Campus Commute Comparison

The Impacts of Campus Transportation Planning on Mode Choice

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Acknowledgements

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Executive Summary

The purpose of this study was to look at bicycle friendly universities and attempt to identify best-practice infrastructure improvements, programs and policies. The habits university students learn at university campuses extend beyond the classroom and can be a catalyst for lifestyle choices in the future. The university structure is a unique atmosphere and an incubator of learning opportunity and campus commutes are an important component of university life.

This analysis used a mixed methods approach including content analysis, secondary survey analysis, and interviews to study the work of four universities around campus commutes. The four universities were selected to be analyzed based on student population, bicycle friendly university rating, and location in the western United States The content analysis included information from university websites and university plans. Many universities complete annual or periodic transportation surveys to analyze campus modal share. The analysis used existing data from each of the four university transportation surveys. The final research method was interviews of seven university transportation stakeholders. At least one transportation stakeholder was interviewed from each university. The study fills the research gap of campus commute comparisons. Traditionally university transportation surveys focus on one university's mode share and this study compares four universities to identify best-practices around campus commuting.

The analysis sections were separated into seven sections university selection, university structure, university programs, university characteristics, community characteristics, survey results and a summary. The analysis sections were designed to answer the three research questions. The last section in the analysis attempts to triangulate the analysis from the previous six sections and hone in on answering the research questions. The analysis revealed seven best-practices for universities to consider in the future.

The comparison of four universities was meant to meet the clear research gap comparing campus transportation mode share. This study was meant to analyze information around campus commuting to make clear recommendations around campus commute best practices. The best practices are based on the literature review and analysis could help universities reduce their reliance on single occupancy vehicles and increase sustainable transportation options on campus. For the purpose of this report sustainable transportation will be defined as non-single occupancy vehicle trips. This includes bicycle, walk, carpool, transit, and other mode trips.

Although, further research is required around campus commuting this report identified some best-practices around campus commuting. Campus commute trends change on constant basis and emerging technology may disrupt current transportation mode choices. Campus transportation is continuously adapting and campus transportation stakeholders should be aware of the continuous change.

Introduction

Many universities complete annual or periodic transportation surveys to internally measure campus modal share and identify opportunities for improvement. A common challenge for universities is increasing the number of trips to campus by sustainable modes. A significant amount of research has been completed on the relationship of the built environment and attitudes to campus commuting. The purpose of this research project is to analyze university modal share and compare university modal share trends to policies, programs, and the built environment. This project aggregates transportation survey, built environment, program, and policy information from four campuses rated gold and platinum by The League of American Bicyclists[1]. The content analysis, secondary survey analysis, and interview data collected can be used by universities to select built environment, program, and policy improvements to reduce single occupancy vehicle (SOV) trips to campus and increase sustainable mode trips to campus.

In total, the analysis looks at four universities with roughly the same student population: University of Oregon, Oregon State University, University of Colorado Boulder, and University of California Davis. The results of the analysis identify policy, program, and built environment improvements that lead to the greatest reduction in single occupancy vehicle use. University administrators can apply this research to recommend built environment improvements, policy changes and program additions to reduce single occupancy vehicle use.

This research is significant because universities have a unique ability to influence transportation mode choice within the larger framework of a city. Research shows that pedestrian connectivity on campus is often better than pedestrian connectivity outside the campus.[2] Improvements or the potential for improvements to pedestrian, bicycle, and transit infrastructure have resulted in increased use or increased willingness to use sustainable modes.[3] Despite all the research on campus commuting and related topics, minimal research has been completed that compares campuses and their efforts to improve pedestrian, bicycle, and transit utilization.

This comparison across university institutions improves the understanding of the relationship between the built environment, campus programs and policies to campus mode share. This cross-campus transportation study fills a research gap and helps universities improve the built environment, develop programs and implement policies in a way that alters universities' modal share.

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[1] The League of American Bicyclists (2017). Current list of Bicycle Friendly Universities. The League of American Wheelmen Inc.

[2] Kaplan, D. H. (2015). Transportation sustainability on a university campus. *International Journal of Sustainability in Higher Education*, 16(2), 173-186.

[3] Sun, G., Oreskovic, N. M., & Lin, H. (2014). How do changes to the built environment influence walking behaviors? a longitudinal study within a university campus in Hong Kong. *International Journal of Health Geographics*, *13*, 28.

Literature Review

Campus commute research is common place among literature on individual university campuses. Transportation and parking are key components of campus life at all universities and many universities have completed campus commute studies at an institutional level. Institutions care about campus commuting because it is directly linked to campus carbon footprints. The largest portion of a campus's carbon footprint is often building electricity use, but campus transportation is a major component. In the Bay Area, single occupancy vehicles are responsible for 50.6% of greenhouse gas emissions.[4] Universities are a component of a larger framework and should take part in reducing carbon emissions.

Institutional campus commute studies often focus on mode choice, bike networks, transit studies, and parking analysis studies. Kent State University completed a Parking and Transportation study that focused mostly on parking availability and less on transportation options.[5] UC Davis completes an annual campus travel survey. The results are used by the University to estimate demand for transportation services and understand perceptions of campus commute options.[6] Kent State and UC Davis are joined by universities and researchers across the United States that are attempting to better understand campus transportation. In addition to campus commute studies, significant research has been completed on general perceptions of the built environment and the built environment's relationship to mode choice.[7]

In addition to research at the institutional level, many studies have been completed on campus commutes from an outside perspective. While the combination of campus commute research and general transportation research covers a wide range of topics, minimal research has been completed comprehensively comparing university campus commutes. A campus commute programs comparison could reveal strategies that improve sustainable mode share the most. A comprehensive examination of multiple universities could help to provide additional insight to transportation modal choice on campuses and fill a research gap.

Built Environment

Campus commute research has often focused on the built environment. Built environment research indicates that streets with sidewalks experience more pedestrian use. Additional factors linked to higher pedestrian traffic and security, traffic accident risk, land use, and connectivity.[8] University campuses are naturally pedestrian friendly, but many students and faculty still commute to campus using single occupancy vehicles. The infrastructure outside of campus often does not support walking and biking.[9] Infrastructure linkage is a significantly studied topic. Improved infrastructure leads to improved pedestrian traffic.[10] In a specific study at the University of Alabama, campus researchers found that perceptions of walking and biking are linked to distance from campus. The built environment closer to the University of

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[4] UC Berkeley (2008). Campus Sustainability. *University of California*.

[5] Kent State University (2015). Campus Parking and Transportation Study. *Kent State University*.

[6] University of California Davis (2016). Campus Travel Survey. *University of California Davis*.

[7] Koh, P., Wong, Y., (2013). Comparing pedestrians' needs and behaviors in different land use environments. *Journal of Transport Geography*, 26, 43-50.

[8] Koh, P., Wong, Y., (2013). Comparing pedestrians' needs and behaviors in different land use environments. *Journal of Transport Geography*, 26, 43-50.

[9] Kaplan, D. H. (2015). Transportation sustainability on a university campus. *International Journal of Sustainability in Higher Education*, 16(2), 173-186.

[10] Koh, P., Wong, Y., (2013). Comparing pedestrians' needs and behaviors in different land use environments. *Journal of Transport Geography*, 26, 43-50.

Alabama better supported walking and biking. Lundberg found that those closer to campus were more likely to have a better understanding of pedestrian and bicycle networks.[11] Another longitudinal study concluded that improvements to the pedestrian network increased walking distances to campus.[12] To date, research has shown that the built environment plays a vital role in campus commuting mode choice. Overall, research has shown a direct linkage between reduced automobile use and increased sustainable modes with improved infrastructure.

Programs and Policies

Universities have attempted to implement programs and policies to increase transportation options on their respective campuses. The programs and policies implemented are similar across many campuses. Some programs and policies have been shown to improve sustainable mode use on university campuses.

Bike share is one example of a university program that can help to improve transportation options on campus. Owning a bike can be expensive and challenging to maintain for a college student. Many universities have begun to implement bike share programs in coordination with local governments and university specific systems. A small city bike share system implemented in North Dakota found that bike share stations located on campus had higher ridership rates.[13] Related to bike share, another common program are areas for students to repair bicycles, rent bikes, and participate in other events. Bike programs similar to Bike share programs offer mobility solutions, however each fills a specific role in filling mobility gaps. For example, bike share helps to solve the first and last mile challenges. Bike programs help fill the educational gap and long-term rental gap. An analysis of the University of Oregon Bike Program revealed that the program most likely increased bicycle usage on campus.[14] Linking bicycle ridership directly to bike programs is difficult, but the Armstrong study revealed some connection.

In addition, policies that reduce the barrier to active modes have found that reducing the actual and perceived travel time by bicycle and bus have the greatest impact on commuting patterns.[15] The same study identified the most promising programs for promoting active modes to be free transit passes, increased student housing near campus, increased parking cost, improved transit, and bike networks. The research shows that promoting and developing polices to increase active modes can reduce automobile usage.[16] Related to the Shannon study, the Delmelle study found that low cost parking permits were the greatest enabler for short car commutes.[17] Existing policy research clearly identifies some policies that reduce single occupancy vehicle trips.

The previously mentioned studies show that policies that promote active transportation and those that implement disincentives for driving can improve the campus goal of reduced single occupancy vehicle modal share. However, sustainable transportation policies and programs may not reach the university

[11] Lundberg, B., & Weber, J. (2014). Non-motorized transport and university populations: an analysis of connectivity and network perceptions. *Journal of Transport Geography*, 39, 165-178.

[12] Sun, G., Oreskovic, N. M., & Lin, H. (2014). How do changes to the built environment influence walking behaviors? a longitudinal study within a university campus in Hong Kong. *International Journal of Health Geographics*, *13*, 28.

[13] Mattson, J., & Godavarthy, R. (2017). Bike share in Fargo, North Dakota, Key to success and factors affecting ridership. *Sustainable Cities Society*, 34, 174-182.

[14] Armstrong, Price. (2010). Bike Sharing: A randomized study evaluating the University of Oregon bike loan program. Department of Planning, Public Policy, and Management Thesis.

[15] Shannon, T., Giles-Corti, B., Pikor, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active commuting ina university setting: assessing commuting habits and potential for modal change. *Transport Policy*, 13. 240-253.

[16] Shannon, T., Giles-Corti, B., Pikor, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active commuting in a university setting: assessing commuting habits and potential for modal change. *Transport Policy*, 13. 240-253.

[17] Demelle, E., & Delmelle, E. (2012). Exploring spatio-temporal commuting patterns in a university environment. *Transport Policy*. 21, 1-9.

population contributing the most to a university's carbon footprint. The Duque study revealed that the non-academic staff on a university campus was found to contribute the most to the university's carbon footprint. Non-academic staff are employees of the university not involved in teaching and include administrators, general laborers, and others. The study found that policies and programs offered by the university did little to reduce non-academic staff transportation choice.[18] Universities face the challenge of developing successful programs and policies that improve the campus mode share for the entire university population. University academic staff and students are the groups most targeted for reduced automobile usage. Overall, policies and programs have been shown to have the ability to reduce reliance on single occupancy vehicles.

Attitudes

American universities are uniquely positioned to support sustainable transportation commuting options within a broader culture that prefers automobile use. Perceptions of infrastructure and other related topics to campus commuting have been researched to better understand campus mode share. Student and faculty perceptions and attitudes towards campus commute options often contribute to mode choice.

The Rybarczyk study looked broadly at Transportation Demand Management (TDM) strategies on campus. The study found that universities' TDM strategies should vary incorporating bicycle and walking incentives along with driving disincentives. Varied strategies are important to implement because distinct groups that live different distances from campus responded differently to various TDM strategies. University staff were more likely to respond to higher automobile cost and students within the bicycle zone were more likely to support bicycle related improvements.[19] In addition, a study from Kent State University revealed that many students feel that time pressures, inconvenience, existing infrastructure, and discomfort because of weather conditions prevented them from using transportation modes besides single occupancy vehicle.[20] Similar studies in the future should compare sustainable modes to not only single occupancy vehicles but transportation network companies. Student attitudes towards campus commute options in addition to the built environment and campus programs contribute to campus mode share.

An often heavily debated transportation demand management topic is campus parking. A study on the UC Davis campus parking structure revealed that parking was underpriced and thus demand was higher than supply.[21] The study revealed that 87.7% of drivers would be receptive to using public transportation if frequency was increased. This indicates that improved transportation options can reduce automobile reliance. It also indicates that students are willing to change behavior and attitudes towards driving.

The studies discussed show that attitudes towards campus transportation are directly related to the built environment and attitudes towards transportation options. The research shows students and faculty attitudes towards different transportation modes can change based on built environment and campus program changes.

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[18] Duque, R. B., Gray, D., Harrison, M., & Davey, E. (2014). Invisible commuters: assessing a university's eco-friendly transportation and commuting behaviors. *Journal of Transport Geography*, 38, 122-136.

[19] Rybarczyk, G., & Gallagher, L. (2014). Measuring the potential for bicycling and walking at a metropolitan commuter university. *Journal of Transport Geography*, 39, 1-10.

[20] Kaplan, D. H. (2015). Transportation sustainability on a university campus. *International Journal of Sustainability in Higher Education*, 16(2), 173-186.

[21] Barata, E., Cruz, L., & Ferreira, J. (2011). Parking at the UC campus: Problems and solutions. *Cities*, 28(5), 406-413.

Campus Comparisons

Minimal research has been completed comparing campus transportation between universities. The Sisson study looked at the walking behaviors across two Arizona State University campuses. The study measured students daily walking distance and activity. The results showed that students on the main campus walked significantly more than students on the polytechnic campus.[22] The Walkability Suitability Assessment revealed that the main campus has more infrastructure for walking. The walking behavior of students on each campus suggests student walking correlates with the built environment.[23] The Sisson study looked at two University of Arizona State campuses. The study focused primarily on the walkability of the campuses.

A recent study analyzed pedestrian planning on college campuses. The study identified a campus pedestrian planning research gap. The study found a variety of planning and design strategies to improve pedestrian travel. The town and gown relationship for universities and the surrounding community is very important. The study revealed that the access hubs to campus from local streets are a major point of conflict. The study identified some best practices in pedestrian planning including wayfinding, education programs, innovative infrastructure, and managing conflicts. Overall, the study finds that universities have a natural opportunity to promote walking, but stakeholders have minimal guidance on pedestrian travel promotion best practices.[24]

Another study created a program chart to compare university transportation programs. The study was designed to help transportation demand management coordinators become more aware of other programs available. The study identifies four pillars to transportation demand management, (1) Strategy, (2) Communication Tactics, (3) Resources and (4) Programs. In conclusion, the study recommends investing adequately in each pillar and warms that lack of investment in any of the four pillars could compromise the integrity of any transportation demand strategy.[25]

In addition, campus plans often reference other institutions. However, a detailed comparative analysis would be a beneficial resource for university transportation planning. Additional studies are necessary to better understand the relationship between the built environment, campus programs, and attitudes towards transportation options. A detailed campus comparison could reveal the easiest to implement and best improvements to reduce automobile usage on university campuses.

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[22] Sisson, S. B., Mcclain, J. J., & Tudor-Locke, C. (2008). Campus Walkability, Pedometer-Determined Steps, and Moderate-to-Vigorous Physical Activity: A Comparison of 2 University Campuses. *Journal of American College Health*, 56(5), 585-592.

[23] Sisson, S. B., Mcclain, J. J., & Tudor-Locke, C. (2008). Campus Walkability, Pedometer-Determined Steps, and Moderate-to-Vigorous Physical Activity: A Comparison of 2 University Campuses. *Journal of American College Health*, 56(5), 585-592.

[24] Holmes, S., Huynh, R., & Millard-Ball, A. (2018). Pedestrian Planning on College Campuses. Planning for Higher Education Journal, 46(2).

[25] Zecevic, D. (n.d.). Transportation Demand Management: Overview, Best Practices Examples, and TDM template. Canadian and American Post-Secondary Institutions.

Research Questions

The mixed methods approach and report structure were designed to answer three research questions. The research questions are referred back to throughout the report and the seven recommendations provide some insight on how universities can answer each research question. The three research questions are listed below.

To what extent have bicycle friendly universities' efforts contributed to a reduced reliance on single occupancy vehicles?

Have specific policies, programs, or infrastructure improvements been shown to have the greatest impact on university modal share?

What are opportunity areas universities have that would reduce reliance on single occupancy vehicles?

Methods

This professional project uses a mixed method approach to answer the research questions. The project includes content analysis, secondary survey analysis, and interviews. Based on the literature review, there was a research gap which this project fills. This was done by comparing campus approaches. Most of the literature examines individual institutional approaches to campus commuting. This report compares multiple universities' approaches to campus planning and identifies best practices.

After the university selection, the second step was an inventory of campus programs, policies, and plans. The inventory is in the form of a content analysis, and focused on the presence or absence of programs, policies, and/or plans and details of important components of the plans. The inventory used the existing League of American Bicyclists bike ratings data and the Association for the Advancement of Sustainability in Higher Education (AASHE) transportation ratings as a baseline for comparison. The inventory is grouped into the following categories: university selection criteria, university characteristics, university programs, university structure, and community characteristics. For example, the university program inventory includes information on specific programs for each university and details of those programs. The inventory data was collected from campus websites, campus master plans, and/or campus transportation plans. The inventory was designed to aggregate data into a user-friendly format where comparisons across campuses can be completed. The format allows readers to identify common programs among universities. The inventory information used in conjunction with the secondary survey analysis is a practical tool for campus planners and other interested stakeholders.

The second method is secondary survey analysis. Many universities have completed transportation surveys. These transportation survey reports were collected and analyzed. Survey data from multiple years allowed for longitudinal analysis. The transportation survey reports did not include raw data, and for the interests of this study raw data was not necessary. Secondary survey data was extracted from survey reports and plans. Each analyzed university had completed campus transportation surveys. The surveys vary in frequency and implementation; however, the campus modal surveys identify important modal share information including percentages of each mode and distances from campus. Survey data was aggregated to identify any significant changes in campus commute modal behavior. Significant changes in campus commute modal share may be linked to specific programs, policies, or built environment changes at a university.

The third method used interviews of campus planners, parking and transportation employees, or other campus employees working on transportation planning. The interviews occurred after data from each university had been aggregated and common themes were discovered. Interviews verified aggregated data, identified future initiatives that universities have planned, and expanded on the first two methods. The interviews revealed more nuanced information that was not included in campus reports. The interviews were in person, over the phone, or skype due to the wide geographic region of the universities. Since this is a professional project and interviews will be used, the Institutional Review Board (IRB) process was completed (Appendix C).

The ethical considerations for the first two methods were minimal. Both content analysis and second survey analysis methods do not directly engage stakeholders. The secondary survey analysis and the inventory used existing data. The interviews had some ethical considerations and IRB approval was necessary. The IRB application materials are located in Appendix C.

