

MEMORANDUM

TO: University Facilities Planning Board: Royce Smith - Chair, Walt Banziger - Vice Chair, Gregg Aytes, Kurt Blunck, City of Bozeman, Chris Catlett, ASMSU President, Ian Eastes, Michael Everts, Chris Fastnow, Greg Gilpin, Brett Gunnink, Keith Hamburg, Neil Jorgensen, ASMSU, Terry Leist, Robert Mokwa, Chris Kearns, Renee Reijo Pera, Faith Rifki, Tom Stump, Julie Tatarka, Jim Thull, David Kack, Leslie Schmidt, and Nicole Redding

FROM: Candace Mastel, Planner; Campus Planning, Design & Construction

RE: **December 05, 2017** meeting of the University Facilities Planning Board to be held in the **Facilities Meeting Quonset at 3:30 pm**

ITEM No. 1 – APPROVAL OF NOTES

Draft notes from October 17, 2017 to be distributed before next meeting.

ITEM No. 2 – EXECUTIVE COMMITTEE REPORT

Report on any current Executive Committee actions

ITEM No. 3 – CONSENT AGENDA **None**

ITEM No. 4 – INFORMATIONAL **125th Anniversary Graphics**
Presenter: CPDC (on behalf of Dylan Weber)

ITEM No. 5 – INFORMATIONAL **Bicycle Master Plan**
Presenter: Candace Mastel

ITEM No. 6 – INFORMATIONAL **Avalanche Park Beacon Training**
Presenter: Kylar Clifton

HORIZON ITEMS

- **Interior Public Spaces Signage**
- **Turf Fields Facility Concept**
- **Renne Library Spaces & Technology Renovation**
- **External Building Signage Policy**
- **Master Planning Issues**
- **Revisit and Update Policies**
- **Second Phase of Garage Art**
- **Transportation Master Plan**
- **New Residence Hall Site Proposal**

CM/es

PC:

President Cruzado	Heidi Gagnon, VP Admin & Finance	Julie Kipfer, Communications
Amber Vestal, President’s Office	Jennifer Joyce, VP Student Success	Jody Barney, College of Agriculture
Maggie Hammett, President’s Office	Leslie Schmidt, Asst.VP Research Office	Susan Fraser, College of Agriculture
Julie Heard, Provost Office	Tony Campeau, Registrar	Robin Happel, College of Agriculture
ASMSU President	Robert Putzke, MSU Police	Elizabeth Schmidt, College of Business
Lisa Hespen, VP Admin & Finance	Becky McMillan, Auxiliaries Services	Candace Mastel, Campus Planning

**MEETING MINUTES OF THE
UNIVERSITY FACILITIES PLANNING BOARD
October 17, 2017**

Members Present: Royce Smith – Chair, Walt Banziger, Kurt Blunck, Chris Catlett, Ian Eastes, David Kack, Fatih Rifki, Leslie Schmitt, Glen Steinhoff, and Keith Hamburg

Members Absent: Kregg Aytes, Mike Everts, Christina Fastnow, Chris Kearns, Terry Leist, Robert Mokwa, Renee Reijo Pera, David Singel, Duane Morris, and Jim Thull.

Staff & Guests: Randy Stephens, Candace Mastel, Matt Regan, and Madison Graff

ITEM No. 1 – APPROVAL OF NOTES

Approval of the draft notes from October 3, 2017 meeting.

ITEM No. 2 – EXECUTIVE COMMITTEE REPORT **None**

ITEM No. 3 – CONSENT AGENDA **None**

ITEM No. 4 – INFORMATIONAL – Capital Projects Process

Walt Banziger introduced the new Capital Planning database and process that will become a part of the facilities management program that includes FCI, Major Maintenance, Capital Planning, and Long-Range Campus Master Planning.

The purpose of the Capital Planning list is to integrate a comprehensive list with FCI and Major Maintenance for the foreseeable next 10 years. It will incorporate projects ranging from cyclical carpet replacement to HVAC replacements.

The goal is to meet with all committees and core university entities (Space Management, Provost Office, Auxiliaries, Athletics, PTAC, Classroom Committee, ADA, etc.) to identify and prioritize capital projects and bring the capital projects database more up to date on existing needs for each area/building.

