones where there is a long uphill stretch on High Street. This data could be easily accounted for by simply adding a column to the sheet where they can be counted.

Monitoring and Evaluation

Jillian Trinkaus will monitor and evaluate the success of this project, determining if it should move forward by use of the information presented after the initial bike counts on May 13th and 15th. The information should only be used as a baseline representation of MMUs and their MMDs. The data collection method will need to be repeated on a quarterly and/or yearly basis in order for Jillian Trinkaus to determine the level of success of this project. A simple transportation questionnaire may be a valuable asset that researchers could focus on in the future of this project. Improving the counting method and other ways to improve this project are highlighted under the recommendations section of this report.

Budget

This quarter, the project was done without any monetary resources. Without the participation of our eight volunteers, data collection would have been a much more difficult endeavor for the three undergraduate researchers and project stakeholder, Jillian Trinkaus. As per the recommendations listed above, offering payment to data collectors would increase the number of students willing to participate. Assuming that this project continues to use twelve data collectors in the future, it is recommended to pay each volunteer at an hourly rate between $12.50 and $15.00. In this sense, time is money. The initial steps of the project, such as meetings between stakeholders and researchers, creation of the data collection method, and determination of counting zones, will not need to be repeated; thus, these steps will not factor into the budget.

- Four hours of data collection at four locations = 16 hours total data collection per day.
- Two days of data collection = 32 hours total for data collection.
- $12.50 x 32 hours = $400 needed to compensate paid volunteers.
- If, in the future, data collection is performed for more than one week, additional funding will be necessary. Assuming two days of data collection per week with 12 data collectors, the cost for one week would be $400; for two weeks, $800, and so on.
- These numbers are approximate figures that do not take taxes into consideration.
- Data entry and analysis are not factored into the budget, only data collection.

Conclusion

The data shows that the busiest entry/exit for MMUs is on south campus by the Wade King Student Recreation Center, while the Intertie received the highest level of traffic overall. As zones of high pedestrian traffic intermixed with MMUs, these areas could be prime targets for future infrastructure improvements such as separated paths for bicycles and other MMUs if deemed necessary after future counts. This could become a necessary safety measure if the incoming electric scooter rental programs greatly increase MMD usage at WWU. Due to the limited number of volunteers involved with this project, further data collection at several spots on campus that could have provided a more complete understanding of traffic flows was not possible this quarter. Despite this, this baseline count has shown that a significant portion of staff and students already commute using MMDs, and this number is likely to grow in the future. As written in the Sustainability Action Plan, the university has committed to encouraging and increasing alternative transportation methods by an expansion of its pedestrian and bicycling infrastructure. This data and future counts can be used as concrete evidence to support a push for the development of these facilities in the future.

Works Cited

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4. WWU Office of Sustainability. (2017). Western Washington University Sustainability Action Plan 2017. In *Transportation.* Retrieved from https://cpb-us-e1.wpmucdn.com/wp.wwu.edu/dist/6/4099/files/2019/02/Sustainability-Action-Plan-2017-FINAL.update02.06.2019-179c9tc.pdf

Appendix:

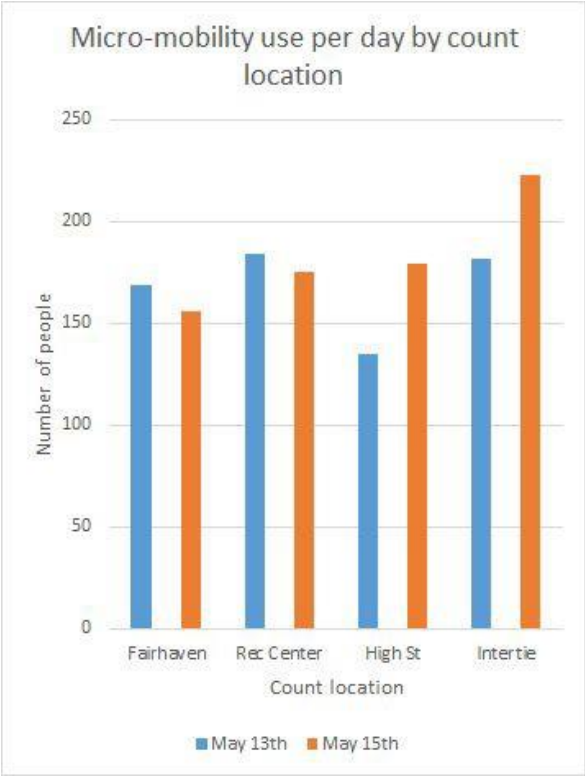
Figure 6: The original counting tool used for tallying MMUs and MMDs.