Analysis

The analysis focuses on four universities' built environment, transportation programs, and policies on those universities. This section will outline the university selection process, university characteristics, university programs, university structure, and community characteristics.

University Selection

The process for selecting universities to analyze followed specific criteria. To be considered, the universities had to be in the western United States, be gold or platinum bicycle-friendly universities, and have a student enrollment greater than 20,000. The initial set of selection criteria narrowed the university options. Additional selection criteria were added to narrow the number of universities and to select similar geographic densities. For example, Portland State University and the University of Washington were not analyzed because their campuses are more urban than the four universities analyzed. Lastly, to ensure that a complete analysis was possible, only universities with available data were selected.

The League of American Bicyclists is a bicycle advocacy group that monitors and runs the Bicycle Friendly University (BFU) program. The BFU program recognizes universities that promote a bicycle friendly campus. Universities submit applications which are evaluated by the League of American Bicyclists, and they are awarded Platinum, Gold, Silver, Bronze or Honorable mention status (Figure 1). Platinum rated universities display excellence across the board, and gold rated universities have strong bike cultures but need to expand on their bike accessibility.[26]

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[26] The League of American Bicyclists (2018). BFU process and criteria. *The League of American Bicyclists.*

Figure 1: Bicycle Friendly Universities

University	Award	Student Enrollment	Campus Land Area (acres)
University of California Davis	Platinum	36,441	5,300
University of Colorado Boulder	Gold	32,432	600
Oregon State University, Corvallis	Gold	24,383	422
University of Oregon, Eugene	Gold	23,809	294

Source: League of American Bicyclists: Bicycle Friendly Universities & US News

The Association for the Advancement of Sustainability in Higher Education (AASHE) offers resources for universities to be drivers of sustainability. AASHE tracks university sustainability performance using the Sustainability Tracking, Assessment & Rating System (STARS) program that allows universities to self-report sustainability measures to measure sustainability performance. The STARS program includes a transportation component. The transportation component includes four categories, campus fleet, student modal share, staff modal share, and support for sustainable transportation. The maximum transportation component score is seven points.[27]

Figure 2 below shows the aggregated transportation data for the four universities selected for analysis. The University of California Davis AASHE rating expired, and therefore data is not available. The other three universities score poorly on campus fleet and employee commute modal share. The campus fleet evaluation criteria score is based on the total number of institution vehicles compared to the number of hybrid, electric, or other alternative fueled vehicles. The employee modal share evaluation criteria are based on the total percentage of sustainable commuting options. The employee modal share scores are significantly lower than the student modal share scores. The literature review discussed earlier supports this data. The final criteria, support for sustainable transportation, is primarily based on sustainable commute programs available for students and staff. Each university scored high on this category, showing some commitment to sustainable transportation.[28] The following sections of this report will further analyze university programs and compare those programs between universities.

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[27] Association for the Advancement of Sustainability in Higher Education (2017). Transportation Component.
[28] Association for the Advancement of Sustainability in Higher Education (2017). Transportation Component.

Figure 2: University AASHE Stars Rating (Transportation Component)
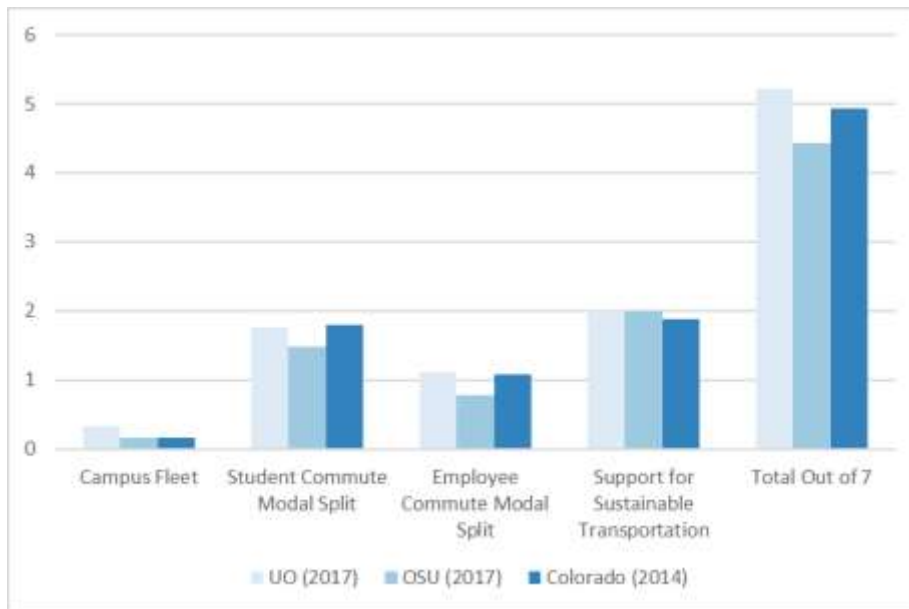
Source: AASHE Stars Program
Note: UC Davis STARS Rating is not available since their AASHE is expired

University Structure

The university structure is a unique atmosphere and an incubator of learning opportunity. The learning opportunity of universities does not stop at the classroom, but stretches outside onto the streets that students travel each day. Many universities have implemented programs around sustainable transportation options. The leaders of these programs and structure of systems vary between universities. The underlying structure of the university system is a key component of transportation on university campuses. This study will identify the basic transportation departments structure on each campus.

In addition to the formal structure, many underlying informal networks exist at each university. For the purpose of this study, the primary focus was the formal department networks. The following four figures (Figures 3-6) represent the primary transportation stakeholders on each campus. The university structure can be complicated and the figures depict the primary transportation stakeholders. The horizontal connections represent communication channels and the vertical connections represent department hierarchies.

University of California Davis

The University of California Davis has a Transportation Services Department, a bicycle program within Transportation Services, a bike barn, and an Institute of Transportation Services. The Transportation Services Department is funded primarily by parking, citation revenue, and grants. The department shares money between parking and transportation services.[29] Within transportation services is the bicycle program led by a bicycle coordinator. The bicycle program provides bicycle licenses, education, bicycle auctions, the GoClub rewards program and other bicycle resources.[30] The bike barn is operated by the

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[29] Curtin, A (2018). Phone Interview. *University of California Davis.*
[30] UC Davis (2018). Bicycle Program. *University of California Davis.*

Associated Students of University California Davis. The bike barn provides a space for bicycle repairs and bicycle rentals.[31]

The University of California Davis has the Institute for Transportation Studies. The institute has 60 faculty, 120 graduate students, a 12-million-dollar budget, and is in charge of completing the annual transportation survey[32]. Other universities do not have access to such a large transportation research department.

Overall, the main transportation stakeholders are shown in Figure 3. In addition to the main transportation stakeholders the university has a bicycle advisory committee that includes the Police Department, Facilities, and Planning.[33]

Figure 3: University of California Davis Structure Organization Chart
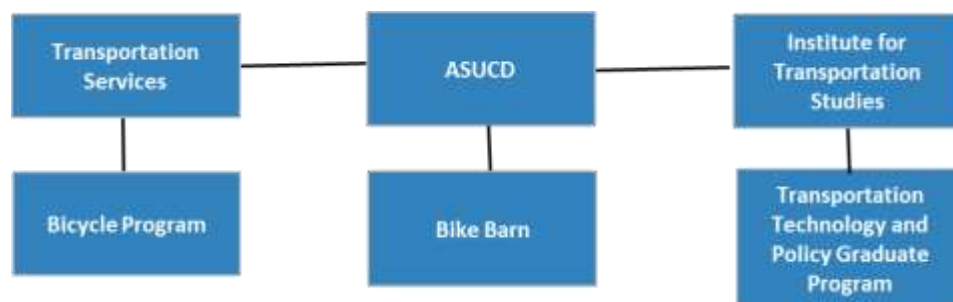
Sources: University of California Davis Transportation Services, University of California Davis Institute for Transportation Studies, ASUCD Bike Barn

University of Colorado Boulder

The University of Colorado Boulder has a Parking and Transportation Department and an Environmental Center Department. The Environmental Center provides resources for using sustainable transportation options. The Environmental Center is home to the bicycle program and other sustainable mode transportation resources. The bicycle program provides resources for bicycle repairs, registration and bike rentals.[34] The Environmental Center is funded through student fees. The fees are charged per semester and provide financial resources for the Environmental Center.[35]

The Parking and Transportation Department is responsible for parking related services, campus event coordination, university fleet vehicles, Buff Bus routes, and oversees campus sustainable commuting options. Parking and Transportation is self-funded through parking permit costs, citations, and other fees.[36] The Parking and Transportation Department is in the process of being separated into two separate sections. The new Transportation Services Department will have the Transportation Demand Management Manager and a Sustainable Transportation Coordinator.[37]

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[31] Associated Students (2018). Bike Barn. *University of California Davis*.

[32] UC Davis (2018). About. UC Davis Institute of Transportation Studies.

[33] Curtin, A (2018). Phone Interview. *University of California Davis*.
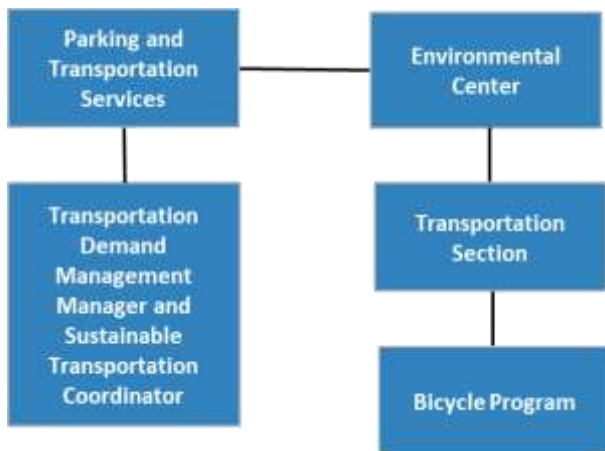
[34] University of Colorado Boulder (2018). Environmental Center. *University of Colorado Boulder.*

[35] Rider, C. (2018). Phone Interview. University of Colorado Boulder.

[36] University of Colorado Boulder (2018). Parking and Transportation Services. University of Colorado Boulder.

[37] Rider, C. (2018). Phone Interview. University of Colorado Boulder.

Figure 4: University of Colorado Boulder Structure Organization Chart

Sources: University of Colorado Boulder Environmental Center
and Parking and Transportation Services

Oregon State University

Oregon State University has Transportation Services, a bike shop and a Sustainability Department. Those three divisions are the main transportation stakeholders on campus and all within the Finance and Administration Department.[38] In addition to the divisions, Oregon State University has a Transportation Committee that combines a variety of other transportation stakeholders.

The Campus Planning Office recently passed the commute survey duties to Transportation Services. The Transportation Services Department is funded by parking related revenue and not reliant on the university's general budget.[39] The Transportation Options Supervisor position at Oregon State University is a new position within Transportation Services and used to be a part of the Sustainability Office. In the past, a Sustainability Office employee was allocated a certain FTE allowance towards transportation options. In addition, the Transportation Services Department has a part-time student transportation options position. Oregon State University identified a need for a full-time transportation options position and filled that position.[40]

The bike shop is within student affairs and recreational services. The bike shop has resources available for bicycle repairs. The bike rental program recently transferred to Transportation Services.[41]
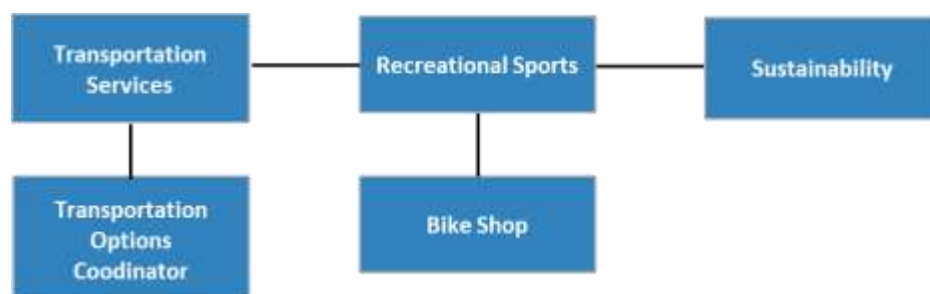
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[38] Oregon State University (2018). Finance and Administration. *Oregon State University*.
[39] Brostien, S. (2018) Phone Interview. Oregon State University.
[40] Brostien, S. (2018) Phone Interview. Oregon State University.
[41] Oregon State University (2018). Bike Shop. *Oregon State University*.

Figure 5: Oregon State University Structure Organization Chart

Sources: Oregon State University Transportation Services, Oregon State University
Student Affairs, and Oregon State University Sustainability

University of Oregon

The University of Oregon has a Campus Planning program, a Parking and Transportation Services program, and a bicycle program. These three departments are the main transportation-focused departments on campus. The main three departments coordinate with other departments including Facilities, Housing, and Athletics departments,[42] however the main three departments will be the primary focus on the University of Oregon structure analysis.

The Parking and Transportation Department at the University of Oregon currently does not have a director and the university is in the process of hiring a director. The new director position description includes a focus on sustainable modes.[43] The current structure of the department limits the amount of time that can be allocated to sustainable mode services. Josh Kashinsky is allocated 0.2 FTE of his time to sustainable modes related work. The interview with Kashinsky indicated that they are in discussions to increase his sustainable mode FTE allowance.[44]

The Bicycle Program does a lot of the programming and outreach on campus and coordinates with Parking and Transportation. The Bicycle Program takes the primary role in campus alterative mode outreach. The Bicycle Program participates in tabling events, IntroDUCKtion (University of Oregon orientation), and other outreach events throughout the year.

The role of Campus Planning is to provide policy guidance to other departments.[45] Campus Planning is funded by the general budget, and Parking and Transportation is funded through parking related revenue.[46] State law requires that the Department of Parking and Transportation is self-supporting.[47]

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[42] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[43] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[44] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[45] Eng, E. (2018). Personal Interview. *University of Oregon.*
[46] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[47] Parking and transportation (2018). University of Oregon. Retrieved from https://parking.uoregon.edu/content/funding

Figure 6: University of Oregon Structure Organization Chart
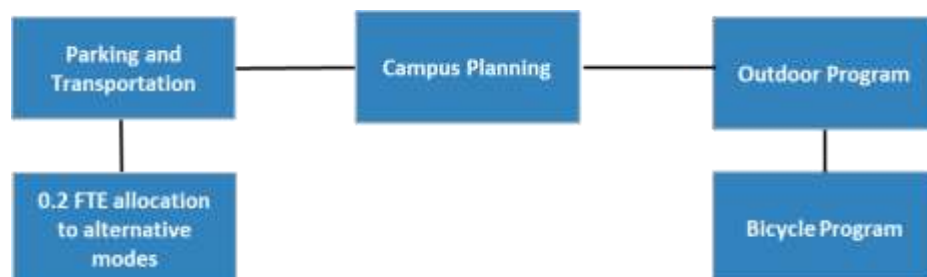
Sources: University of Oregon Bicycle Program, University of Oregon Parking and
Transportation and University of Oregon Campus Planning

Overall, each university is structured in a slightly different manner, but each university has a "Transportation Services" or a "Parking and Transportation Services" department funded primarily by parking and citation related revenue. All universities face the challenge of balancing and generating revenue and meeting sustainable mode goals.

The recent shift in the structure of University of Colorado Boulder and Oregon State University indicates a benefit in having a campus structure that allocates resources to sustainable modes. The Oregon State University Transportation Options position has had a positive influence on sustainable transportation modes on campus.[48] In addition, the University of Oregon is considering a parking and transportation restructure.

The university structure information gathered from the four universities shows an opportunity area for universities to improve sustainable transportation mode usage. The underlying university structure plays a key role in the success of university programs and sustainable mode usage on campuses.

University Programs

The four universities offer a range of programs related to transportation. The university programs offered are outlined in the following figures, and detailed descriptions of each program can be found in Appendix A. The programs in this section were categorized into bicycle programs, transit programs, automobile programs and incentive programs.

All of the universities analyzed in this study have bicycle share systems or are in the process of launching systems. Each of the bicycle share systems span beyond the university into the city. The University of Colorado Boulder and the University of Oregon have the largest bicycle share programs of the four universities (Figure 7). The University of Oregon bicycle share system launched in April 2018. University of Oregon Parking and Transportation employees do not expect to see an impact on the most recent mode share survey as a result of the bicycle share.[49] The survey is distributed around May and bike share utilization behaviors may not have been established since the system just launched in April. However, initial Peachealth data indicates that the program has been widely popular in the first month. The bike share bicycles have averaged three rides per day.[50] The UC Davis bicycle share is expected to launch in May 2018, and students will receive a discounted rate and one hour of usage per day for free.[51] University

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[48] Brostien, S. (2018) Phone Interview. Oregon State University.

[49] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*

[50] Glucklich, E. (2018). Eugene bike rental program out-pedaling expectations. *The Register-guard.*

[51] Curtin, A. (2018). Phone Interview. *UC Davis.*

of Oregon students receive fifteen minutes of riding per day for free,[52] University of Boulder students receive a discounted yearly membership,[53] and Oregon State University students pay the same rate as local citizens. Despite not having a student rate, the Oregon State University bicycle share system has a lower monthly cost compared to the other university area systems. Overall, the bicycle share systems on each university campus vary in size.

Three of the four universities require bicycle registration, and registration is offered free of charge at Oregon State University (Figure 7). The UC Davis bicycle registration costs twelve dollars initially and six dollars for renewal. The registration lasts about two years.[54] Despite this requirement UC Davis has identified a low bicycle registration rate.[55] Colorado Boulder has approximately a 54% bicycle registration rate on campus.[56] The number of unregistered bicycles on university campuses is difficult to quantify and registration difficult to enforce. Enforcement of bicycle registration at UC Davis occurs when bike keys are lost and owners need the bicycle unlocked.[57] Research did not identify the enforcement methods of the other three universities.

The bicycle programs on each campus are comparable and offer opportunity for students interested in bicycle commuting. UC Davis provides significantly more bicycle parking in total and per capita compared to other universities (Figure 7). The data on covered bicycle parking was only available for two of the universities (Figure 7). The covered bicycle data did not identify whether bicycle parking within parking garages was counted as covered bicycle parking. Each of the universities offer some secure bicycle parking at additional cost. In addition, the data analyzed for the purposes of this report does not rate the locations of bicycle parking. In 2003, Oregon State University counted 5,847 bicycle parking spaces.[58] In 2015, the number of bicycle parking spaces has increased to 8,855 total spaces (Figure 7).

The per-capita bicycle parking spaces correlates with the bicycle ridership rates shown in Figure 20. The availability of bicycle parking may be a contributing factor to the high bicycle ridership at University of California Davis. In addition, Oregon State University increased bicycle parking by about 3000 spaces from 2003 to 2015. In that same time frame the university has seen an increase in bicycle ridership rates (Figure 16). The availability of bicycle infrastructure is an infrastructure improvement that is a contributing factor in increased bicycle usage.

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[52] Peacehealth (2018). Peacehealth rides pricing.