Examples of categorization of projects:

- Major Maintenance – replace in kind, improve or modernize
 - Roofs
 - Heating system
- Capital Projects
 - Lighting upgrades
 - Energy upgrades
 - Wayfinding signage
- Special Institutional
 - Large renovation
 - New dining hall

The Capital Projects database will include a ballpark estimate, area name, building, work type (*Building, Energy, MEP etc.*), and prioritization of projects.

Banziger would like for the UFPB committee to contribute to the Capital Project process by:

- Evaluating existing conditions
- Determine if these conditions warrant requesting capital projects
- Prioritize projects and concise requests
- Communicate openly about expectations
- Open dialogue about real needs
- Advocate for funding

- Capital renewal, maintenance and improvements

The goal is to have a comprehensive tracking plan to identify the needs and priorities for each building within two years.

Royce Smith suggested breaking up some of the projects into phases. Banziger stated that breaking up the buildings into phases and priorities is part of the process for the Capital Projects process.

ITEM No. 5 – INFORMATIONAL – LRBP MSU Bozeman List

Banziger explained that the Long-Range Building Program (LRBP) is the state’s legislative process for funding to develop and define the state’s biennial Capital Construction Program (CCP). For MSU, the LRBP is a continuous, cyclical planning process. MSU Campus Planning, Design & Construction (CPDC) is coordinating the LRBP process for MSU, its four campuses, and Montana Agricultural Experiment Station (MAES). Projects that are eventually funded by the legislature are then executed by the state’s Architecture & Engineering Division in collaboration with MSU CPDC.

MSU Bozeman’s LRBP project priority list is currently in the process of development where CPDC shares the draft as an informational item governance groups on throughout campus. On October 31, 2017, CPDC will relay the comments from the governance group to the President and work with the President and Campus Executives to compile, consolidate and finalize the LRBP project priority list for all MSU campuses and MAES.

The state needs to still approve buildings that are funded by private sources because the state will fund the life cycle of the building.

LRBP is a continuous planning process that CPDC assesses through site visits and compiles a comprehensive list. CPDC presents the LRBP plan to President Cruzado by November of each year.

MSU is planning to combine projects that will be presented:

- Romney Hall is the number one project on the list. CPDC plans on consolidating projects to present.
- ADA projects to be combined into a comprehensive request.
- Fire suppression projects will be combined into a comprehensive request.
- Seismic evaluations will be combined into a comprehensive request.

BOR meetings are every other month and approvals last three years.

ITEM No. 6 – DISCUSSION – New Residence Hall

There was discussion about the new Residence Hall location. There is currently no site plan, but it should be available in a few months.

HORIZON ITEMS

- **Interior Public Spaces Signage**
- **Turf Fields Facility Concept**
- **Renne Library Spaces & Technology Renovation**
- **External Building Signage Policy**
- **Master Planning Issues**
- **Revisit and Update Policies**
- **Second Phase of Garage Art**
- **Bicycle Master Plan**
- **New Residence Hall Site Proposal**

CM/es

PC:

President Cruzado
Amber Vestal, President’s Office

Heidi Gagnon, VP Admin & Finance
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Julie Kipfer, Communications
Jody Barney, College of Agriculture