Location:_____ Name:_____

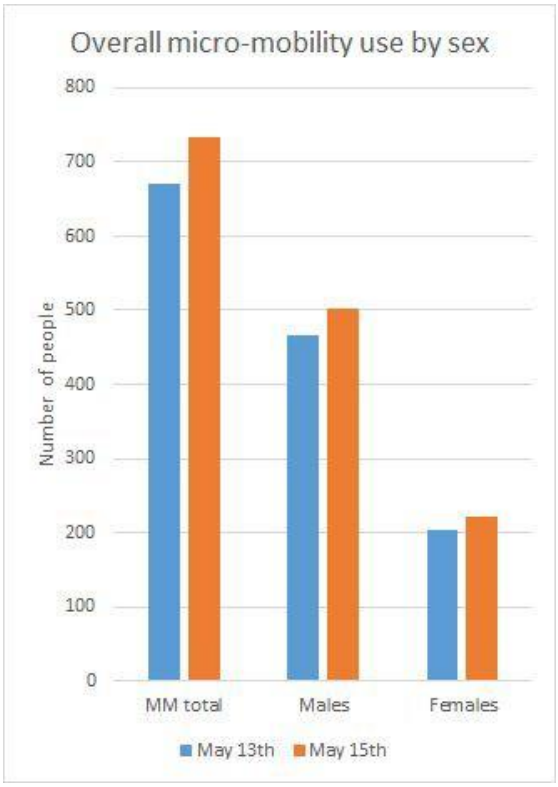
Date and Day:_____ Temp & Weather:_____

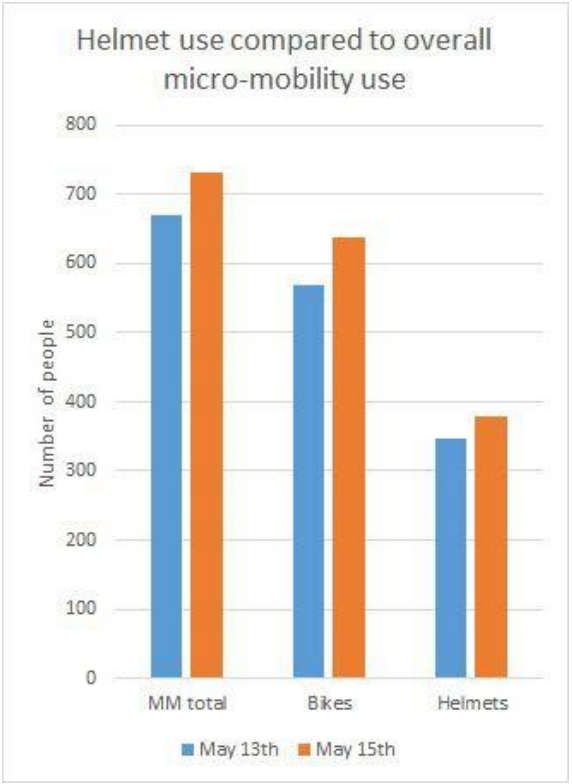
Time	#	Dir	Bike	Sboard	Scoot	Helm	M	F	Not Stu	Elec	# Pass	Notes
	1											
	2											
	3											
	4											
	5											
	6											
	7											
	8											
	9											
	10											

Figure 7: MMD usage at each counting location:



Figures 8 and 9: Gender differences and helmet usage among MMUs (all locations):





Figures 10 and 11: Overall MMU mode choice (all locations):