[53] BoulderBcycle (2018). How does bike share work?.

[54] UC Davis (2018). Transportation Services. *UC Davis.*

[55] Curtin, A. (2018). Phone Interview. *UC Davis.*

[56] National Research Center (2018). 2017 University of Colorado Student Transportation Survey Summary Results. *NRC.*

[57] Curtin, A. (2018). Phone Interview. UC Davis.

[58] Oregon State University (2004). Campus Master Plan 2004-2015. Oregon State University.

Figure 7: Bicycle Programs and Service Details

University	Bicycle Parking Spaces	Bicycle Parking Spaces Per Capita	Covered Bicycle Parking Spaces	Bicycle Registration	Community Bike Share Stations
University of California Davis	30,000	0.82	N/A	Required with Fee	N/A
University of Colorado Boulder	14,000	0.43	N/A	Required	43 (10)
Oregon State University	8,855	0.36	3,222	Offered	8 (2)
University of Oregon	7,434	0.31	1,186	Required	35 (9)

Sources: OSU Bicycle Parking Utilization Study 2015, BoulderBcycle, Colorado Boulder Campus Master Plan 2011, University of Colorado Boulder, University of Oregon Campus Planning, Draft UC Davis Bicycle and Transit Network study, UC Davis.
Notes: (X) number of stations on campus (or near). Bicycle parking spaces per capita calculated using Figure 1 student enrollment. An email response from UC Davis indicated an estimated 30,000 bicycle parking spaces on campus. The interview with Clark Rider of Boulder Colorado revealed the current bicycle parking total of around 14,000 compared to 9,433 in the Boulder master plan.

The university public transit programs and services have many similarities and some differences. The analysis of public transit services is high-level and does not analyze route efficiency. Each university offers free bus passes to undergraduate students, provides an access shuttle, provides an on-demand night shuttle, and offers emergency ride home. The University of Colorado Boulder transportation survey revealed that 44% of students would no longer ride the RTD bus and 32% would ride the bus less if the college pass was no longer available.[59] These programs are described in detail in Appendix A and each program is similar across the four universities.

The University of Oregon offers a designated driver shuttle (DDS), funded by the student government.[60] The DDS appears to overlap with the safe-ride program also offered at the University of Oregon. The University of Oregon recently launched a nighttime campus shuttle. The campus shuttle was created by the UO Police Department and now operates three shuttle routes.[61] The routes serve campus and nearby residences with concentrations of student housing. The University of Oregon safe-ride program has increased the number of riders from 10,877 in 2013 to 22,086 in 2017. The safe-ride program had to turn away 7,515 riders in 2017.[62] The data indicates a high demand for the program. The DDS and campus shuttle program have high demand.[63] The programs serve a similar purpose of getting students home safely and the programs could operate more efficiently as a one program that has both on-demand and shuttle service available.

Oregon State University offers an on-campus shuttle service that circulates students on campus.[64] The University of Colorado Boulder shuttle service connects the main and east campus.[65] Oregon State University has the only true on-campus day-time shuttle service of the four universities analyzed. The Oregon State University shuttle circulates students on campus and operates five shuttle lines on campus.[66] The other universities analyzed have bus services available to students but no day-time shuttle only on campus.

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[59] National Research Center (2018). 2017 University of Colorado Student Transportation Survey Summary Results. *NRC*.
[60] University of Oregon (2018). Designated Driver Shuttle.
[61] Benitez, F. (2018). The new campus shuttle makes getting home safer. *Emerald*.
[62] Egener, M. (2018). Campus Ride Service Funding has increased, But is it enough? *Daily Emerald*.
[63] Egener, M. (2018). Campus Ride Service Funding has increased, But is it enough? *Daily Emerald*.
[64] Oregon State University (2018). OSU Beaver Bus. Oregon State University.
[65] Colorado Boulder (2018). Getting Around Campus. Parking and Transportation Colorado Boulder.
[66] Oregon State University (2018). OSU Beaver Bus. Oregon State University.

The University of Colorado Boulder[67] and University of California Davis[68] have bus routes available to the airport. The University of Oregon and Oregon State University do not have a direct bus route to an airport. Each of the universities have private options that are available to anyone traveling to the airport for a fee (Figure 8).

The literature review identified that one of the most promising programs for promoting active modes were free transit passes.[69] The University of Colorado Boulder transportation survey supported this study. The data shows that universities should offer free transit passes to students and the result will be increased transit ridership.

Figure 8: Public Transit Programs and Services Broadly

	UC Davis	Boulder Colorado	UO	OSU
Bus Passes Free (City Bus)	X	X	X	X
Access Shuttle or mobility assistance shuttle	X	X	X	X
Safe Ride or Nightride (on-demand)	X	X	X	X
Designated Driver Shuttle			X	
Emergency/ Guaranteed Ride Home	X	X	X	X
Day Time Campus Shuttle		X		X
Night Time Campus Shuttle or Bus (Fixed)		X	X	X
Airport Shuttle or Bus (Free)	X	X		

Sources: UC Davis, YOLO bus, University of Colorado Boulder, University of Oregon, and Oregon State University
Notes: UO and Oregon State have private airport shuttle options. UC Davis Unitrans bus 42A and 42B to Sacramento International airport operated by YOLO bus. UC Davis bus pass only free to undergraduate students. Graduate students get a reduced rate.

Figure 9: Public Transit Programs and Services Details

University	Airport Shuttles	Late Hours Bus or shuttle	Undergraduate and Graduate Student Bus Passes
University of California Davis	Bus, Private Options	On-demand	Free
University of Colorado Boulder	Bus, Private Options	Fixed (4), On-demand	Free
Oregon State University	Private Options	Fixed (3), On-demand	Free
University of Oregon	Private Options	Fixed (3), On-demand	Free

Sources: UC Davis, UC Davis Transportation Services, YOLO bus, University of Colorado Boulder, Boulder Environmental Center, University of Oregon Housing, UO Saferide, University of Oregon, and Oregon State University
Notes: Late Night after 10 PM

Each of the universities offer parking on campus, and parking is available in surrounding neighborhoods, however the range of available parking between the universities is significant. The University of Oregon offers less than 4,000 parking spaces while University of California Davis has over 10,000 spaces available. The 2005 Oregon State University campus plan counted approximately 7,174 car parking

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[67] RTD (2018). Airport Service. *Regional Transportation District Denver Metro.*
[68] Yolo Bus (2018). Sacramento International Airport Service. *Yolo Bus.*
[69] Shannon, T., Giles-Corti, B., Pikor, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active commuting ina university setting: assessing commuting habits and potential for modal change. *Transport Policy*, 13. 240-253.

spaces on campus, and the majority of spaces were on the perimeter of campus.[70] Since 2005, the number of car parking spaces has declined despite student enrollment increases (Figure 10). The parking numbers only include parking lot spaces and not local neighborhood inventories. A total of 29% of students at the University of Oregon identified that they park in free surrounding neighborhood parking.[71] Oregon State University utilizes a zonal parking structure and completes an annual parking utilization study to reduce neighborhood parking.[72] Overall, each university naturally has surrounding neighborhoods with parking and this parking is regulated by the local city government.

Per-capita the University of California Davis and Oregon State University have the highest amount of available parking spaces. This data correlates with the single occupancy vehicle rates to campus (Figure 20). The literature review revealed the availability of parking as a key driver of single occupancy trips, and the universities analyzed for this study correlate with the literature.

The university automobile parking analysis did not consider the amount of parking available to students compared to staff. Some parking lots are designated for students or staff. Additional research is required to determine the available parking for students.

In addition, all of the universities offer some type of infrequent driver program. The programs offer parking options for those who drive less frequently to campus, and each university offers a pre-tax payroll deduction for parking permits.

Other car programs and services offered by each university include electric vehicle parking and car share availability. The electric vehicle parking supports automobile trips and may not reduce single occupancy vehicle use but supports greenhouse gas reduction goals.

The car share programs provide students an option to not own a vehicle. Oregon State University staff indicated excitement about the car share program and the internal availability of utilization data.[73]

Figure 10: Car Programs and Services Details

University	EV Charging Spaces	Car Share Vehicles on Campus	Parking Spaces	Parking Spaces Per Capita
University of California Davis	35	5	10,881	0.30
University of Colorado Boulder	16	20	7,152	0.22
Oregon State University	21	6	6,896	0.28
University of Oregon	8	3	3,950	0.17

Sources: University of California Davis, University of Colorado Boulder, Oregon State University, University of Oregon.
Notes: Parking spaces per capita calculated using Figure 1 student enrollment.

The University of Davis California offers an incentive program for sustainable modes. The program is called, GoClub, and allows students to receive rewards for sustainable commuting choices.[74] The program is used for outreach to current students and more targeted to upperclassman since freshman are

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[70] Oregon State University (2004). Campus Master Plan 2004-2015. Oregon State University.
[71] University of Oregon (2016). Campus Travel Survey. *University of Oregon*.
[72] Capital Planning & Development and University Land Use Planning (2017). OSU Parking Utilization Study 2016-17 Fall Term. *Oregon State University*.
[73] Brostien, S. (2018). Phone Interview. Oregon State University.
[74] University of California Davis (2018). Go Club.

not supposed to have cars on campus.[75] The rewards program provides an incentive to use sustainable commute options; however, about 63% of students identified that they had never heard of the program.[76] The University of California Davis also has a Bicycle Education and Enforcement Program (BEEP). The program allows students to participate in a course instead of paying a bicycle ticket.[77] Similar to GoClub the majority of students have not heard of the BEEP program.[78]

The University of Boulder Colorado is testing an incentive program called CU Positive Impact Points (PIPs). The PIPs rewards program is connected to sustainable activities beyond transportation including recycling and volunteering. Transportation related PIPs points include riding bicycle share or using carshare programs.[79] The program offers additional points for riding bicycle share bikes to locations that have high outflow rates and low inflow rates. A common high outflow and low inflow location is at the top of hills. A bicycle share location at CU Boulder had a 65% outflow rate and 35% inflow rate. After the implementation of the PIPs program the outflow rate was reduced because of the incentive program.[80]

Oregon State University recently implemented a bike rewards commute program. The ZAP program uses technology that senses trips into campus. Participants attach a sensor on their bicycle and ride past specific entry points to campus and this is connected to a rewards program.[81]

The University of Oregon does not have a sustainable transportation rewards program.

The data shows that sustainable transportation incentive programs can influence mode choices. Additional research is needed to identify the incentive programs that work best.

University Characteristics

The universities analyzed in this study were identified to have broad similarities. Additional, analysis revealed that each university is unique in many ways and the university characteristics contribute to the mode share on campus. This section analyzed survey data from the four universities. The survey methodology between universities varies and so does survey methodology internally between years. Each university's section will introduce the survey methodology. The surveys analyze more detail than necessary for this report. This report will not compare commute time of day, frequency of trips to campus, and parking lot locations. The main focus of the secondary survey analysis was the modal splits, housing locations, and distance from campus.

University of California Davis

The majority of the University of California Davis campus core is closed to vehicle traffic, the campus is flat, and the weather is mild.[82] The University of California Davis Campus Tomorrow Plan envisions the campus' future. The plan creates parking planning objectives including investing in programs before parking, promoting ride sharing, and parking on the periphery.[83] The parking planning objective in addition to the transportation demand management strategies identified showed a commitment to sustainable modes.

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[75] Curtin, A (2018). Phone Interview. *University of California Davis.*

[76] Heckathorn, D. & Handy, S. Results of the 2016-17 Campus Travel Survey. *Institute of Transportation Studies and Transportation and Parking Services, University of California Davis.*

[77] Curtin, A (2018). Phone Interview. *University of California Davis.*

[78] Heckathorn, D. & Handy, S. Results of the 2016-17 Campus Travel Survey. *Institute of Transportation Studies and Transportation and Parking Services, University of California Davis.*

[79] Environmental Center (2018). CU PIPs- Positive Impact Points. *Colorado Boulder.*

[80] Rider, C. (2018). Phone Interview. University of Colorado Boulder.

[81] Brostien, S. (2018). Phone Interview. Oregon State University.

[82] Campus Planning and Design (2015). Designing for Bikes at UC Davis. *University of California Davis.*

[83] University of California Davis (2018). Draft 2018 Long Range Development Plan. *University of California Davis.*

The Campus Travel Survey is a combined effort between the Transportation and Parking Services and the National Center for Sustainable Transportation. A survey has been administered each year since 2007. The 2016-17 survey was administered online in the fall of 2016 and emailed to a random sample of students, faculty, and staff. In total about 16% of those contacted completed the survey. A primary purpose for the UC Davis campus travel survey is to compare mode trends between years. The 2016-17 survey saw an 8% decline in bicycle rates compared to 2015-16, however the survey report believes this is due to the survey methodology change. The 2016-17 survey methodology for calculating weights changed. Looking further into the past the 2008-9 mode rates are comparable to the 2016-17 rates. The 2008-9 and 2016-17 mode rates are all within 3%, except drive alone rates which increased by 6% (Figure 11).[84]

The majority of students within one mile and between 1 to 2.9 miles travel by bicycle to campus. As distance increases the number of students traveling to campus by bicycle declines. Inversely as distance increases drive alone trips to campus increase. The highest rate of bus ridership is for those located between 1 to 2.9 miles from campus. Overall, distance from campus influences the transportation mode choices to campus.

The majority of students live off campus in Davis. Student housing totals were as follows, 14% live on campus, 4% in the West Village, 53% live off campus in Davis, and 24% live outside Davis. West Village is technically off campus but adjacent to the campuses western edge and is separated into its own category. In addition, to the off campus question the survey compared mode choice and neighborhood location. The bicycle mode split was above 62% for those located in central and downtown Davis followed by 45% in the east quadrant, 37% in the west quadrant, 33% in the north, and 28% in the south (Figure 12). The central and downtown quadrants are the closest to campus. The west quadrant is separated from campus limiting the number of access points to campus.

Overall, the University of California Davis has a strong bicycle culture and that is reflected in the high bicycle ridership rates. The second most used transportation mode to campus are drive alone trips.

Figure 11: University of California Davis Mode Split
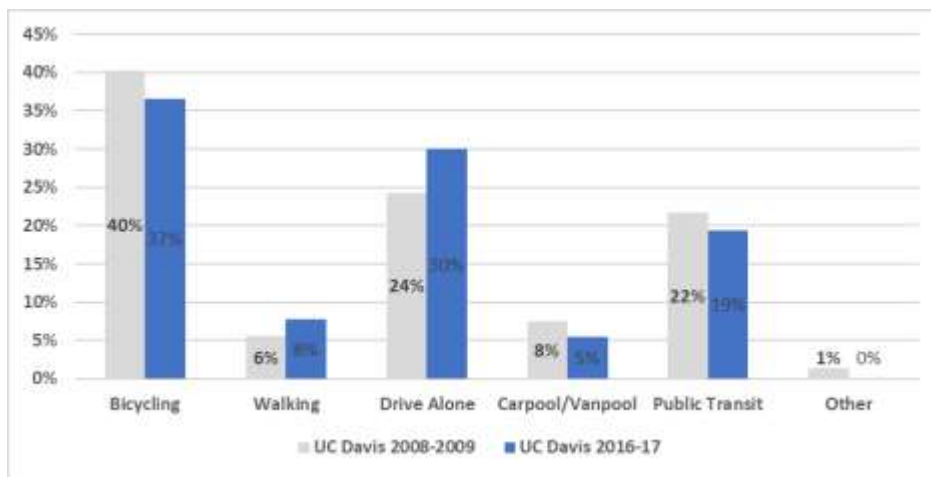
Sources: UC Davis Campus Travel Survey 2008-9 & UC Davis Campus Travel Survey 2016-17
Note: Other includes work from home & public transit includes bus and train

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[84] Heckathorn D. & Handy, S. Results of the 2016-17 Campus Travel Survey. Institute of Transportation Studies and Transportation and Parking Services, University of California Davis.

Figure 12: University of California Davis Neighborhoods

Source: Results of the 2016-17 Campus Travel Survey
Note: UC Davis is located below the Central neighborhood. UC Davis did not have a heat map or campus map similar to the other universities.

University of Colorado Boulder

The University of Colorado Boulder's commitment to sustainability and transportation is a major component of their sustainability efforts. The transportation master plan identifies a desire to expand transportation demand strategies rather than expanding parking availability. However, the transportation services were strained in 2011 by a new debt service for a parking structure. The transportation management plan identified a goal of decreasing single occupancy vehicle trips to campus to 19% for students.[85]

The longitudinal survey analysis for the University of Colorado Boulder uses surveys from 2008 and 2017. In 2008 an online survey was distributed and 3,078 faculty, staff and students participated.[86] The University of Colorado Boulder completed another survey in 2017. The survey was distributed online in September of 2017 and the National Research Center, Inc. conducted the survey. In total, 28,121 students were contacted and 3,597 responded, a response rate of 12.8%. This results in a 2% margin of error at a 95% confidence level. The data was weighted to correlate the survey results with the enrollment status of students. The survey asked how often students use a variety of modes and students could select multiple daily modes. An additional question asked students how they arrived on campus that day.[87] The results of this question are shown in Figure 14. The two survey results were comparable with all of the gathered mode share information within 5% between the years (Figure 13).

The majority of students within one-mile travel by walking to campus. As distance increases the number of students traveling to campus by bicycle declines. The majority of students ride transit for distances between one and two miles and distances between 2 and 5 miles from campus. Driving alone is the dominant mode for longer trips to campus.[88] The highest rate of transit ridership occurs in the 2 to 5 miles range from campus. The transit ridership rate drops after 2 to 5 miles and then begins to increase again. Between 5 to 10 miles the transit ridership rate is 23%, between 5 to 10 miles the transit ridership rate is 25%, and for those further than 20 miles from campus the transit ridership rate is 30% (Figure 14).