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ASMSU President

Lisa Hesper, VP Admin & Finance

Leslie Schmidt, Asst. VP Research
Office

Tony Campeau, Registrar

Robert Putzke, MSU Police

Becky McMillan, Auxiliaries Services

Susan Fraser, College of Agriculture

Robin Happel, College of Agriculture

Elizabeth Schmidt, College of Business

Candace Mastel, Campus Planning

DRAFT

ITEM # 4		125th Anniversary Exterior Branding Graphics				
PRESENTERS:						
Randy Stephens, University Architect, on behalf of University Communications						
PROJECT PHASE:	PLANNING	X	SCHEMATI C		DESIGN DOCUMENTS	CONSTRUCTION DOCUMENTS
VICINITY MAP:						
Various locations on campus, including, but not limited to: Sidewalks, Centennial Mall gateways, entrance doors.						
STAFF COMMENTS:						
<p>As part of the rollout of MSU’s 125th Anniversary on February 16th, 2018, University Communications is working with a vendor to install signs, banners and other branding graphics to announce the celebration in various locations on campus. The graphics will also appear in various photo and video projects throughout the anniversary year.</p> <ul style="list-style-type: none"> • For sidewalk graphics: 42" square/round vinyl graphics placed at main pedestrian entrances to campus. The artwork would be the 125th anniversary seal made of adhered vinyl specifically for exterior sidewalk applications. • For the gates at the east and west entrances to Centennial Mall: temporarily-mounted banners hanging on each side of the gate – see photo below. • For building entrance doors: Round vinyl graphics placed on primary entrance doors into buildings. The artwork would be the 125th anniversary seal with a frosted/transparent look. 						



The installation of the proposed graphics would occur during the winter break and would be removed after the fall semester in 2018.

This information is presented to make members of the planning board aware of the University's excitement and preparations for the Anniversary celebration.

COMPLIANCE:	YES	NO
MSU POLICIES	X	
COMMITTEE OR APPROPRIATE REVIEW	X	
MASTER PLAN	N/A	
BOARD ACTION REQUIRED:		
None – presented as information for UFPB members		

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ITEM # 5		MSU Bicycle Master Plan				
PRESENTERS:						
Candace Mastel, Assistant Planner						
PROJECT PHASE:	PLANNING	X	SCHEMATIC	DESIGN DOCUMENTS	CONSTRUCTION DOCUMENTS	
VICINITY MAP:						
N/A						
STAFF COMMENTS:						
<p>Awhile back the Bicycle Master Plan Planning Team presented, as an informational item, to UFPB the Goals and Objectives of the Bicycle Master Plan. Since then the team has been working towards a final draft, which is before you today for review and recommendation to the President.</p> <p>The master plan was developed with the assistance of a professional consultant who specializes in bicycle-friendly planning and design, a planning team, and with the input of the campus community and the Bozeman Area Bicycle Advisory Committee. In addition, it is aligned with both the recently adopted MSU Transportation Master Plan, the City of Bozeman Transportation Master Plan, TDM initiatives, and the City of Bozeman Capital Improvements Plan (C.I.P.) list of future projects.</p> <p>The master plan is different than most plans in that it contains both suggestions for physical improvement AND programmatic improvements. In respect of UFPB's time to review the more than a 100-page document, it would be prudent to focus on two core chapters (4 and 5) which deal with these two types of improvements in detail. The recommendations in these two chapters focus primarily on encouraging transportation choices, safe travel, connectivity, and support through staffing and educational/mode promotion initiatives.</p> <p>The Bicycle Task Force and the Planning Team have been working collaboratively with university staff and faculty to execute some of the recommendations prior to the plan being adopted, including education and outreach, expansion and refinement of bike parking, additions of a bike fix-it station, the installation of secure bicycle parking in the parking garage, cooperative planning with the city to include bicycle-centric projects in the TMP and C.I.P., and enforcement of bicycle parking regulations.</p>						

The master plan vision has been a guiding statement that has shaped the plan itself and interim initiatives that work towards the goals and objectives of the plan:

Montana State University will create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff, and visitors. The University will be a leader in setting policy, developing programs, encouraging respectful riding, and improving infrastructure to encourage bicycling to, from and within the MSU campus.

Please note that the final draft plan will be initially presented as an informational item on December 5th. Between December 5th and December 19th UFPB should take the time to familiarize themselves with the document so that on December 19th a formal recommendation to the President can occur. Some jurisdictional agencies call this a 1st and 2nd reading. If members of the board have questions or concerns and would like to speak to the Project Manager they should contact Candace Mastel at 994-7457 or candace.mastel@montana.edu.

COMPLIANCE:	YES	NO
MSU POLICIES	X	
COMMITTEE OR APPROPRIATE REVIEW	X	
MASTER PLAN	X	

BOARD ACTION REQUIRED:

The December 5th meeting does not require action. It is for information only. At the December 19th meeting the Bicycle Task Force respectfully requests the recommendation of approval of the plan to the President.