The results of the 2017 survey revealed that 81% of students that live in the Williams Village or Bear Creek apartments rode the bus. The Williams Village and Bear Creek apartments are located to the South East of the main campus. In comparison to dominant modes for other locations are as follows, 63% of students that live on campus walk to campus, 28% that live off campus in Boulder bike, and 59% that live outside of Boulder drive alone. The results show some correlation between home location and

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[85] Alta Planning (2011). CU-Boulder Transportation Master Plan.
[86] Alta Planning (2011). CU-Boulder Transportation Master Plan.
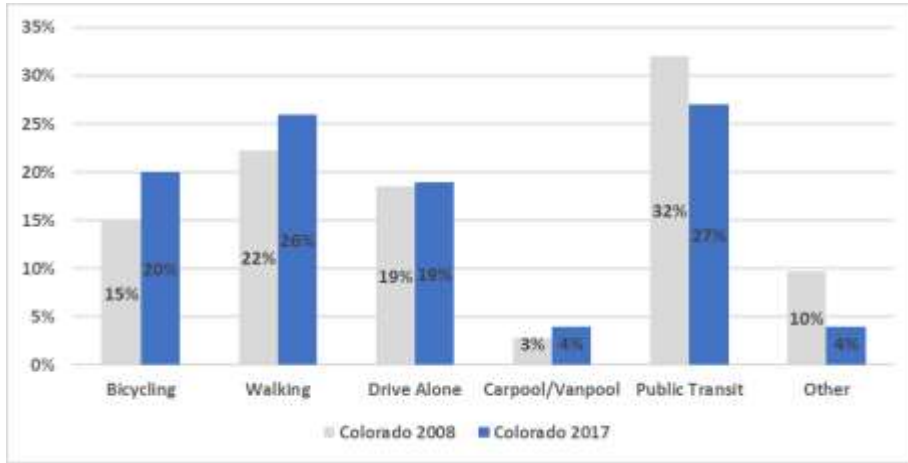[87] National Research Center (2018). 2017 University of Colorado Student Transportation Survey Summary Results. *NRC*.
[88] Alta Planning (2011). CU-Boulder Transportation Master Plan.

commute patterns.[89] The Williams Village and Bear Creek apartments have a constant bus route that runs by the apartments.

Overall, the University of Colorado Boulder offers a variety of transportation demand management programs to increase sustainable mode use on campus.

Figure 13: University of Colorado Boulder Mode Split

Source: CU-Boulder Transportation Master Plan 2011 and CU Boulder 2017 Student Transportation Survey Summary Results

Figure 14: University of Colorado Boulder Housing Locations and Transit Use
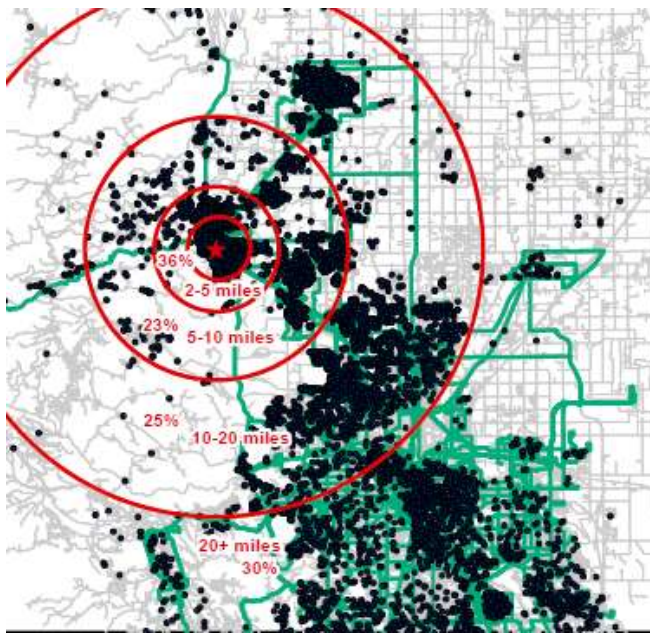
Source: CU- Boulder Transportation Master Plan
Note: The area to the Southeast is Denver and the Denver suburbs.

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[89] National Research Center (2018). 2017 University of Colorado Student Transportation Survey Summary Results. *NRC.*

Oregon State University

The Oregon State University 2004-2015 Campus Master Plan identifies walking as the primary mode of transportation. The campus shuttle is available for longer trips on campus.[90] The campus framework plan is in the process of being updated.[91] Oregon State University has a Transportation committee that helps guide the Vice President for Finance and Administration. The committee consists of a wide range of stakeholders with transportation interests including among others housing, public safety, faculty, and students.[92]

The 2003 campus transportation survey was conducted using traveler interviews. The interviews occurred in January 2003 and a total of 1,437 people were interviewed. The interviews did not distinguish between faculty or students; however, the 2003 survey provides the best historic transportation data for Oregon State University.[93] The current Oregon State University transportation survey is used to identify transportation trends and plan for future transportation projects to better serve students, staff, and faculty.[94] The 2016 transportation survey was solicited online in November 2016 to all students and employees. In total, 2,906 students and 1,916 employees responded to the survey. The Oregon State University transportation survey data identifies a decrease in drive alone trips to campus from 2003 to 2016. Drive alone trips were replaced by bicycle, carpool and public transit trips (Figure 15). In recent years the survey data has not identified a significant change in mode splits.[95] The 2014 and 2016 data, outlined in the 2016 survey report, does not indicate a significant change in transportation mode choice.

The transportation mode splits may vary based on distance from campus. An Oregon State University Policy Analysis Laboratory (OPAL) study revealed that walking to campus significantly declines for distances greater than 1.5 miles. The study showed that 83% of students within 1.5 miles walk to campus, however only 11% of students walk to campus for trips between 1.5 and 3.8 miles. In addition, biking to campus declines as distance to campus increases, but at a lower rate than walking. Inversely transit and driving increase as distance increases.[96]

Currently, 43% of off-campus students live within zones 1,2, 3, and 4 which are the closest zones to the university (Figure 16). This indicates that many students live within close proximity to the university.[97] An interview indicated that a challenge for the university is that Corvallis has not increased housing supply at the same rate that the university student population has increased. This has contributed to a situation of higher housing prices in Corvallis and many people live in nearby communities. Providing transit to and from other communities is not feasible, and Oregon State University indicated a desire to provide more transportation and housing choices.[98] For example, 31% of off campus students residing outside Corvallis live in Albany, Oregon.[99] The Linn-Benton loop bus service provides a transit option between the cities. However, the expansion of the Linn-Benton loop is politically difficult as a result of the Metropolitan

[90] Oregon State University (2004). Campus Master Plan 2004-2015. *Oregon State University*.

[91] Houghling, R. (2018). Phone Interview. Oregon State University

[92] Oregon State University (2018). Transportation Committee. *Oregon State University*.

[93] Oregon State University (2004). Campus Master Plan 2004-2015. *Oregon State University*.

[94] Kittleson and Associates (2016). Oregon State University 2016 Campus Travel Survey.

[95] Brostien, S. (2018). Phone Interview. Oregon State University.

[96] Nguyen, M., Shevtsova, I., and Smith, C. (2014). OSU Transportation Choices: What Drives Us?, Oregon State University Policy Analysis Laboratory.

[97] Oregon State University (2004). Campus Master Plan 2004-2015. *Oregon State University*.

[98] Brostien, S. (2018). Phone Interview. Oregon State University.

[99] Kittleson and Associates (2016). Oregon State University 2016 Campus Travel Survey.

Planning Structure. Albany and Corvallis fall within two different MPO's.[100] The MPO structure complicates funding streams for the bus Linn-Benton bus service.

The Oregon State University Policy Analysis Laboratory (OPAL) conducted a study on the single occupancy vehicles and parking permits. The study analyzed the on-campus zonal parking permit system that was implemented in 2014. The study found that graduate students are less likely to buy a parking permit, faculty and staff are more likely to purchase a parking permit, and being a professional non-degree seeking student increases the probability of buying a parking permit. The study recommended encouraging alternatives to single occupancy vehicles and coordinating with the different departments to provide education opportunities.[101]

Despite the lack of significant modal change in recent years, the Zipcar system shows promise and staff have access to real-time usage data. Staff indicated a hope that Zipcar can help achieve other goals such as parking.[102] Increased zipcar usage could reduce a need for parking by allowing students not to own a car and instead share a car for necessary errands. Oregon State University programs will be discussed in more detail in a future section.

Overall, Oregon State University prioritizes pedestrian travel on-campus and offers a variety of options to students and faculty to commute to campus.

Figure 15: Oregon State University Mode Split
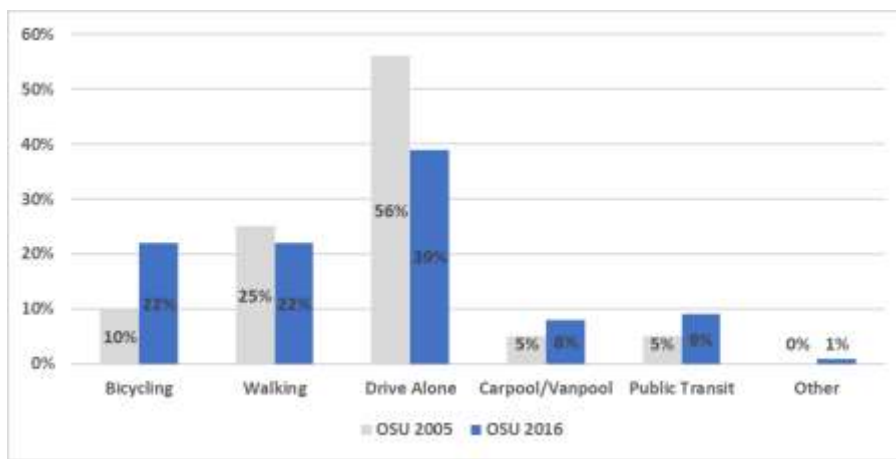
Sources: Oregon State University Campus Survey Report and Oregon State University
Campus Mater Plan 2004-2015
Note: 2005 numbers to and from campus

[100] Houghling, R. (2018). Phone Interview. Oregon State University
[101] Tran, T. (2014). Preliminary findings: Single occupancy vehicle and parking permits. *Oregon State University Policy Analysis Laboratory.*
[102] Brostien, S. (2018). Phone Interview. Oregon State University.

Figure 16: Reported Locations of Off-campus Students Residing in Corvallis
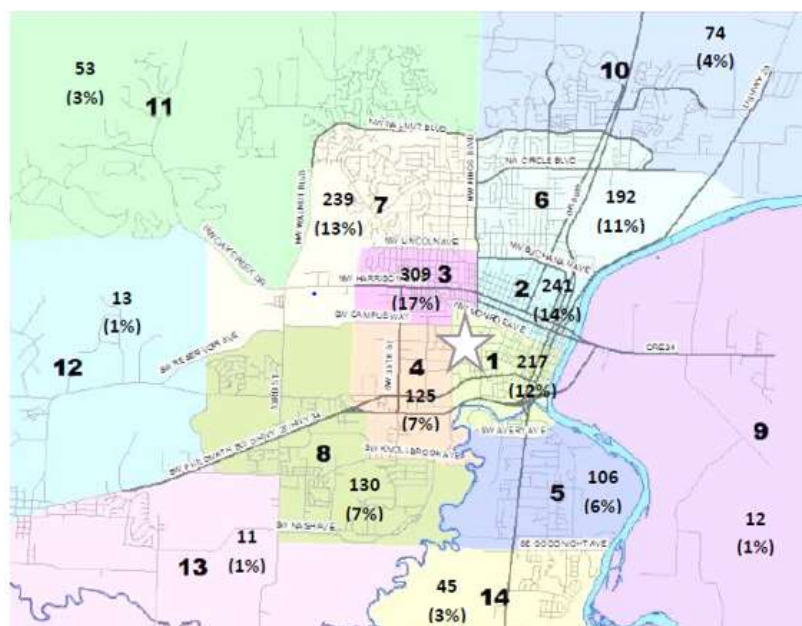
Source: Oregon State University 2016 Transportation Survey
Note: The star indicates the location of Oregon State University

University of Oregon

The University of Oregon Campus Plan Policy #9 discusses on-campus transportation.[103] The Campus Plan lists a set of priority levels to different modes of transportation. The highest priority is given to emergency vehicles, pedestrians and people with disabilities, bicyclists, and public transit. Other modes are then listed with the lowest priority given to personal cars.[104] The Campus Plan shows a university commitment to sustainable transportation modes. Overall, the Campus Plan's twelve policies inform other subject plans, implementation plans, and other campus plans.

The University of Oregon completes a campus planning survey almost every year. The 2016 Campus Travel Survey is the most recent available report. The 2016 survey was emailed in May to 11,043 university email accounts, 5,550 of which were student accounts and the survey was in Qualtrics. All staff and faculty were emailed but only a portion of students. In total, 708 students and 1,324 staff responded to the survey.[105] This results in a 4% margin of error at a 95% confidence level for the student survey portion. The survey incentive was a random drawing for four $25 Duck Store gift cards.

The 2016 transportation survey identified commute to campus percentages based on distance from campus. The question revealed that 73% of students that live less than a mile from campus walk. Bicycling represents the highest student transportation mode percentage for distances between 1 and 3 miles. For all other distance ranges drive alone trips were the dominate mode choice.[106]

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[103] University of Oregon (2014). Campus Plan. 3rd edition. *University of Oregon.*

[104] University of Oregon (2014). Campus Plan. 3rd edition. *University of Oregon.*

[105] University of Oregon (2016). Campus Travel Survey. *University of Oregon.*

[106] Campus Planning (2016). UO Commuter Survey 2016. *Campus Planning.*

In addition to the distance from campus question, the survey had a housing location question. The survey question revealed a high concentration of walkers living near campus, cyclists a little more distributed, bus riders near transit stations, and drive alone trips widely dispersed (Figure 18). The exact distance from transit stations is not quantified. However, the high concentrations of transit ridership are near the downtown Eugene station, a Bus Rapid Transit stop near campus, a densely populated student housing location to the north of campus and the Willamette River, and from near the Gateway mall (Figure 18).

The University of Oregon allows freshman to buy parking permits at a monthly fee of $89. Parking and Transportation staff discussed decreasing the amount of freshman automobile parking spaces.[107] Freshman often live in dorms and do not need personal vehicles except for some errands and trips to and from their home.

The University of Oregon Police Department recently helped launch a night-time shuttle. The shuttle offers a safe transportation option home for students.[108] The campus shuttle operates three fixed-route lines on and around campus.[109]

Overall, the University of Oregon prioritizes pedestrian travel on-campus and discourages single occupancy trips to campus by have a limited number of parking spaces, strong policies, and closing portions of campus to private automobiles. The University of Oregon has a variety of plans studying campus commuting at the university (Appendix B).

**Figure 17: University of Oregon Mode Split**
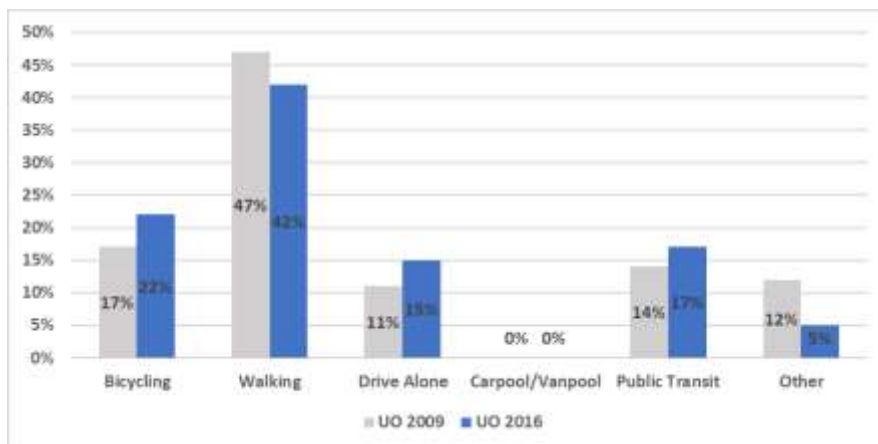
Source: University of Oregon Commuter Survey 2016
Note: Other includes Carpool and Vanpool

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[107] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon*.

[108] University of Oregon (2018). Overnight Parking Permits. *University of Oregon*.

[109] University of Oregon (2018). Campus Shuttle. *University of Oregon*.

Figure 18: Primary Commute Mode Heatmaps for Students
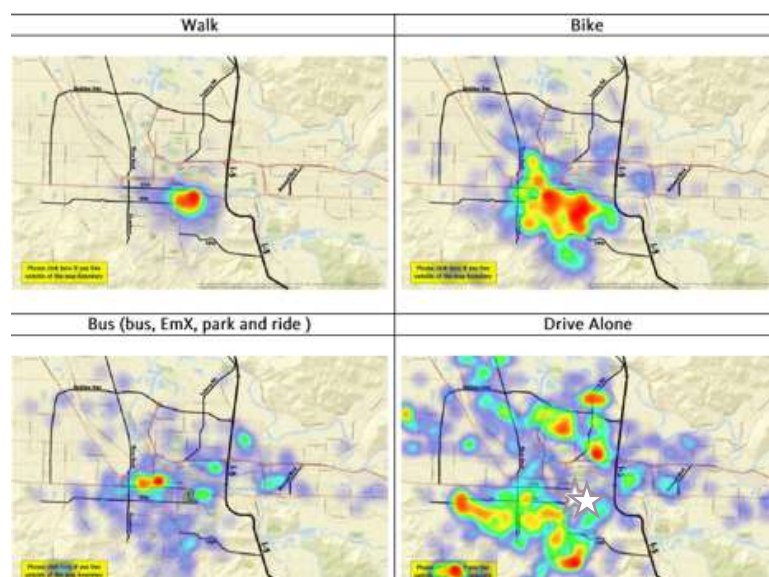
Source: UO 2016 Commuter Survey
Notes: The star on the drive alone map marks the location of the university. Also the walking trips are concentrated at the location of the university.

Aggregated University Characteristics

Each of the universities analyzed in this project are unique but have the ability to influence transportation behavior in the broader city framework. In general, the sustainable transportation options provided by each institution are related to the universities unique characteristics. The universities are each interested in improving transportation options for students as shown in various campus plans (Appendix B). The transportation documents referenced in Appendix B do not represent a comprehensive list of campus efforts on each campus. Other efforts include climate mitigation plans which often reference transportation related goals.

The following two tables compare the bicycle rates and the sustainable mode rates of each campus. The earlier sections outlined the survey methodology and other campus characteristics. In summary, the University of California Davis has the highest bicycle mode share. However, the aggregated sustainable mode figure reveals that the University of Oregon has the highest rate of sustainable modes (Figure 20). When analyzing modal share it is important to look at all sustainable mode shares in addition to individual sustainable modes. The University of California Davis has a strong bicycle culture, however of the four universities analyzed, it also has the second highest drive alone rate. The analysis earlier revealed that the University of California Davis has the most parking per-capita; this could be a contributing factor to the high single occupancy trips rate.

Each university analysis section showed that single occupancy mode rates increase as distance from campus increases. The data shows that increasing the density and availability of housing near campus should increase the amount of sustainable trips to campus.

An emerging mode that universities should be aware of are transportation network companies (TNCs). Transportation network companies connect riders to drivers via technology. Commonly known TNCs are Uber and Lyft. This form of transportation may reduce the number of parking spaces needed on campus. Another outcome is that transportation connected network companies may decrease sustainable mode trips. In the future, universities may consider another category on their transportation surveys to account for this emerging mode.