BICYCLE MASTER PLAN | 2017

TABLE OF CONTENTS

About the MSU Bicycle Master Plan	1
Vision, Goals and Performance Measures	5
Existing Conditions	13
Needs Analysis	35
Recommended Improvements	47
Recommended Programs and Implementation Strategies	85
Glossary	105
Acknowledgements	107

LIST OF TABLES

1: Engineering Goals, Objectives and Performance Measures	8
2: Education Goals, Objectives and Performance Measures	9
3: Encouragement Goals, Objectives and Performance Measures	10
4: Enforcement Goals, Objectives and Performance Measures	11
5: Evaluation and Planning Goals, Objectives and Performance Measures	12
6: Bozeman Volunteer Bicycle Count Summary	32
7: Near and Mid-Term Recommendations for East-West Corridors	70
8: Near and Mid-Term Recommendations for North-South Corridors	71
9: Near and Mid-Term Recommendations for Campus Path Widening and Spot Improvements	72
10: Performance Criteria for Bicycle Racks	73
11: Recommended Bicycle Racks for all Applications	74
12: MSU Bicycle Commuter Goal and Parking Supply	80
13: Recommended Bicycle Parking Requirements	80
14: Near and Mid-Term Recommendations for Bicycle Parking	81

LIST OF FIGURES

1: MSU Fall Semester Enrollment	15
2: Existing Bicycle Facilities City-wide	25
3: Existing Bicycle Facilities MSU Campus Core	26
4: Existing Bicycle Parking	27
5: Existing Bicycle Commute Mode Share	29
6: Bicycle Commute Mode Share Five-year Average	31
7: Student, Faculty and Staff Distribution	41
8: Parking Pass Residences vs. Distance From Campus Core	42
9: Commuter Parking Permit Residence Locations	43
10: Bicycling Barriers and Gaps	44
11: Key Corridors and Commuter Density	59
12: Recommended Corridor Facilities	60
13: Standard Bicycle Parking Layout	78

*“Nothing compares to the simple pleasure
of a bike ride.”*

John F. Kennedy



ABOUT THE MSU BICYCLE MASTER PLAN

In October 2013, Montana State University (MSU) received a generous monetary donation specifically designated to fund bicycle programs, facilities and education for MSU students. In response, MSU conducted the first formal meeting of bicycle-friendly faculty, staff, students and MSU commuters on campus, including members of Facilities Services, Western Transportation Institute, University Police and the Office of Sustainability. The goal was to address concerns for and about people biking on campus and determine some of the challenges that MSU would face if it committed to becoming a bicycle-friendly university. From that meeting emerged a smaller, dedicated group that would be responsible for overseeing and encouraging MSU bicycle projects, as well as directing the use of the donation. This group came to be called the MSU Bicycle Task Force (Task Force).

Soon after their formation in November 2013, the Task Force accomplished two major steps towards making campus more bicycle friendly. With their support and the direction of the MSU Bicycle and Pedestrian Coordinator Petra Davis, the school completed and submitted its first Bicycle Friendly University Application to the League of American Bicyclists. MSU received an honorable mention. The League of American Bicyclists sent a feedback report recommending steps MSU should take to become more bicycle friendly (see Appendix A). The Task Force then conducted a formal survey of over 400 MSU students, faculty and staff in order to learn more about their transportation habits and to gauge their interest in bicycling to, from and within campus. The results of that survey revealed that MSU already had a significant number of people using bikes as transportation, for commuting to and from

campus and riding between their classes. Twenty-three percent of survey respondents reported that bicycling was their primary mode of transportation to MSU. Responses indicate that people riding bikes are encountering challenges at MSU and in the Bozeman community. Analysis of the results has proven invaluable in guiding the development of the Bicycle Master Plan.

Shortly after the completion of the bicycle transportation survey, the Task Force reasoned that without a formal plan for addressing bicycle challenges at MSU and a means of measuring progress, bicycle programs on campus might fall to the wayside. They, therefore, decided that a portion of the money previously donated to MSU would be allocated to the creation of a campus-wide bicycle master plan, and with the guidance of Alta Planning + Design, the Task Force started work on the document in November of 2014. The Bicycle Master Plan is

the result of many hours of hard work, research and revisions on the part of the MSU Bicycle Task Force and Alta Planning + Design. The Master Plan is intended to guide the future development, design, education and implementation of all bicycle activity on the MSU Bozeman campus by providing attainable objectives and methods to measure performance in terms of completing those objectives.