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Figure 19: Student Bicycle to School Rates
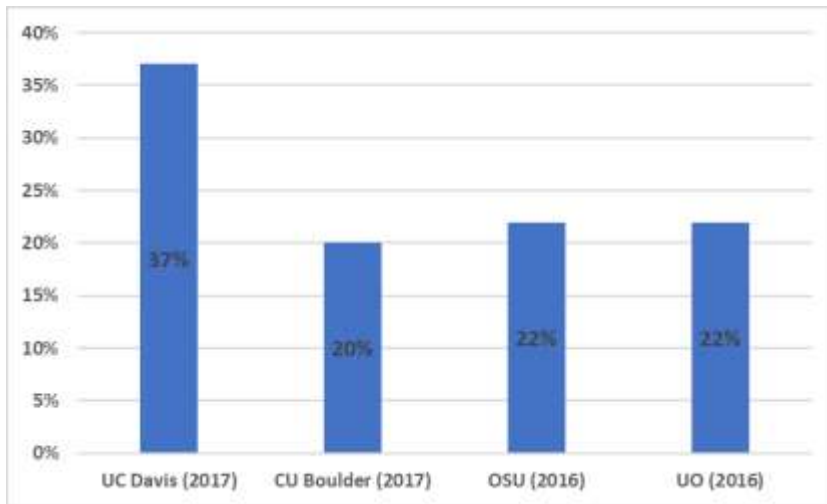
Sources: Oregon State University Campus Travel Survey 2016, University of Oregon Commuter Survey 2016, University of Colorado Boulder Campus Master Plan, UC Davis Campus Travel Survey 2016-17, CU Boulder 2017 Student Transportation Survey Summary Results

Figure 20: Aggregated sustainable mode rates
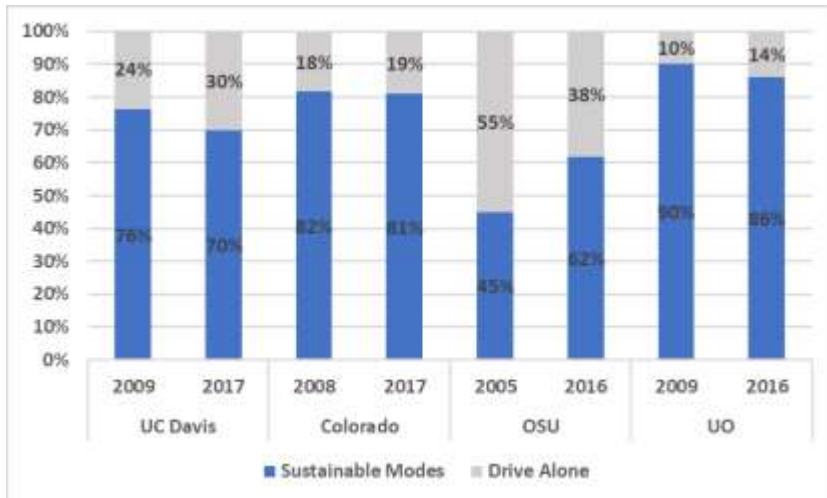
Sources: Oregon State University Campus Travel Survey 2016, University of Oregon Commuter Survey 2016, University of Colorado Boulder Campus Master Plan, UC Davis Campus Travel Survey 2016-17, CU Boulder 2017 Student Transportation Survey Summary Results

Figure 21: Current University Mode Splits

University of California Davis 2016-17
Other 0%
Public Transit 20%
Carpool/Van pool 5%
Bicycling 37%
Drive Alone 30%
Walking 8%

University of Colorado Boulder 2017
Other 4%
Bicycling 20%
Public Transit 27%
Walking 26%
Carpool/Van pool 4%
Drive Alone 19%

Oregon State University 2016
Other 1%
Carpool/Van pool 8%
Public Transit %
Bicycling 22%
Drive Alone 38%
Walking 22%

University of Oregon 2016
Other 5%
Carpool/Van pool 0%
Public Transit 17%
Bicycling 22%
Drive Alone 15%
Walking 41%

The following figure outlines the time transportation and master plans were last updated on each campus. Transportation technology and other factors often impact transportation goals on campus, and plans should be re-evaluated. Overall, most of the plans were compl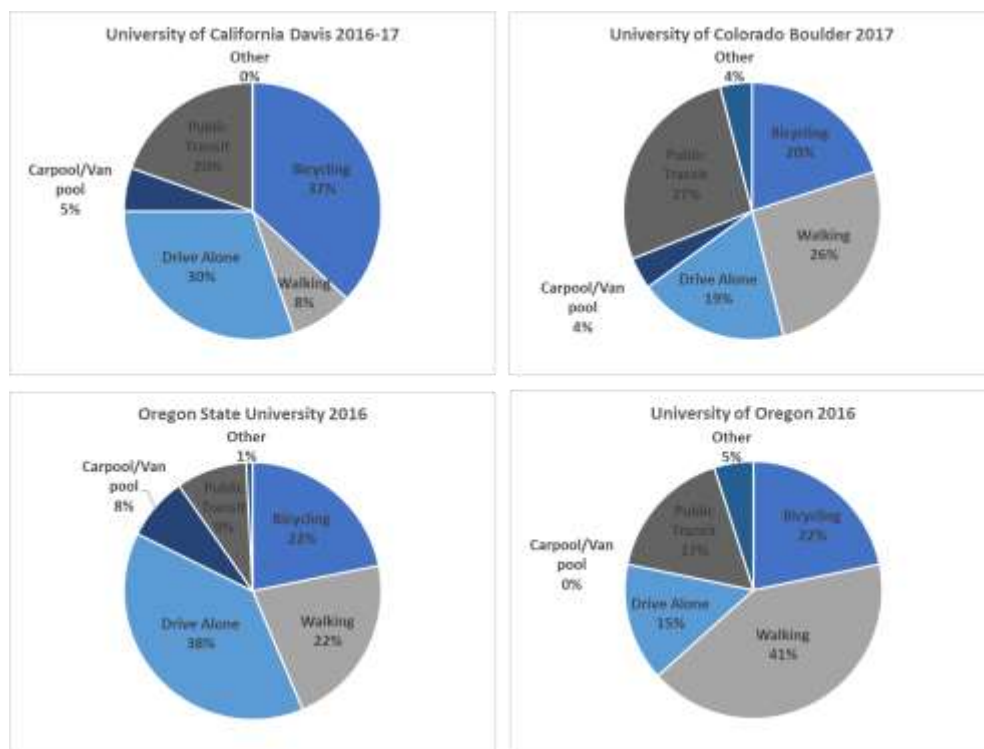eted in the last decade. However, the University of Oregon transportation plan is outdated and the Oregon State University master plan is outdated. Oregon State is in the process of updating their campus framework plan. The University of Oregon indicated a desire to update their transportation plan, but they are in the process of hiring a new director and the project will likely start after that process.[110]

Figure 22: Transportation and Master Plan Updates

University	Year of Last Transportation or Bike Plan Update	Year of Last Campus Master Plan Update
University of California Davis	2011 (Bike)	2018
University of Colorado Boulder	2011 (Transportation)	2011
Oregon State University	2010 (Bike)	2004*
University of Oregon	1976 (Transportation)	2014

Sources: University of Oregon, University of Colorado Boulder, University of California Davis, and Oregon State University
Note: Oregon State University is in the process of updating their campus framework plan

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[110] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*

Community Characteristics

Every university is part of a larger city framework and plays an important role within the city. The cities that are home to the four universities analyzed range in population from 55,766 to 161,649.[111] In addition to the city population, it is important to analyze the metropolitan population. Eugene, Oregon is the outlier and has a population higher compared to the other three universities. The metropolitan populations for Boulder and Eugene are similar and the same is true for Davis and Corvallis. The university and community relationships are an important component of sustainable transportation choices. Each university has the ability to control transportation factors on campus including bicycle parking, bicycle facilities, sidewalks, and automobile parking cost. However, universities do not control infrastructure (bicycle, pedestrian, automobile, etc.) or public transit outside campus boundaries. Many universities choose to partner with the local community on transportation programs, as discussed in the campus programs section.

The League of American Bicyclists has a state, community, and business Bicycle Friendly America programs in addition to the university BFU program.[112] Figure 23 below outlines the ratings for the four communities. The ratings are the same for the communities and universities except that Boulder, Colorado rates platinum compared to the University of Boulder Colorado which has gold status. Boulder is the only city of the four analyzed to have a higher rating than the university. This indicates that the City of Boulder is leading the way and the University of Colorado Boulder lags behind the city.

Figure 23: Bicycle Friendly Communities

Community	Award	Population	Metro Population	Land Area (Square Miles)	Density
Davis, California	Platinum	66,886	66,886	10	6,887
Boulder, Colorado	Platinum	105,420	313,961	25	4,383
Corvallis, Oregon	Gold	55,766	87,455	14	4,042
Eugene, Oregon	Gold	161,649	360,273	44	3,810

Sources: League of American Bicyclists, American Community Survey 5-year estimates 2012-16, Table B01003, and Governing Magazine
Notes: Population Density (Persons/Square Mile). Population Density based on 2016 **city** population. No metropolitan population for Davis.

Davis has the smallest land area and the highest density. The other three cities have similar densities. Davis has the highest bicycle-to-work commute rate and Eugene has the lowest bicycle-to-work commute rate (Figure 26). This correlates with the density and land area numbers for each city. Corvallis and Boulder have similar density rates, but Corvallis has a smaller land area. Corvallis has a higher bicycle-to-work rate than Boulder, which could be related to the land areas of each city. Land area and density are not the only factors that influence sustainable mode choices, however the four cites show some correlation between these factors and sustainable mode choice.

Other community factors that may influence transportation mode choice include weather and distance to other major cities. The University of Oregon and Oregon State University are relatively isolated from other metropolitan regions with the closest large metropolitan city being Portland. Portland is approximately 90 miles from Oregon State University and approximately 110 miles from the University of Oregon. The University of California Davis and the University of Boulder Colorado are closer to large metro regions.

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[111] U.S. Census Bureau; American Community Survey, 2012-2016 American Community Survey 5- Year Estimates, Figure B01003: Population; generated by Justin Peterson; using American FactFinder. (27 February 2018).
[112] League of American Bicyclists (2017). Bicycle Friendly America Program.

Boulder Colorado is approximately 27 miles from downtown Denver and UC Davis is approximately 16 miles from downtown Sacramento.[113]

The City of Davis has a long history of being a model for bicycle transportation. The City of Davis was building bicycle facilities in the 1960s and 1970s while most other cities in the United States built for the automobile.[114] In addition, the other three cities have a strong history of bicycle culture. The bicycle culture of each city helps influence and contribute to the bicycle culture on the university campuses.

The longitudinal change in to work commuting is displayed in the figures below. Understanding how community's transportation patterns change over time can help identify successful sustainable transportation efforts. The 2010 Decennial Census did not include a commute to work question, however, the American Community Survey does include an annual means of transportation to work questions an estimate of community characteristics. The American Community Survey samples a smaller portion of the population than the Decennial Census, as such the data is subject to higher margins of error.[115]

Since 2000 Davis, Boulder, Corvallis and Eugene saw a reduction in Single Occupancy trips to work (Figure 27). Corvallis and Boulder declined from 2000 to 2012 and then remained steady from 2012 to 2016. Davis saw a relatively steady decline of Single Occupancy trips to work between each interval.

Since 2000 Davis, Boulder, and Corvallis saw increases in bicycle to work rates. Davis experienced the greatest increase with a 7% increase in bicycle to work rates.

None of the cities saw significant changes in public transit ridership or walking rates. Boulder and Corvallis saw noticeable declines in carpool rates.

Figure 24: Means of Transportation to Work 2000

	Drove	Carpool	Public Transit	Bike	Walk	Other
Davis, CA	61%	9%	7%	14%	5%	4%
Boulder, CO	60%	9%	8%	7%	9%	7%
Corvallis, OR	66%	9%	2%	7%	11%	4%
Eugene, OR	67%	11%	5%	6%	6%	5%

Source: United States Decennial Census 2000, Table P030
Note: Other includes motorcycle, worked at home, and other

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[113] Google Maps (2018). Google.
[114] City of Davis (2018). Why is the Bicycle on the City Logo?. *City of Davis*.
[115] United States Census Bureau (2018). American Community Survey.
"The American Community Survey (ACS) is a national survey that uses continuous measurement methods. In this survey, a series of monthly samples produce annual estimates for the same small areas (census tracts and block groups) formerly surveyed via the decennial census long-form sample."

Figure 25: Means of Transportation to Work 2012

	Drove	Carpool	Public Transit	Bike	Walk	Other
Davis, CA	57%	8%	7%	19%	3%	6%
Boulder, CO	53%	6%	9%	10%	9%	13%
Corvallis, OR	59%	8%	3%	11%	12%	7%
Eugene, OR	65%	9%	5%	9%	7%	6%

Source: American Community Survey 5-year estimates 2008-2012, Table B08301
Note: Other includes motorcycle, worked at home, taxi, and other

Figure 26: Means of Transportation to Work 2016

	Drove	Carpool	Public Transit	Bike	Walk	Other
Davis, CA	**52%**	8%	6%	**21%**	5%	8%
Boulder, CO	**51%**	**5%**	8%	**10%**	11%	14%
Corvallis, OR	**59%**	**7%**	3%	**13%**	10%	8%
Eugene, OR	65%	10%	4%	7%	7%	7%

Source: American Community Survey 5-year estimates 2012-16, Table B08301
Notes: Bold black represents a negative change of greater than 2% since 2000, bold blue represents a positive change of greater than 3% since 2000. Bold black or blue not used for other category since other components varied between the Decennial Census and American Community Survey. Other includes motorcycle, worked at home, taxi, and other.

Figure 27: Means of Transportation Change from 2000 to 2016

	Drove	Carpool	Public Transit	Bike	Walk	Other
Davis, CA	-8%	-1%	0%	7%	0%	3%
Boulder, CO	-9%	-4%	0%	3%	2%	6%
Corvallis, OR	-7%	-2%	0%	6%	-1%	5%
Eugene, OR	-2%	-2%	-1%	2%	1%	1%

Sources: United States Decennial Census 2000, Table P030, American Community Survey 5-year estimates 2008-2012, Table B08301, American Community Survey 5-year estimates 2012-16, Table B08301

In each of the four cities the local university is the largest employer in the city or region. UC Davis accounts for 71% of the total Davis employment.[116] The universities' large portion of total employment gives them a substantial influence over the transportation framework. The high volume of employment is one area creates the opportunity for improved transportation networks to and from universities.

Figure 28: Top Five Employers

Rank	Davis, California	Boulder, Colorado	Corvallis, Oregon	Lane County
1	UC Davis	University of Colorado	Oregon State University	University of Oregon
2	Davis School District	IBM Resiliency Services	Samaritan Health Services	Peace Health
3	City of Davis	Covidien Surgical Solutions	Hewlett-Packard Company	Lane County
4	Sutter Davis Hospital	Micro Motion	Corvallis Clinic	Eugene School District 4J
5	Unitrans	Lockheed Martin	Corvallis School District	Springfield Public Schools

Sources: Livability.com, Corvallis Chamber of Commerce, City of Davis Comprehensive Annual Financial Report 2016
Note: Lane County home to Eugene

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[116] Finance Department (2016). Comprehensive Annual Financial Report. *City of Davis.*

The integration of technology and transportation services has created the option of ride-share services, such as Uber and Lyft. The availability of ride-share services provides another transportation option. Currently, Eugene does not have Uber or Lyft due to city regulations, however Eugene recently relaxed standards for rideshare companies.[117]

The Boulder Transportation Master Plan identifies a goal that single occupancy vehicles (SOV) only account for 25% of resident trips by 2025.[118] Boulder saw a reduction of 9% in single occupancy vehicle work trips since 2000 (Figure 27). Since 2000 Boulder saw an increase or maintained level of all other modes except carpool rates (Figure 27). In addition to US Decennial Census data, Boulder Colorado completes a periodic modal shift study. The study looks beyond mode split to work and analyzes all trips. As of 2012, SOV trips accounted for 35.9% of all trips and biking accounted for 18.7% of all trips.[119] The SOV total recorded in 2012 positions the City of Boulder to reach the identified goal of 25% of resident trips.

A Eugene Transportation System Plan (TSP) goal looks to, "triple the percentage of trips made on foot, by bike & transit".[120] The work trips data in Eugene does not show signs of SOV reduction (Figure 27).

Davis has a performance objective to increase walking trips to 10%, public transportation to 10%, and trips by bicycle to 30% by 2035.[121]

Corvallis is in the process of updating their Transportation System Plan (TSP). The Benton County TSP identifies, providing safe interactive multi-modal facilities as a primary transportation goal.[122]

Each community identified sustainable transportation goals. The goals show a desire to reduce the number of single occupancy vehicles in each respective city. Reaching the goals could be challenging for each community, however the four communities analyzed have universities within their boundaries and can leverage the university benefits to meet city-wide transportation goals.

Interview Results

The interview component of the research project verified and expanded on the content analysis and secondary survey analysis. The interviews required Institutional Review Board (IRB) approval before the completion of the interviews. The interviews were deemed exempt by the IRB on February 8, 2018 and the project was assigned IRB Protocol Number: 02052018.009. An IRB amendment application was submitted on March 31, 2018 and approved on April 10, 2018. The amendment application revised the interview question guide. A copy of the approval letter is located in Appendix C.

A total of seven interviews were conducted over a two-month period. The interviews included university staff from each of the four universities analyzed. The interviews were both in-person and phone interviews depending on the university location. Each interview lasted between thirty minutes to an hour. The interview questions included questions around department structure, outreach, unique elements of

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[117] Hill, C. (2018). Eugene Council opens door for return of Uber. *Registerguard*.
[118] City of Boulder (2014). Transportation Master Plan. *City of Boulder*.
[119] National Research Center Inc (2013). Modal Shift in the Boulder Valley 1990 to 2012. *National Research Center*.
[120] City of Eugene (2017). Envision Eugene Comprehensive Plan. *City of Eugene*.
[121] City of Davis (2013). General Plan Transportation Element. *City of Davis*.
[122] Benton County (2001). Benton County Transportation System Plan. *Benton County Public Works.*

universities, current projects, collaboration with local government, and the final question asked about responding to student needs. The complete list of interview questions is available in Appendix C.

In total seven interviews were completed three associated with the University of Oregon, two associated with Oregon State University, one associated with University of California Davis, and one associated with the University of Colorado Boulder. The roles of those interviewees varied from parking and transportation managers to bicycle program coordinators. Those interviewed and their roles are listed in Figure 29.

Figure 29: Interview Summary

Name	University	Position Title	Current Project
Aaron Curtin	University of California Davis	Bicycle Program Coordinator	Bicycle Share
Clark Rider	University of Colorado Boulder	Sustainable Transportation Coordinator	EV Charging Expansion
Sarah Brostien	Oregon State University	Transportation Options Coordinator	ZAP
Rebecca Houghtaling	Oregon State University	Senior Planner	Roadway Improvements
Paula Ellison	University of Oregon	Office Manager	GIS Campus Maps
Josh Kashinsky	University of Oregon	Citation Appeal Coordinator	Website Update
Emily Eng	University of Oregon	Planning Associate	13th Ave. Design

Sources: Interview Results

In addition to the interview data in this analysis section the interview data was interwoven into the analysis sections above and this section will outline major themes discussed in the interviews. A few common themes were discovered through the interview process, (1) transportation department restructures are on universities radar, (2) housing near campus can be expensive, (3) transportation technologies are being discussed and (4) student outreach could be expanded in the future.

Oregon State University created a Transportation Options Coordinator position within their Transportation Services Department,[123] the University of Oregon is discussing adding a Transportation Options position,[124] and Colorado Boulder is restructuring their Transportation Services Department to be separate from parking services.[125] The department structure and transportation options positions were common topics discussed in the interviews. The underlying structure of a transportation and parking services department is a key component of transportation mode choice on campus. The addition of a Transportation Options Coordinator at Oregon State University has shown positive effects including increased outreach and a focus on transportation options.[126] Universities should consider creating a department structure that can best provide a range of transportation options for students.

The cost of housing was a common barrier to sustainable transportation choices to campus. Brostien and Houghtaling discussed the lack of affordable housing in Corvallis as a barrier to sustainable transportation trips. They discussed the challenges of transit services to nearby communities including the metropolitan planning organization structure, cost, and their not being enough demand.[127] At Colorado Boulder the cost of housing causes many students and faculty to live in surrounding communities.[128] At the University of California Davis the West Village housing complex is very close to campus but many students drive from West Village to campus. The West Village housing has a high cost and many foreign students live in the complex.[129] Housing has a clear relationship to transportation choices and the lack of affordable

[123] Brostien, S. (2018). Phone Interview. Oregon State University.
[124] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[125] Rider, C. (2018). Phone Interview. *University of Colorado Boulder.*
[126] Brostien, S. (2018). Phone Interview. Oregon State University.
[127] Brostien, S. (2018). Phone Interview. Oregon State University.
[128] Rider, C. (2018). Phone Interview. *University of Colorado Boulder.*
[129] Curtin, A. (2018) Phone Interview. *University of California Davis.*

housing near the universities contributes to drive alone trips to campus. The survey data shows that housing beyond three miles has significantly more drive alone trips to campus, therefore if students, faculty, and staff are forced to live in nearby communities they are more likely to drive alone to campus.

The continued innovation of transportation technologies could have an impact on transportation choices on university campuses. Technologies like rideshare, carshare, bike share, and autonomous vehicles could have a large impact on campus commuting choices. In each interview transportation technology was identified as a topic of discussion. Rideshare, carshare, and autonomous vehicles could reduce the need for parking on campus. The impacts of transportation technologies are still unknown but the transportation stakeholders on each campus identified technology as a future component of the campus transportation future.

Outreach is an important component of campus transportation planning. Many freshmen are moving away from home for the first time and have more independence. The transition process to universities can be challenging for some students and many students may be used to auto-oriented environments. The transition to a university campus that does not prioritize automobile travel can be challenging. Each of the university stakeholders identified some outreach efforts on campus. In general, the outreach efforts do not expand beyond tabling and fliers. The University of California Davis requires a video orientation specific to transportation.[130] The University of Oregon discussed interest in expanding outreach efforts beyond fliers and tabling once they have a transportation director.[131] The survey data discussed earlier indicated low awareness of many transportation programs. Increased outreach efforts could lead to a better understanding of transportation option programs offered on campus.

The university environment is ever changing and each transportation stakeholder identified a specific project that they are currently working on. The projects clearly relate to each specific job description. For example, Clark Rider's focus is on sustainable transportation and his project revolves around expanding EV charging stations. The range of projects that the transportation stakeholders are working on shows the importance of transportation on each campus. Universities may be able to look to specific universities for specific project examples.

The final question of each interview asked the interviewees whether or not they believed their university was responding to student, faculty and staff transportation needs. The responses to the question varied from the Curtin saying yes[132] to Brostien saying that more could be done on campus[133]. Curtin said that the university is responding to student transportation needs but also indicated that they are always trying to improve their efforts.

The interview process went smoothly for both the phone interviews and in-person interviews. The most challenging aspect of the interviews was identifying interviewees, reaching out to interviewees, and scheduling the interviews. Those interviewed have full time jobs and had to adjust their schedules to be a part of my project. The initial goal was to complete 8 to 12 interviews. The final interview number was slightly less than the initial estimate. Initially three transportation stakeholders from each university were emailed; however, the response rate of those emails was low for the University of California Davis and the University Colorado Boulder. Additional emails were sent to additional transportation stakeholders at the University of Colorado Boulder and the University of California Davis. The lessons learned from this

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[130] Curtin, A. (2018) Phone Interview. *University of California Davis.*
[131] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[132] Curtin, A. (2018) Phone Interview. *University of California Davis.*
[133] Brostien, S. (2018). Phone Interview. Oregon State University.

project include starting the outreach process for interviews earlier. The timeline for the interview process was very short and additional time could have increased the number of interviews.

Analysis Summary

The analysis sections above outlined the results of the content analysis, secondary survey analysis, and survey results. The analysis sections helped to answer the three research questions.

> To what extent have bicycle friendly universities' efforts contributed to a reduced reliance on single occupancy vehicles?

> Have specific policies, programs, or infrastructure improvements been shown to have the greatest impact on university modal share?

> What are opportunity areas universities have that would reduce reliance on single occupancy vehicles?

The single occupancy rates on each university campus are significantly less than the single occupancy rates of the local community as a whole. The university environment promotes sustainable transportation choices. Despite an environment that supports sustainable transportation choices students at each campus still commute to campus using single occupancy vehicles.

The creation of a transportation options position is a key policy improvement for universities to consider. As discussed above, the transportation options position has had positive impacts at Oregon State University. The cost of building parking garages is expensive and having a transportation options coordinator can reduce the demand for parking. The reduced demand can save the university money and help meet carbon emissions goals. Closely related to the transportation options position, expanding outreach efforts can have a positive impact on modal choice. The addition of the transportation options position allows more time to be dedicated to outreach efforts. The analysis above discussed the benefits of outreach efforts in detail and the recommendations discuss the benefits of the changes.

The analysis showed a clear correlation between distance from campus and sustainable mode rates. The further from campus students were more likely to drive single occupancy vehicles to campus. The interviews reveal cost of housing as a barrier to many students, faculty, and staff living closer to campus. The third recommendation addresses the need for additional housing close to campus and how a policy change can increase sustainable mode use.

A variety of campus programs, policies, and infrastructure improvements appear to have positive impacts on commuting choices. The analysis above discussed programs, policies, and infrastructure improvements that seemed to have positive impacts. The research shows that a variety of programs could have a positive impact on sustainable mode choice and a focus on multiple efforts may be the best practice approach. Additional research is needed around specific programs to determine the isolated impacts of specific programs. Perceptions and awareness of programs data discussed earlier indicate some programs are not widely known about. Related university stakeholders should analyze programs that may serve a similar purpose. The consolidation of programs may improve program efficiency and increase sustainable mode choices.

The analysis revealed that Freshman are more likely to use sustainable modes to campus. Freshman often live in dorms near the campus core and have little need for an automobile. However, many Freshman still have a vehicle to drive home or run some errands. The sixth recommendation addresses Freshman specific policies that can increase sustainable mode usage.

Each of the universities have long range plans that identify transportation policies and goals. However, current events that require immediate action may cause university stakeholders to forget long-term policies when addressing a short-term challenge. The analysis showed the importance of long-term policies and goals. The final recommendation in the next section addresses university response in the short-term and the relationship to the long-term.

The discussion and recommendations section identifies seven improvements that university stakeholders should consider. Some of the recommendations have already been implemented on certain campuses; however, the recommendations are meant to provide opportunity areas for universities to consider. The impact of each improvement on campus will vary based on implementation and the unique environment of the university. Each university should complete additional research to select the recommendation most suitable for their campus.

Discussion & Recommendations

The idea of this study was to identify if bicycle friendly university efforts have led to a reduced reliance on single occupancy vehicles. Based on the analysis in previous sections some infrastructure improvements, programs and policies have been shown to reduce single occupancy trips to campus. The four universities analyzed were similar enough to compare; however, every university is different, thus there is no one size fits all approach for every university. Although no one size fits all for campus commuting the portions of this study are transferable to different universities.

The analysis of the four universities built environment, programs and policies revealed some valuable findings around campus commuting. The discussion is intended to be a high-level analysis of the programs, policies, and infrastructure improvements that had the most success in decreasing single occupancy mode share. Directly linking a program to a percent decrease in single occupancy mode share is challenging; however, the analysis shows some built environment improvements, campus programs and policies have a greater impact on mode share. This section will identify seven recommendations, what's on the horizon and research gaps.

Transportation Department Re-Structure

An important component of transportation mode share on each campus are the over-arching policy plans. Creating a strong policy foundation can lead to effective transportation demand management projects and a reduced reliance on single occupancy vehicles. The analysis revealed that most of the university plans and policies were modernized or in the process of being modernized.

To address campus policies universities should re-evaluate their campus structure. Oregon State University recently added a full-time transportation options position. Originally the functions of this position were completed within the sustainability office with only a certain FTE allowance for a full-time employee.[134] The University of Oregon has also discussed having someone dedicated to sustainable transportation modes.[135] The addition of a full time sustainable modes position has shown promise at Oregon State University.[136] The addition of a transportation options or sustainable modes coordinator to the transportation services department would be a beneficial addition to a university structure. The position would allow additional focus on sustainable modes and reduce the need to provide additional

[134] Brostien, S. (2018) Phone Interview. Oregon State University.
[135] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[136] Brostien, S. (2018) Phone Interview. Oregon State University.

automobile parking. New parking structures are expensive and so is maintaining parking structures. The sustainable mode or transportation options position should reduce the need for parking and save universities money in the long-run. The transportation options position is discussed in additional detail in the analysis section.

As a component of the parking and transportation re-structure universities should consider the removal of the employee pre-tax parking payroll deductions. The ability for pre-tax payroll parking deductions provides an incentive for driving to work. The primary focus of this analysis was on student mode share but professional and non-professional staff mode share have more room for improvement than students. Removing any incentive to drive alone to campus should be a primary focus of universities.

Strategically Increase Sustainable Transportation Outreach Efforts

A potential result of the transportation department re-structure should be a sustainable modes transportation champion. The function of a champion can help serve the informal networks between university departments. A common theme in government and university structure are the silos each department becomes trapped in. A sustainable modes champion could help break some of these barriers in the transportation realm.

The addition of a sustainable transportation options champion could help lead to additional outreach efforts on university campuses. The interviews of campus transportation staff revealed that outreach efforts are conducted at each university in this study. However, the University of Oregon staff expressed interest in additional freshman orientation outreach beyond tabling.[137] Tabling events provide a great opportunity for students to access transportation related information; however, incoming students receive a lot of new information beyond transportation related resources. The entire process can be overwhelming and some of the information provided by the transportation department may be forgotten.

Additional, efforts could include short presentations or videos for incoming freshman. In this setting students would be required to attend a short presentation ensuring some initial knowledge about commuting on campus. After the first year on campus many students move off campus and face new transportation challenges. Continuing outreach efforts beyond the first year should be a primary focus of transportation stakeholders on campus. The University of California Davis has the GoClub program to continuously outreach to students; however, the survey showed a low visibility of that program. The creation of a highly visible transportation outreach program or rewards system could help to continue outreach beyond freshman year. The low visibility of outreach programs and the benefits of an transportation options coordinator show a need for additional transportation outreach efforts.

Work with the Local Government on Housing Location

The transportation survey data from each university showed a significant decline in walking and biking trips to campus at distances greater than three miles. In addition, the interviews discussed above indicate the cost of housing can be a barrier to students, faculty, and staff living closer to campus. Based on the data universities should work with local governments to build housing within three miles of campus. Each university has some capacity to build dorms on campus and some additional housing. However, many students live off campus and rely on non-university affiliated housing. A partnership with the local

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[137] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*

government to focus housing supply within three miles could reduce student reliance on single occupancy vehicle trips to campus.

Focus on the Sustainable Mode that best fits your Campus Characteristics but do not Forget about Other Sustainable Modes

Campus size and natural campus features are an important component of campus mode share. The ability to change campus size is minimal but universities can create more density on campus instead of expanding the campus footprint. Universities can focus on a specific sustainable mode but still provide other sustainable mode options beyond the primary choice. Campus features naturally promote certain transportation modes and universities should identify the natural sustainable mode preference of students on their campus. The University of California Davis has the largest campus and the highest bicycle rate. The analysis section discussed bicycle culture in Davis, California. The bicycle culture is a key component of the bicycle rate. In addition, to the bicycle culture the large campus size supports bicycling more than walking between classes. The high bicycle rate on the University California Davis is offset by the low walking rate compared to the other three universities.

The primary focus of university campus commute programs should be reducing single occupancy automobile mode share by increasing a variety of sustainable mode options. The reduction of single occupancy mode choice can save universities money by decreasing demand for parking structures and allowing more space for university development. This should be done by improving transportation options in a variety of ways and not focusing on one sustainable mode. Bicycling is often a primary focus of campus commute analysis; however other sustainable mode programs can be just as effective or more effective. For example, each of the universities analyzed have free bus passes offered to undergraduate students. Free bus passes were identified in the literature review as an effective transportation demand management tool.[138] Free bus passes are a form of encouragement program and can be an effective transportation demand management tool. In addition to encouragement programs, disincentive programs including parking cost can discourage driving. The University of Oregon has the lowest per capita automobile parking and the lowest single occupancy vehicle rate. This correlation and the literature review show the importance of single occupancy trip disincentive programs. The analysis of each university showed incentive and disincentive programs to reduce single occupancy trips to campus. A combination of incentive and disincentive programs has been identified as the best-practice approach to reducing single occupancy trips to university campuses.[139]

Consolidate Overlapping Programs

Based on the transportation data some university efforts served the same or similar purpose. The University of Oregon has a Saferides home program and a designated driver program (Appendix A). Each serves a similar purpose and could operate more efficiently if combined. The two University of Oregon programs are discussed in details in the analysis section.

Internally universities should evaluate existing programs and identify areas of overlap. Two programs that serve the same or similar purpose could be confusing to students. The consolidation of those programs could improve efficiency and allow the program to serve more students than the two individual programs

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[138] Shannon, T., Giles-Corti, B., Pikor, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active commuting in a university setting: assessing commuting habits and potential for modal change. *Transport Policy*, 13. 240-253.

[139] Rybarczyk, G., & Gallagher, L. (2014). Measuring the potential for bicycling and walking at a metropolitan commuter university. *Journal of Transport Geography*, 39, 1-10.

combined. Not all university's will have programs that overlap but any programs that overlap should consider consolidation.

Create a no Automobile on Campus Policy for Freshman

Freshman primarily live on-campus and should not need a vehicle on campus. Every university should phase out allowing freshman to have a vehicle on campus. In conjunction with this effort better transportation options to airports and nearby metropolitan regions should be available. This will reduce the need for automobile ownership on campus for trips home. The majority of the time freshman students do not need their automobile except for trips home and to the store. This means freshman automobiles often sit in university parking lots. Providing options for students to get the airport and take the bus home could reduce the need for freshman parking on campus.

Respond to Current Events with the Long-term on the Radar

The University of Oregon recently faced an increase of crime on the edges of campus. The University of Oregon Police Department launched a fixed route night time shuttle. The service was meant to provide safe travel home for students. A previous program that served as a on campus shuttle was a Lane Transit District program.[140] The safety concerns around campus created an immediate need for the university to respond. The campus shuttle program provides three route options for students to utilize in the evening hours. The university still does not have a similar service during the day. The campus shuttle program could be expanded in the long-term to meet this gap. In essence university actions should meet university goals and policies. Even though the campus shuttle was an emergency response to a safety concern the shuttle program should still consider meeting long-term goals.

On The Horizon

The future of transportation is less certain with the recent emergence of autonomous vehicle technology. A recent report projects that by 2030 on-demand autonomous vehicles (AVs) will account for 95% of U.S. passenger miles.[141] Another report anticipates that middle income adoption of AVs in the 2040s or 2050s.[142] The focus of this report was not autonomous vehicles but universities should be aware of national transportation trends and how they will impact university modal share. The increase of AVs may allow universities to reduce the amount of on campus parking and utilize that space for additional buildings, open space, bicycle infrastructure, or other identified campus needs. The adoption of AVs could also allow student to live further from campus and complete homework to and from school. The interview analysis above shows that the emergence of transportation technology is on campus transportation stakeholders minds.

Research Gaps and Future Considerations

This report identified some key findings around campus commuting; however, the report is not a catch-all document and universities should continue to conduct yearly transportation surveys. Any institution that does not complete an annual survey should in order to better understand campus transportation trends. Determining the success or failure of programs is difficult to analyze without transportation mode share data. The yearly transportation survey data should be used to identify specific areas of improvement.

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[140] Kashinsky, J. & Ellison, P. (2018). Personal Interview. *University of Oregon.*
[141] Arbib, J. & Seba, T. (2017). Rethinking Transportation 2020-2030. *RethinkX.*
[142] Litman, T. (2017). Autonomous Vehicle Implementation Predictions: Implications of Transport Planning. *Transport Policy Instititute.*

Based on this information universities can complete additional surveys or data collection around that topic. For example, Oregon State University competes a parking unitization study to better understand automobile parking on campus. Additional, studies to consider are a detailed parking revenue comparison. This study could reveal specific revenue considerations for universities. Revenue considerations are important to consider in conjunction with the parking and transportation department restructure. Parking and transportation relies primarily on parking related revenue. The separation of the departments removes the parking revenue component from transportation services.

Alternative methods considered in the initial scoping process included GIS analysis and survey development. Both GIS analysis and survey development would likely reveal additional information, however it is likely that the same information can be found using secondary survey analysis, content analysis, and interviews. Obtaining GIS information from each university would have been difficult and in some cases impossible. The GIS method offered the appeal of creating campus specific maps, however university staff and planners have already created campus maps. As for survey development, a single survey sent to each university would be ideal. However, obtaining permission to send out a survey to four universities would be difficult and each campus analyzed has already completed a survey. The surveys do not necessary align perfectly but the information can be aggregated to compare universities campus transportation data.

The methods used in for this analysis allowed big picture recommendations to be identified. Additional research should be completed around the success rate of programs at universities. A portion of the University of California Davis Campus Commute Survey asks about transportation program awareness. The research completed for this study looked at the presence and absence of programs and policies. A detailed research project comparing specific programs could improve the understanding around campus transportation programs.

Conclusion

The purpose of this study was to look at bicycle friendly universities and attempt to identify opportunity areas for infrastructure improvements, programs and policies. The habits university students learn on university campuses extend beyond the classroom and can be a catalyst for lifestyle choices in the future. The comparison of four universities was meant to meet the clear research gap comparing campus transportation mode share. The identified research gap looked at specific universities and specific programs. This study was meant to analyze information around campus commuting to make clear recommendations around campus commute best practices. The recommendations section above identified some best-practices for universities to follow. However, further research is required around campus commuting. Campus commute trends change on constant basis and emerging technology may disrupt current transportation mode choices.