The Bicycle Master Plan is firmly rooted in the reality that MSU has faced, and will continue to face, physical, social and monetary challenges in becoming a more bicycle friendly campus. However, the MSU Bicycle Task Force is confident that these challenges are not insurmountable and that with the help of this document and dedication of people on campus, MSU can become a leader among Bicycle Friendly Universities and foster an inclusive, safe and efficient bicycle ridership.



A utilitarian bicycle in action on campus

1

Vision:

Montana State University will create a campus environment where bicycling is a safe, convenient, and comfortable transportation option for students, faculty, staff and visitors. The university will be a leader in setting policy, developing programs, encouraging respectful riding, and improving infrastructure to encourage bicycling to, from and within the MSU campus.



VISION, GOALS & PERFORMANCE MEASURES

Vision

The MSU Bicycle Master Plan sets forth the vision that:

Montana State University will create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors. The University will be a leader in setting policy, developing programs, encouraging respectful riding and improving infrastructure to encourage bicycling to, from and within the MSU campus.

Goals, Objectives & Performance Measures

The goals, objectives and performance measures support the vision and guide implementation of future bicycle facilities and programs. The goals and objectives should aid in directing resource allocation, program operation and project prioritization.

The proposed goals are organized into five categories known as the Five E's—as identified by The League of American Bicyclists as essential elements to make a place great for bicycling:

Engineering, Education, Encouragement, Enforcement and Evaluation and Planning.

Engineering

Bicycle friendly communities and universities have a well-connected bicycling network consisting of quiet neighborhood streets, conventional and protected bike lanes, shared use paths, trails, bike parking and policies to ensure connectivity and maintenance of these facilities. See Table 1 for Engineering goals, objectives and performance measures.

Education

Building programs and opportunities for people to obtain the skills and confidence to ride is key to building a bicycle-friendly community or university. In addition, people can be educated about active transportation as a viable option for getting from Point A to B. See Table 2 for Education goals, objectives and performance measures.



Mobile Bike Kitchen assists bicyclists on campus

Encouragement

Encouraging people to bike by promoting bike month celebrations, producing community bike maps, creating route finding signage and other incentives help people adopt bicycling as a transportation mode. Public bike sharing, rentals or bike fleets may also encourage biking as a convenient and efficient mode of transportation on campuses. See Table 3 for Encouragement goals, objectives and performance measures.

Enforcement

Laws and regulations governing bicycling and rules of the road are essential to ensure safety for all road users. Bicyclists need to be treated equitably as users of the larger transportation system. Law enforcement, motorists and cyclists must

understand these laws. Theft prevention is also a part of Enforcement. See Table 4 for Enforcement goals, objectives and performance measures.

Evaluation and Planning

Planning for bicycling as a safe and viable transportation option requires regular evaluation. Evaluating the metrics associated with university bicycle programs and policies can help leaders ascertain how they are working and make adjustments, if necessary. The League of American Bicyclists strongly encourages communities and universities to employ the expertise of a Bicycle Program Coordinator and a Bicycle Advisory Committee to create, prioritize and implement bicycle programs and policies. See Table 5 for Evaluation and Planning goals, objectives and performance measures.



Informational signs help educate campus community

Table 1: Engineering Goals, Objectives and Performance Measures

ENGINEERING	
Goal: Provide a safe, efficient and well-connected network of bicycle facilities and accommodations on campus.	
Objectives	<ul style="list-style-type: none"> • Implement the recommended improvements for bicycle and pedestrian facilities on campus. These recommendations will be utilized for all University projects and programs within a year of Bicycle Master Plan adoption. • Develop and install consistent campus bikeway signage (to increase awareness of bicyclists on campus). • Provide convenient, covered and secure bicycle parking at focal points on campus, such as parking areas, residence halls, academic buildings and other campus use areas. • Evaluate location of existing bicycle racks on an annual basis, or as needed, and reposition to promote most efficient use, if necessary. • Address the top three major hazards and barriers to bicycling within two years of adoption of the plan. • Increase the number of bike racks to reduce over-capacity bike racks.
Performance Measures	<ul style="list-style-type: none"> • Development and implementation of the recommended improvements. • Number of University projects that use the recommendations in planning, design and construction. • Increase number of covered bicycle parking spaces. • Increase number of secure bicycle parking spaces. • Increase number of short- and long-term bicycle parking spaces. • Map location and evaluate position of bike racks to determine bike rack use and efficiency. • Measurable reduction of bicycles locked to something other than a rack. • Percent reduction in over-capacity bike racks.