Appendix A: Campus Program and Services Descriptions

Each University offers a variety of campus commute programs. The programs are described here.

University of California Davis

Bike Programs and Services

Bicycle Registration

Students at University California Davis are required to register their bicycles at a cost of twelve dollars for a new license and six dollars for a renewal. Bicycles can be registered at the Transportation and Parking Services Office.[143]

Bicycle Share

The bicycle share system is expected to launch on May 15, 2018 in the Davis area.[144]

Bike Barn

The centrally located bike barn offers repair services, retail sales, and bike rentals for UC Davis students[145].

Bus Programs and Services

Safe rides

The UC Davis Police Department offers safe rides, an on-demand ride service. The service operates after 5 pm until 6 am. A safe ride trip can be scheduled using the TapRide app. The service is designed to be an alternative to walking or biking home at night and runs mostly while the Unitrans bus is not operating[146].

Taps Mobility Assistance Shuttle

The mobility shuttle is free to students and offers rides to on campus locations. Students and staff must have a documented disability. The shuttle operates 7:30 am to 6:30 pm during weekdays. Rides a scheduled by calling the transportation services[147].

Unitrans

The Associated Students, University of California Davis and the City of Davis operate the Unitrans a Davis wide bus service. The Unitrans bus operates Monday to Friday from 7 am to 8:10, and operates a

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[143] University of California Davis (2018). Bicycle Licences. Retrieved from http://taps.ucdavis.edu/bicycle/licenses
[144] Rockeman, O. (2018). Bike-Share system to launch in Sacrament, Davis in 2018. *The California Aggie*.
[145] ASUCD (2018). Bike Barn. Retrieved from https://asucd.ucdavis.edu/portfolio-item/bike-barn/
[146] UC Davis Police Department (2018). Safe Rides. Retrieved from
    http://police.ucdavis.edu/divisions_services/campus_security/safe_rides.html
[147] UC Davis Transportation Services (2018). Taps Mobility Assistance Shuttle. Retrieved from http://taps.ucdavis.edu/parking/mas

night service 8:30 pm to 10:35 pm Monday to Thursday. The majority of Unitrans staff are part-time student workers[148]

Car Programs and Services

EV Charging

The electric vehicle charging stations are spread across campus. Charging at the station is free for up to four hours and any valid UC Davis parking permit can be displaced.[149]

Zipcar

Zipcar is located on the UC Davis main campus and cost $8 per hour[150]. The main campus has five zip cars located on campus[151].

Zimride

UC Davis students, faculty, and staff can sign up for a private ridesharing service. The service allows those with a car to carpool and link trips with other UC Davis affiliates[152]

Incentive and Encouragement Programs and Services

GoClub Rewards Program

The GoClub program is a rewards program offered by the UC Davis Transportation Services. The program offers rewards and discounts for using sustainable modes.[153]

Guaranteed ride home

The guaranteed ride home offers peace of mind for those who utilize sustainable modes of transit. The program offers taxi rides home for emergencies.[154]

[148] Unitrans (2018). UC Davis. Retrieved from https://unitrans.ucdavis.edu/about/

[149] University of Califronia Davis (2018). Electric Vehicle Charing Station Map. Retrieved from http://taps.ucdavis.edu/parking/information/ev_charging_station_map

[150] UC Davis Transportation Services (2018). Zipcar. Retrieved from http://taps.ucdavis.edu/transportation/zipcar

[151] Zipcar (2018). Find zipcar car sharing locations. Retrieved from http://www.zipcar.com/business/find-cars/davis

[152] UC Davis Transportation Services (2018). Zimride. Retrieved from http://taps.ucdavis.edu/transportation/zimride

[153] UC Davis Transportation Services (2018). GoClub. Retrieved from http://goclub.ucdavis.edu/

[154] UC Davis Health (2018). Guaranteed Ride Home. Retrieved from http://www.ucdmc.ucdavis.edu/parking/green/ridehome/

University of Colorado Boulder

Bike Programs and Services

Bicycle Program

The bicycle program at CU Boulder offers various programs including bicycle registration, bicycle stations, bicycle maintenance assistance, and bike rentals. The bike stations operate most of the year and are home to bicycle mechanics available to help with bicycle needs[155].

Bicycle Registration

Bicycle registration is required at CU Boulder for bikes regularly on campus[156]

Bicycle Share

The Boulder bicycle share system has 43 stations and 300 bikes around the city[157]. The bicycle share system has 10 bikes on or near University of Colorado Boulder and offers a free annual pass through the CU Environmental Center[158].

Bus Programs and Services

Access-a-ride program and Via

The Colorado, Boulder area offers two programs for people with disabilities. The Via not-for-profit program and the access-a-ride. Each program gives a transportation option for University of Colorado Boulder students, faculty, or staff. The programs help reach those who cannot access available fixed route systems. In addition, to these two programs the city bus system and buff bus system are ADA accessible[159].

Airport Bus

The SkyRide service has one stop next to the Colorado Boulder campus and goes to the airport. The Skyride service is free with both the EcoPass and College pass. This service offers a free option to and from the airport for Colorado Boulder affiliates[160].

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[155] Colorado Boulder Environmental Center (2018). CU Boulder Bicycle Program. Retrieved from
https://www.colorado.edu/ecenter/transportation/cu-boulder-bicycle-program
[156] Colorado Boulder Environmental Center (2018). Rules for Cycling. Retrieved from
https://www.colorado.edu/ecenter/transportation/bicycle/rules-cycling
[157] BoulderBcycle (2018). B-cycle LLC. Retrieved from https://boulder.bcycle.com/
[158] Colorado Boulder Parking & Transportation Services (2018). Bike Sharing. Retrieved from https://www.colorado.edu/pts/getting-around/bicycle/bike-sharing
[159] Colorado Boulder (2018) Transportation for CU affiliates with Disabilities. Retrieved from
https://www.colorado.edu/pts/transportation-cu-affiliates-disabilities
[160] Colorado Boulder (2018). Getting In and Out of Town. Retrieved from https://www.colorado.edu/pts/getting-around/bus/getting-and-out-town

Boulder Bus Options

The City of Boulder offers a variety of bus routes that connect campus to the rest of Boulder. The bus routes are free with the student pass[161]

Buff Bus (Shuttle)

The Buff Bus system circulates students around campus. The program is administered by Parking and Transportation services and sponsored by Housing and Dining services[162].

CU NightRide (Safe Ride)

The CU NightRide program is student-operated and offers a late night on-demand transportation option. The program has a app and operates each day of the week as late as 1:15 am. The program is funded by student fees distributed by the University of Colorado Student Government. The program has evolved since 1985 as a late-night walking companion service to an on-demand ride service.

Late Night Transit (Fixed Late night route)

The late-night transit service is available Thursday, Friday, and Saturday and is a fixed route option from 10 pm to 3 pm. The night transit system operates four lines and is cooperatively run by the Environmental Center, Parking and Transportation, and HOP[163].

Car Programs and Services

CHIP Parking Permit

The chip permit is an option for faculty and staff that use sustainable modes of transportation most of the time. The chip permit is less expensive than normal parking permits but only allows chip permit holders to park on campus twice a week[164].

Car Share

The University of Colorado Boulder campus is home to two car share companies. EGo and Zipcar have 10 vehicles on campus with more in the Boulder area[165].

Electric Vehicle Charging

University of Colorado Boulder offers 16 parking spaces with access to Level 2 Dual chargers. In addition, in early 2018, the Sustainability, Energy and Environment Community (SEEC) will be adding the ability to charge 10 vehicles. The cost to charge is free for permit holders and a charge is applied for those without

[161] Colorado Boulder Parking and Transportation Services (2018). Getting Around Boulder. Retrieved from https://www.colorado.edu/pts/getting-around/bus/getting-around-boulder
[162] Colorado Boulder Parking and Transportation Services (2018). Getting Around Campus. Retrieved from https://www.colorado.edu/pts/getting-around/bus/getting-around-campus
[163] Colorado Boulder Parking & Transportation Services (2018). At Night. Retrieved from https://www.colorado.edu/pts/getting-around/night
[164] Colorado Boulder Parking and Transportation Services (2018). Getting Around. Retrieved from https://www.colorado.edu/pts/getting-around
[165] Colorado Boulder Parking & Transportation Services (2018). Carshare. Retrieved from https://www.colorado.edu/pts/getting-around/sharing-ride/carshare

parking permits. The charge is 2 dollars and hour during business hours and 1 dollar an hour any other time[166].

<u>Parking</u>

The University of Colorado Boulder offers a variety of parking options including permits and a CHIP parking program detailed above[167].

Incentive and Encouragement Programs and Services

<u>Guaranteed Ride Home</u>

The guaranteed ride home program is limited to EcoPass holders that used an sustainable mode to arrive to campus. The guaranteed ride home program is not available to students. The program is only for emergencies[168].

Oregon State University

Bike Programs and Services

<u>Beaver Bike Rental</u>

Oregon State University offers a program to allow bike rentals for the entire term. The bike rentals cost $45[169].

<u>Bike Shop</u>

The bike shop at Oregon State University offers bike maintenance tools[170].

<u>Bike Rentals</u>

Transportation services offers a term bicycle rental for $45. Students are responsible for maintaining the bike rental and can use the bike shop discussed earlier[171].

<u>Bicycle registration</u>

Oregon State University does not require bicycle registration, but suggests registration using the 529 program[172].

<u>Bike Share</u>

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[166] Colorado Boulder Parking and Transportation Services (2018). Electric Vehicle Charging. Retrieved from
https://www.colorado.edu/pts/getting-around/car/electric-vehicle-charging
[167] Colorado Boulder Parking and Transportation Services (2018). By Car. Retrieved from https://www.colorado.edu/pts/getting-around/car
[168] Colorado Boulder Parking & Transportation Services (2018). Guaranteed Ride Home. Retrieved from
https://www.colorado.edu/pts/getting-around/guaranteed-ride-home
[169] Beaver Bike Rentals (2018). Transportation Services. Oregon State University. Retrieved from
http://transportation.oregonstate.edu/transportation-services/biking/beaver-bike-rentals
[170] Bike Shop (2018). Recreational Sports. Oregon State University. Retrieved from http://recsports.oregonstate.edu/ali/bike-shop
[171] Beaver Bike Rentals (2018) Transportation Services. Oregon State University. Retrieved from
http://transportation.oregonstate.edu/transportation-services/biking/beaver-bike-rentals
[172] Bike Theft Prevention (2018). Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation-services/biking/bike-theft-prevention

Corvallis, Oregon offers the Pedal Bike share system to anyone over the age of 18. The program charges a $5 membership fee then only charges for trips longer than 2 hours. The bike share is operated by Zagster, funded partially by InterCommunity Health Network Coordinated Care Organization, and coordinated by Cascades West Council of Governments[173]. Two of the stations are located on Oregon State University's campus and are sponsored by Transportation Services and the Sustainability Office[174].

Bus Programs and Services

Airport Shuttle

The Oregon State University website lists private airport shuttle options[175].

Beaver Bus (Campus Bus)

The Beaver Bust operates five free routes on campus and operates Mon-Fri 7am-7pm. The frequency varies between routes but can be as often as 5 minutes.

Bus Pass

Oregon State University students can ride the Corvallis Transit System for free[176].

Night Owl

The night owl bus in Corvallis operates three routes on Thursday, Friday, and Saturday from 8:45 PM - 2:45 AM. The bus service is provided by the Corvallis Transit System and Associated Students of Oregon State University. The service is open to the public and OSU students[177].

SafeRide

SafeRide operates while Oregon State University is closed. The hours of operation are 7:00 PM to 2:00 PM. The program operates seven days a week and rides can be requested using a smart phone app or calling dispatchers. The service does not drop off at commercial locations and operates within a specified boundary which can be found on the OSU website[178].

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[173] Pedal Corvallis (2018). Zagster. Retrieved from http://bike.zagster.com/pedalcorvallis/
[174] Pedal Corvallis (2018). Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation-services/biking/pedal-corvallis
[175] Transit (2018). Transportation Services. Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation-services/transit
[176] Transit (2018). Transportation Services. Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation-services/transit
[177] Night Owl (2018). Corvallis Transit System. City of Corvallis. Retrieved from https://www.corvallisoregon.gov/cts/page/night-owl
[178] SafeRide (2018). ASOSU Safe Ride. Oregon State University. Retrieved from http://asosu.oregonstate.edu/saferide/faqs

Car Programs and Services

Carshare

Oregon State University is a home to Zipcar and has three locations on campus. Zipcar is available to anyone over the age of 18 after membership requirements are met. Members pay an annual fee and then $7.5 per hour. Oregon State University student, staff, and faculty are offered a lower membership rate. The per hour fee includes gas, insurance, and up to 180 miles a day[179].

EV Charging

21 electric vehicle (EV) charging stations are located on Oregon State University's campus. There are two types of charging stations, blink and ChargePoint. Each requires a membership, but CharePoint stations are owned and operated by OSU and do not charge a fee. In total, 18 out of the 21 EV charging stations are blink stations[180].

Parking

Oregon State University offers a variety of parking options including annual, monthly, and daily. Parking rates vary by zone. Employees are able to pay for their parking permit from gross income before their taxable income is calculated. The university also offers ADA, carpool, and infrequent driver parking permits[181].

Incentive and Encouragement Programs and Services

Emergency Ride Home

The Emergency Ride Home program is provided for free by Cascades West. The program offers a free taxi ride or rental car for family emergencies. The program is for OSU workers and students who did not commute by automobile to campus[182].

University of Oregon

Bike Programs and Services

Bicycle share

In 2013, the City of Eugene and Lane Transit District completed a feasibility study. The study indicated that the City of Eugene would be a good candidate for bicycle share[183]. In addition, the Associated Students of the University of Oregon (ASUO) allocated $197,311 for bicycle share[184]. The implementation

[179] Zipcar (2018). Transportation Services. Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation-services/share-ride/zipcar

[180] EV Charging (2018). Sustainability at OSU. Oregon State University. Retrieved from http://fa.oregonstate.edu/sustainability/ev-charging

[181] Parking Permits (2018). Transportation Services. Oregon State University. Retrieved from http://transportation.oregonstate.edu/parking/parking-permits

[182] Transportation Options (2018). Emergency Ride Home. Oregon State University. Retrieved from http://transportation.oregonstate.edu/transportation/emergency-ride-home

[183] Eugene Bike Share (2018). City of Eugene. Retrieved from https://www.eugene-or.gov/2551/Bike-Share

[184] Robbins, B. (2018). UO will be home to new bike share project. *Daily Emerald*. Retrieved from: https://www.dailyemerald.com/2017/10/30/2487820/

of the bicycle share has included outreach efforts to identify the ideal locations for bicycle share stations. Bicycle share station locations are not permanent and can be moved if necessary.

Bicycle share is expected to launch in the City of Eugene and at the University of Oregon in Spring 2018. The program will be operated by Social Bicycles, a leader in "smart bike" technology. Social Bicycles operates 18 bicycle share systems in North America[185]. Riders will be able to purchase a membership plan based on their needs. The plan options will include one-time, monthly, and annual. The program will provide another transportation option in the region.

Bicycle Share programs are designed for short term point to point ridership, as riders generally ride only about 15-20 minutes and between 1-3 miles[186]. In theory, the bicycle share in Eugene will provide some relief to the "first/last mile problem" and bicycle theft. A limitation to the program is that the bicycle share will be contained within a "geo-fence". The initial bicycle share area will cover downtown, the Whiteaker, and the University of Oregon. In the future, the bicycle share program may be expanded to additional neighborhoods.

Bicycle registration

Bicycle theft can be a major challenge and frustrating experience for residents and students. In fact, bicycle theft has been the single largest category of reported crime at UO[187]. Tracking down a bicycle after it has been stolen can be difficult and sometimes impossible. For this reason, the University of Oregon selected Project 529 of Portland as the university's bicycle registration partner.

Students at the University of Oregon are required to register their bikes with the program. Bicycles not registered and parked on campus can be impounded. Although bicycles are not likely to be impounded unless abandoned over the summer or clearly damaged on a rack.

The registration process is designed to be simple. A 529 bicycle shield (sticker) can be picked up at locations around campus including the UO Department of Parking and Transportation and the UO Outdoor Program. The student then places the shield on their bicycle and begins the registration process online or on the phone application. The registration process includes taking photos their bicycle and entering the unique 529 shield number. The registration process takes only a short amount of time but could prevent your bicycle from being stolen.

Registered bicycles become part of social network of bicycle owners. Stolen bicycles alerts will be sent out to all nearby registered bicycle owners. The program does not completely eliminate bicycle theft but makes locating stolen bicycles more likely.

UO Bike Program

The University of Oregon Bike Program supports biking on campus and to campus and is conveniently located in the EMU. The UO bike program provides a variety of programs and services for students. Programs include a DIY maintenance shop, campus repair stations, bike rentals, classes, rides, and

[185] Eugene Bike Share (2018). City of Eugene. Retrieved from https://www.eugene-or.gov/2551/Bike-Share
[186] Eugene Bike Share (2018). City of Eugene. Retrieved from https://www.eugene-or.gov/2551/Bike-Share
[187] AroundtheO (2018). New bicycle registration system now available to UO students and staff. Retrieved from https://around.uoregon.edu/content/new-bicycle-registration-system-now-available-uo-students-and-staff

events. Each program supports the UO Bike Programs mission of supporting biking as a transportation, fun, and adventure option[188].

The DIY maintenance shop and campus repair stations give students a location to complete bicycle repairs on campus. The membership for students is free while faculty, staff, alumni, and the public have to pay a yearly membership fee.

The bike rentals offered by the UO Bike Program give students an option to rent and not own a bicycle on campus. Rental bikes are refurbished by students and are equipped with a basket, fenders, and lights. The bikes can be rented at the cost of $30 per term, $10 per day for commuter bikes, $15 per trip for road bikes, or $10 for group rentals[189]. The UO bike program does not sell new bicycles but can offer advice on the best bike for you.

The last components of the UO Bike Program are classes, rides, and events. Each component provides a learning opportunity for students. Classes range from buying a bike, bike touring, bike maintenance, fix a flat, and mountain biking. The classes give students an opportunity to learn bicycle basics and feel comforfigure riding on campus.

The UO Bike Program is a great resource for students and the public interested in biking on campus or in the City of Eugene.

<u>Secure Bicycle Parking Permits (Cages and Lockers)</u>

The University of Oregon offers bicycle Cages and Lockers to faculty, staff, and students that are interested in taking additional steps to prevent bicycle theft. Bike registration and using a U-lock in some cases is not enough. The first step to renting a bicycle cage or locker is for students, faculty, or staff to register their bike through Project 529. The next step is to contact the Department of Parking and Transportation to fill out an application, pay, and receive a key. Bicycle lockers and cages are limited to certain locations around campus including Columbia Garage, HEDCO, and Condon hall. A complete list can be found on the Parking and Transportation website. Bike lockers cost $75 a year plus a bike locker key deposit of $25 and bike cages cost $55 a year. Overall, bike cages and lockers offer students, faculty, and staff a secure place to park their bicycles[190].