Table 2: Education Goals, Objectives and Performance Measures

EDUCATION	
Goal: Implement comprehensive bicycle education programs targeted at students, faculty and staff.	
Objectives	<ul style="list-style-type: none"> • Incorporate bicycling and bike culture (safety, programs, rules of the road) into new student and employee orientation programs in order to reach incoming students, faculty and staff. • Develop education and outreach programs. • Educate MSU campus community regarding safe motor vehicle operation around bicycles. • Offer bicycle maintenance program. • Provide education on rack usage and locking. • Provide city- or campus-oriented bicycle map online and in hard copy form. • Coordinate with nearby agencies and groups on annual bicycle events such as “Bike to Work Week,” “Bike to School Day” and bicycle safety courses. • Develop integrated student engagement in the planning and design process for educational programs and bicycle related projects on campus.
Performance Measures	<ul style="list-style-type: none"> • Record number of bicycle maintenance classes offered and number of attendees. • Record number of bicycle safety classes offered and number of attendees. • Record number of bicycle education specific events on campus and number of attendees. • Decrease number of stolen bicycles.

Table 3: Encouragement Goals, Objectives and Performance Measures

ENCOURAGEMENT

Goal: Promote the use of bicycles as transportation for students, faculty, staff and visitors.

Objectives	<ul style="list-style-type: none"> • Develop programs that encourage off-campus students, faculty, staff and visitors to bike. • Develop programs that encourage on-campus residents (students, faculty and staff) to bike. • Implement a bicycle mentorship program. • Provide incentives and support facilities for individuals who commute by bicycle. • Promote bicycling at MSU sponsored events. • Increase the number of bikes available for rent on campus. • Promote recreational biking. • Enhance integration of bicycling with other modes of transportation for travel to and from campus. • Develop and promote online information sources for bicycle transportation and recreation.
Performance Measures	<ul style="list-style-type: none"> • Monitor increase in number of bicycle programs on campus, such as bicycle share programs, a bicycle repair center, safety classes and other bicycle activities and events. • Track the growth and traffic of online information outlets; of bicycle program website hits; and number of news items about bicycle transportation in various media. • Record number of encouragement programs and participants. • Record number of people using the bike mentorship program.

Table 4: Enforcement Goals, Objectives and Performance Measures

ENFORCEMENT	
Goal: Establish positive campus enforcement program for bicycling behavior and bicycle parking.	
Objectives	<ul style="list-style-type: none"> • Review, revise and enforce the “MSU Police Department Bicycle Regulations.” • Appoint a University Police point person to interact with campus cyclists and the Bicycle Task Force. • Increase enforcement of appropriate behavior among drivers, pedestrians and cyclists on campus. • Establish a protocol for reporting of motorist, bicyclist and pedestrian infractions. • Encourage and incentivize the proper use of bike parking. • Encourage registration of bicycles on campus. • Review and revise policy on abandoned bicycles. • Establish program(s) to positively reinforce good cycling practices.
Performance Measures	<ul style="list-style-type: none"> • Decrease in annual bicycle collisions (proposed source: UPD and City of Bozeman crash data). • Decrease in reports of bicyclists-pedestrian conflicts, real or perceived. • Decrease in abandoned bicycles parked in racks. • Increase in the number of bikes registered. • Decrease in number of improperly parked bikes, including those parked alongside railings of accessible ramps.

Table 5: Evaluation and Planning Goals, Objectives and Performance Measures

EVALUATION AND PLANNING	
Goal: Ensure implementation of the MSU Bicycle Master Plan and update on an annual basis.	
Objectives	<ul style="list-style-type: none"> • Appoint a permanent full-time staff member as Bicycle Program Manager. • Create a sustainable, dedicated source of funding within the annual budget, for bicycle infrastructure and programs. • Establish a formal Bicycle Transportation Committee that makes recommendations to the Parking and Transportation Advisory Committee (PTAC). • Include Bicycle Master Plan in all campus planning, design and construction activities. • Create a program to regularly conduct research on bicycle usage to more efficiently distribute resources. • Produce an annual report to track, review and evaluate implementation of the plan and recommend updates. • Develop prioritization process for implementation of projects and programs recommended in the master plan. • Apply annually to the League of American Bicyclists for evaluation to determine level of bicycle friendly University accomplishment.
Performance Measures	<ul style="list-style-type: none"> • Increase in annual bicycle mode share. • Hire/appoint a Bicycle Program Manager and assign an annual budget. • Complete an annual report tracking progress on objectives. • Attain recognition by the League of American Bicyclists as a bicycle friendly University. • Ask Bicycle Transportation Committee is regularly for input regarding campus planning, design and construction activities.

2

*“Every time I see an adult on a bicycle
I no longer despair for the human race.”*

H.G. Wells



EXISTING CONDITIONS

Introduction

This chapter describes current conditions related to bicycling as a mode of transportation to, from and within the Montana State University campus.

Setting

The setting of any university campus has a large impact on how people travel to, from and within the campus, and ultimately informs the recommendations that will prove effective in improving the bicycling environment. For this study, the setting is viewed through the following lenses:

- Study Area – Bozeman and the Gallatin Valley
- Campus enrollment and employment
- Topography and climate
- Campus and regional planning and development
- Housing
- Transit

Study Area - Bozeman and the Gallatin Valley

Surrounded by the picturesque Rocky Mountains in the Gallatin Valley, Montana State University is located approximately 1.5 miles southwest of Bozeman’s historic downtown. Since its inception as a Land-grant institution in 1893, MSU has evolved from its agriculture and mechanical arts (engineering) roots into a diverse institution that provides intellectual, economic, cultural and recreational opportunities. MSU offers extension services to ranches and farmers in the surrounding states, departments with world leading scientists and professionals, access to diverse and exceptional outdoor recreational opportunities and an international street food bazaar. The university has come to play an important role in Bozeman’s growth and success and is a major partner within the community.

The MSU campus is comprised of 950 acres that stretch from South 3rd Avenue on the east to Ferguson Avenue on the west and from College Street on the north to Kagy Boulevard

on the south. The campus is highly visible due to several of the area's most recognizable landmarks, including the cupola-capped Montana Hall and the domed Brick Breeden Field-house, which at the time of its construction was the largest clear-span wooden structure in the world.

The MSU campus' centralized location within the city of Bozeman makes it ideal for optimizing bicycling as a viable mode of transportation for the university community. The neighborhoods and parks around MSU offer a wide variety of cycling opportunities from single track style trails to smooth gravel paths. The quieter neighborhoods around campus provide a relatively low stress environment for people on bikes. In 2012, the city of Bozeman gained the "Bike-Friendly Community" endorsement of The League of American Bicyclists, earning a Silver designation, the second of five levels. In 2014, MSU Bozeman submitted a Bike Friendly University Application and the campus received an "honorable" mention along with a report, shown in Appendix A, recommending how MSU can improve.