Bus Programs and Services

<u>Access Shuttle</u>

The Access Shuttle is a no cost service available to students, faculty, staff, and visitors with conditions that limit mobility. The shuttle operates Monday- Friday from 7:00 a.m. to 5:30 p.m. The shuttle only provides service to university facilities and does not service off campus residences. Those interested in using the shuttle can request a ride on the UO Parking and Transportation website[191].

[188] Bike Program (2018). University of Oregon. Retrieved from https://outdoorprogram.uoregon.edu/bikes
[189] Bike Program (2018). University of Oregon. Retrieved from https://outdoorprogram.uoregon.edu/bike-rentals
[190] Bicycling (2018). Bicycle Registration. Department of Parking and Transportation. Retrieved from https://parking.uoregon.edu/content/bicycling
[191] Department of Parking and Transportation (2018). Access Shuttle. Retrieved from https://parking.uoregon.edu/content/access-shuttle

Bus passes and Park and ride locations

The University of Oregon is part of the Group Pass Program provided by LTD. UO students, faculty, and staff must show a valid ID card to ride any bus for free. The partnership between the University of Oregon and LTD provides students, faculty, and staff an affordable option to commute to campus. Parking can be expensive and weather conditions may limit the ability to walk or bike to campus. In addition, LTD provides multiple park and ride locations for free. A complete list of park and ride locations can be found on LTDs website. This allows students, faculty, and staff who do not live near a bus line to combine trips. Overall, the Group Pass Program is an important transportation option for students, faculty, and staff commuting to the University of Oregon[192].

Designated Driver Shuttle (DDS)

The Designated Driver Shuttle (DDS) is a FREE service offered by the ASUO for students. The program is designed to provide students a safe sustainable to driving under the influence. The program is free and operates seven days a week from 10PM to 2:30 AM. To schedule a ride students, call 541-346-RIDE. The service is designed to prevent intoxicated driving which is a major problem in college towns. The service is designed to be "no-questions' asked". The DDS service is a safe alternative to driving home intoxicated[193].

Safe Ride

Safe Ride provides an option for all students at the University of Oregon the ability to travel safely at night. The program is also available to faculty and staff, but not the public because the program is a student funded organization. The Safe Ride Service begins operating in the evening but rides can be scheduled at any time by calling. Safe Ride is limited to a boundary covering approximately 3 miles around campus. The exact boundary can be found on the Safe Ride website. Safe Ride is an alternative to walking alone, traveling on the bus, or biking alone at night[194].

UO Campus Shuttle

The University of Oregon recently launched a Campus Shuttle service in January 2018. The service has 13 stops, runs on a fixed route, and operates Thursday to Saturday 5pm to 12am. The shuttles arrive roughly every 15 to 20 minutes[195]. The service is in a trial period and hopes to alleviate demand for Safe Ride and The Designated Driver Shuttle which turned away 6,361 students in the 2016-17 school year. The campus shuttle program is funded by the UOPD and the Division for student life[196].

Car Programs and Services

Electric car charging

The University of Oregon has two electric car charging stations on the main campus. The stations are located outside the ERB and the Rec Center. The information about Electric Car Charging stations on

[192] UO & LCC Passes (2018). Lane Transit District. Retrieved from https://www.ltd.org/uo-lcc-passes/
[193] UO DDS (2018). Designated Driver Shuttle. Retrieved from https://asuodds.weebly.com/
[194] SafeRide (2018). Retrieved from http://pages.uoregon.edu/saferide/
[195] UO Campus Shuttle (2018). Retrieved from https://www.facebook.com/UOCampusShuttle/
[196] Benitez, F. (2018). The new UO campus shuttle makes getting home safe easier. Daily Emerald. Retrieved from
        https://www.dailyemerald.com/2018/01/29/new-uo-campus-shuttle-makes-getting-home-safe-easier/

campus can be found on the plugshare website[197]. The UO charging stations were built in conjunction with new buildings on campus. The UO lacks a comprehensive Electric Car Charging Plan.

Enterprise Car Share

Parking a personal car on campus can be expensive and impractical for students. The Enterprise car share program offers students the ability to complete errands around town without having a personal car on campus. In addition, the program is available to the public, faculty, and staff. The program costs only $35 a year and a per hour or day cost is added for each time a member uses a vehicle. The per day or hour costs includes fuel and members use the membership card found in the glove box to fuel the rental car. Enterprise Cars are located around campus and town for easy access. The member simply has to reserve a car and return it to an Enterprise Car Share parking zone[198]. The program is a great option for students, the public, faculty, and staff to complete errands around town without having to own a car.

Parking

The University of Oregon has a variety of parking options on Campus including ADA parking, carpool parking, permits, motorcycle permits, and daily pay to park locations. Faculty, staff, and students who have a DMV Disabled Persons pass and purchase a University of Oregon parking permit can park at any ADA space on campus. Visitors with DMV Disabled Persons passes can park at metered locations on campus for free within the time frame marked on the meter. Carpool parking permits are available and carpools are considered at least two faculty, staff, or students. A third carpool rider may work in the surrounding area. Carpool permits are cheaper than regular parking permits. Regular parking permits are available for faculty, staff, and students. To obtain a permit faculty, staff, and students must fill out the application on the UO Parking and Transportation website. The University also offers permits for motorcycles. Motorcycles are allowed to park in zones designated for motorcycle parking. Temporary visitor parking is available for $10 a day and $15 for overnight parking. Additional UO Parking information can be found at the UO Parking and Transportation website[199].

Incentive and Encouragement Programs and Services

Emergency Ride home (ERH)

The Emergency Ride Home program provides staff, faculty, and students workers piece of mind when choosing alternative modes of transportation. The ERH program provides a taxi voucher for employees if a family member suffers an illness, their home is damaged, have to stay at work because of unexpected overtime, or if an employee's carpool has an emergency. The LTD Point2Point website has a list of participating employers including the University of Oregon. This program reduces stress for employees that commute to work by sustainable modes. Employees just have to create a Drive Less Connect account and print their own voucher for the free taxi ride[200].

[197] PlugShare (2018). Retrieved from https://www.plugshare.com/location/13308
[198] Enterprise (2018). University of Oregon Enterprise. Retrieved from
        https://www.enterprisecarshare.com/us/en/programs/university/uoregon.html
[199] Department of Parking and Transportation (2018). Parking Policy and Rules. Retrieved from
        https://parking.uoregon.edu/content/parking-rules
[200] LTD (2018). Emergency Ride Home Program. Retrieved from https://www.ltd.org/emergency-ride-home/

Transportation day and Bike Appreciation week

Transportation Day and Bike Week engage and encourage students to bike, walk, bus, or use an sustainable mode of transportation to commute to campus. Transportation Day happens in October each year and consists of a series of booths related to transportation. The interactive environment is meant to engage students to register their bike, learn more about bicycle routes in Eugene, practice placing their bike on a bus rack, learn about transportation on campus, and engage with other students. In addition, students have the opportunity to win a screen-printed shirt by visiting six booths[201].

Bike Appreciation Week is a series of events promoting and appreciating bicycling. Every morning during bike week the UO Bike Program offers FREE bicycle gear and coffee. Other groups who support bicycling including LiveMove, Mountain Bike Team, UO Cycling, and often special guests are available at the UO Bike Program throughout the week. In addition, each year the UO Bike Program puts on other events during bike week including a photo shoot and movie night. Bike Appreciation Week allows students to come together and express their enjoyment of riding bicycles.

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[201] Events Calendar UO (2018). Transportation Day 2017. Retrieved from
https://calendar.uoregon.edu/event/transportation_day_2017#.WqLh1SjwY2w

Appendix B: Campus Plans and Reports

Each University had a variety of campus plans and reports related to transportation. This section lists all of the plans found in my research. This is not a comprehensive list of all of the university campus plans.

University of California Davis

Bay Area Economics and Nelson Nygaard Consulting (2006). Alternative Transportation and Parking Investment Study. *University of California Davis.*

Fehr & Peers (2009). Draft UC Davis Campus Bicycle and Transit Network Study. *University of California Davis.*

Heckathorn, D. & Handy, S. Results of the 2016-17 Campus Travel Survey. *Institute of Transportation Studies and Transportation and Parking Services, University of California Davis.*

Transportation and Parking Services (2011). UC Davis Bicycle Plan. *University of California Davis.*

Transportation Services (2017). UC Davis Transportation Services Organization Chart. *University of California Davis.*

University of Colorado Boulder

Alta Planning (2011). CU-Boulder Transportation Master Plan, CU-Boulder. *Alta Planning.*

Colorado Boulder (2011). Campus Master Plan. *Colorado Boulder.*

Employee and CU Student Survey for Transportation Comparison of Survey Results (2011).

National Research Center Inc. (2013). Modal Shift in the Boulder Valley. *National Research Center.*

National Research Center Inc. (2018). 2017 University of Colorado Student Transportation Survey Summary of Results. *NRC.*

University of Colorado Boulder (2017). CU-Boulder Parking and Transportation Servcies, Annual Report FY 2016-17.

Oregon State University

Capital Planning and Development (2018). OSU Bicycle Parking Utilization Study 2017. *Oregon State University Capital Planning and Development.*

Capital Planning and Development (2016). OSU Bicycle Parking Utilization Study 2015. *Oregon State University Capital Planning and Development.*

Capital Planning & Development and University Land Use Planning (2017). OSU Parking Utilization Study 2016-17 Fall Term. *Oregon State University.*

Kittleson and Associates, Inc. (2017). Oregon State University 2016 Campus Travel Survey. *Oregon State University.*

Kittleson and Associates, Inc. (2017). Campus Master Plan Monitoring Report 2016. *Oregon State University Capital Planning and Development.*

Nguyen, M., Shevtsova, I., and Smith, C. (2014). OSU Transportation Choices: What Drives Us?, *Oregon State University Policy Analysis Laboratory.*

Oregon State University (2003). Oregon State University Campus Master Plan 2004-2015. *Oregon State University.*

Oregon State University (2010). Draft OSU Bicycle Plan. *Oregon State University.*

Tran, T. (2014). Preliminary findings: Single occupancy vehicle and parking permits. *Oregon State University Policy Analysis Laboratory.*

University of Oregon

Campus Planning (1991). Bicycle Plan Reformatted in 2016. *University of Oregon.*

Campus Planning (2016). Commuter Survey 2016. *University of Oregon.*

University of Oregon (2014). Campus Plan Third Edition. *University of Oregon.*

University of Oregon (2002). Bicycle Management Program. *University of Oregon.*

University of Oregon (2005). University of Oregon Campus Transportation Analysis. *University of Oregon.*

University of Oregon (2014). Diagram of Campus Planning Documents. *University of Oregon.*

University of Oregon (1976). Long Range Campus Transportation Plan. *University of Oregon.*

University of Oregon (2016). Campus Physical Framework Vision. *University of Oregon.*

Appendix C: IRB Approval Letter

DATE: February 08, 2018   **IRB Protocol Number: 02052018.009**

TO: Justin Peterson, Principal Investigator
              Department of Planning, Public Policy, and Management

RE: Protocol entitled, "Campus Commute Comparisons: The Impacts of Campus
              Transportation Planning on Mode Choice"

<div align="center">

Notice of IRB Review and Exempt Determination
as per Title 45 CFR Part 46.101 (b)(2)

</div>

The above protocol has been reviewed by the University of Oregon Institutional Review Board and Research Compliance Services. This is a minimal risk research protocol that qualifies for an exemption from IRB review under 45 CFR 46.101(b)(2) for research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior.

Please note that you will not be required to submit continuing reviews for this protocol, however, you must submit any changes to the protocol to Research Compliance Services for assessment to verify that the protocol continues to qualify for exemption. **This exempt determination will expire February 07, 2023.** Should your research continue beyond expiration date, you will need to submit a new protocol application.

Your responsibility as a Principal Investigator also includes:
- Obtaining written documentation of the appropriate permissions from public school districts, institutions, agencies, or other organizations, etc., prior to conducting your research
- Notifying Research Compliance Services of any change in Principal Investigator
- Notifying Research Compliance Services of any changes to or supplemental funding
- Retaining copies of this determination, any signed consent forms, and related research materials for five years after conclusion of your study or the closure of your sponsored research, whichever comes last.

As with all Human Subject Research, exempt research is subject to periodic Post Approval Monitoring review.

If you have any questions regarding your protocol or the review process, please contact Research Compliance Services at ResearchCompliance@uoregon.edu or (541)346-2510.

Sincerely,

Eutterback

Lizzy Utterback
Research Compliance Administrator

CC: Yizhao Yang, Faculty Advisor

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS • RESEARCH COMPLIANCE SERVICES

677 E. 12ᵗʰ Ave., Suite 500, 5237 University of Oregon, Eugene OR 97401-5237

T 541-346-2510   **F** 541-346-5138   **http://rcs.uoregon.edu**

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UNIVERSITY OF OREGON

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH COMPLIANCE SERVICES

INVESTIGATOR AND
FACULTY ADVISOR AGREEMENTS

A. Conduct of the Research

1. I accept responsibility for the ethical conduct of this research and protection of participants as set forth in the Belmont Report, Declaration of Helsinki, the Nuremberg Code, the Common Rule, and the ethical principles of my discipline.

2. I accept responsibility for the conduct of this research ensuring this research is conducted according to
   a. sound research design and methods;
   b. the IRB approved protocol including the informed consent process;
   c. the applicable terms of the grant, contract and/or signed funding agreements; and
   d. applicable laws and regulations, including those for protecting the rights, safety, and welfare of human subjects.

3. I certify that I am or my faculty advisor is sufficiently qualified by education, training, and/or experience to assume responsibility for the proper conduct of this research. I accept responsibility for ensuring that members of this research team, including study staff and trainees, are appropriately qualified, trained and supervised.

4. I accept responsibility to personally conduct and/or directly supervise this research. I certify that I have sufficient time and resources to properly conduct and/or supervise this research for which I am responsible.

B. Ensuring and Maintaining Compliance

1. I will comply with relevant regulatory and institutional requirements, including those relating to conflicts of interest, responsible conduct of research and research misconduct.

2. I understand it is my responsibility to ensure that any research personnel, including myself, responsible for the design, conduct, and reporting of research declare any potential conflicts of interests related to the research and to maintain current records. I will ensure changes in conflicts of interest are promptly disclosed to the IRB.

3. I will ensure that informed consent is obtained as approved by the IRB and a copy is provided to participants, unless the IRB waives these requirements.

4. I will obtain initial IRB approval prior to implementing human subject research activities as well as prior approval for any amendments to this research.

5. I will conduct this research within the approval period issued by the IRB. I agree to submit a request for continuing review of this research at least 45 days in advance of the expiration date.

6. I will submit a closure report form prior to protocol expiration or within 45 days of completion of all activities involving human subjects or identifiable participant data.

7. I will maintain approval, as applicable, with collaborative entities including approvals from other countries or jurisdictions.

8. I will promptly report to the IRB (no later than seven days of discovery) any instances of noncompliance with the approved protocol or requirements of the IRB and any unanticipated problems.

9. I will assist in the facilitation of any monitoring and/or auditing of study activities and/or records as required by the IRB, funding entities, sponsors, and any federal and state regulatory agencies.

C. Investigator Records, Reports and Documentation

1. I will maintain research records, all protocol materials, and any other documents associated with this research (e.g., research plan, signed consent forms, and IRB correspondence).

2. I will maintain records for at least three years after this research ends, or for the length of time specified in applicable regulations or institutional or sponsor requirements, whichever is longer. I will take measures to prevent accidental or premature destruction of these documents.

3. I will ensure the safe and secure storage of this research data (whether in paper or electronic formats) and for protecting the confidentiality of the data in accordance with the approved protocol.

4. I will submit written reports to the IRB and permit inspection of the research records as required by the IRB.

UNIVERSITY OF OREGON

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH COMPLIANCE SERVICES

**INVESTIGATOR AND
FACULTY ADVISOR AGREEMENTS**

> By signing below, the Principal Investigator attests to having read and agrees to uphold the responsibilities and duties as outlined above. In addition, the materials provided in support of this application are an accurate reflection of the proposed research.

Click here to type name or insert electronic signature.

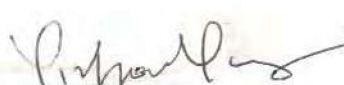2/4/18

Principal Investigator Signature

Date

- Electronic signatures acceptable. The name of the Principal Investigator may be typed in the signature line.
- If the person emailing this application is not the Principal Investigator, the Principal Investigator must be copied on this application submission.

REQUIRED FOR STUDENT RESEARCH

> By signing below, the **Faculty Advisor** attests he/she has read and approves the attached protocol submitted for IRB review. In addition, he/she agrees to provide appropriate education and supervision of the student investigator, and share the Principal Investigator responsibilities as stated above.

Click here to type name or insert electronic signature.

Click here to enter a date. 2/1/2018

Faculty Advisor Signature

Date

- Electronic signatures acceptable. The name of the Faculty Advisor may be typed in the signature line.
- If the person emailing this application is not the Faculty Advisor, **the Faculty Advisor must be copied on this application submission and all subsequent correspondence**.

DATE: April 10, 2018   **IRB Protocol Number: 02052018.009**

TO: Justin Peterson, Principal Investigator
          Public Policy and Management

RE: Protocol entitled, "Campus Commute Comparisons: The Impacts of Campus Transportation Planning on Mode Choice"

Notice of Amendment Review and Exempt Determination

The amendment submitted on April 04, 2018 to the above protocol has been reviewed and determined to continue to qualify for exemption as per the Common Rule regulations found at Title 45 CFR 46.101(b)(2). Any other change to this research will need to be assessed via a separate amendment to ensure the study continues to qualify for exemption. The research is approved to be conducted as described in the attached materials.

The purpose of this Amendment is to:
- Add option of in-person interviews along with phone or Skype interviews
- Update interview questions
- Remove University of Arizona from research protocol

Approval period: April 10, 2018 - February 07, 2023

If you anticipate the research will continue beyond the approval period, you must submit a Progress Report at least 45-days in advance of the study expiration. **Without continued approval, the protocol will expire on February 07, 2023 and human subject research activities must cease.** A closure report must be submitted once human subject research activities are complete. Failure to maintain current approval or properly close the protocol constitutes non-compliance.

You are responsible for the conduct of this research and adhering to the *Investigator Agreement* as reiterated below. You must maintain oversight of all research personnel to ensure compliance with the approved protocol.

The University of Oregon and Research Compliance Services appreciate your commitment to the ethical and responsible conduct of research with human subjects.

Sincerely,

Brandi Fleck
Research Compliance Administrator