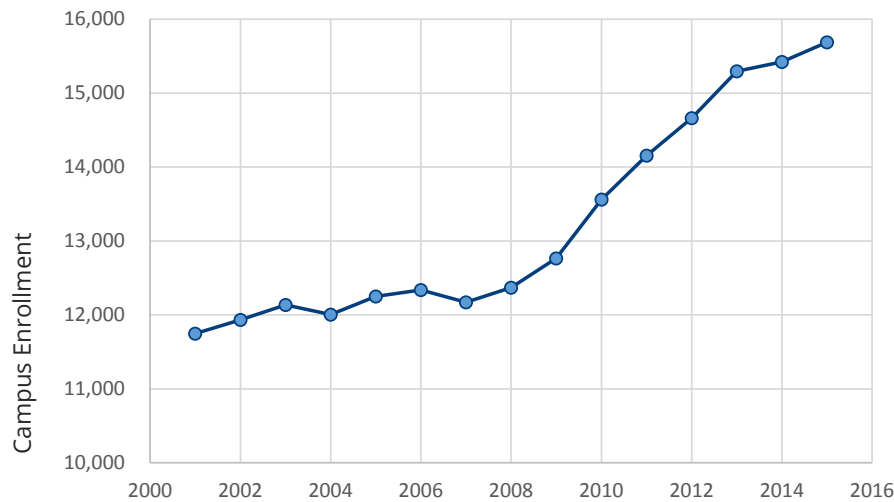


Figure 1: MSU Fall Semester Enrollment

Campus Enrollment and Employment

Student enrollment for the fall semester of 2015 totaled 15,688 undergraduate and graduate students, making MSU the largest university in Montana. MSU is also the largest employer in the Gallatin Valley, with a total of 3,092 employees, including 2,321 full time and 771 part-time faculty and staff. Figure 1 shows MSU fall semester enrollment from 2001 to 2015.

Topography and Climate

While nestled in the relatively flat Gallatin Valley, MSU is surrounded by the mountain ranges of the greater northwest Rockies. The weather varies with each of the four seasons and Bozeman averages 300 days of sunshine a year. Due to the dry climate, summers are pleasant with warm days and cool nights. During the summer season, daylight lasts well into the evening, extending opportunities for outdoor activities.

Mild winter weather is not unusual, and more than a week of consistently frigid weather is infrequent. At 5,000 feet above sea level, the valley may experience snow seven months of the year; however, the semi-arid climate and abundant sun-



Bicycle routes are challenging to navigate during winter

shine create beautiful outdoor environments and year-round recreational opportunities. Bozeman topography is rolling with a general downhill grade from campus toward much of town. The topography of the Bozeman area is generally level or gently sloping, but there are a number of short, steep hills, making for an engaging but undemanding riding experience.

Campus and Regional Planning and Development

Between 2000 and 2014, the population of Bozeman grew 45 percent, from 27,509 to 41,660. The total number of Gallatin County residents in this period was 97,304. This growth has presented many challenges for the area's transportation system, particularly as land use and new subdivisions have led to sprawling development patterns throughout the region. Commuters into Bozeman and onto the MSU campus have placed a burden on the region's roadways and neighborhoods, prompting concern for quality of life and livability. Alternative transportation modes, including bicycling, bus transit and carpooling will play a critical role in reducing the burden on adapting the transportation system to expected growth.

Housing

Housing has been an ongoing issue in Bozeman. As both the campus and the city have grown, students, faculty and staff have desired to live closer to the university, which enjoys proximity to Downtown Bozeman and recreational amenities. Increases in housing prices and increased pressure on the rental market have dispersed residences throughout Bozeman and the surrounding area, resulting in longer commutes to and from campus.

Overall, housing affordability is measured by the percentage of homeowners and renters paying greater than 30 percent of their incomes for housing. In the 2000s, the number of Bozeman residents at 'unaffordable levels' averaged 28 percent of homeowners and 49 percent of renters, and data from 2011



Full bike racks, both covered and uncovered are a common sight at the Stadium View Apartments, which opened in 2015

showed that the overall vacancy rate in Bozeman was at two percent. This signified that far too few housing units were available to meet the demand for living space. Moreover, rental prices were, and continue to be, well above the national averages and the affordable price point of \$600 a month for a three-bedroom unit.

MSU is currently only able to house approximately 3,500 of its 15,688 students. To address this, MSU has made investments in on-campus housing with recent projects, including the new Yellowstone Hall, which opened in fall 2016. It is designed to accommodate 400 students.

Private developers have also begun to address the lack of student housing with an increased assortment of smaller condos and apartments. These are frequently far from campus with the exception being the new Stadium View Apartments development, which contains 499 bedrooms. As these resources

come on-line, they will change the current residential dispersal and may impact the number of students, faculty and staff who will choose to commute to campus by bike.

Transit

MSU is served by the Streamline bus transit system with a significant transfer stop just outside the main entrance to the Strand Union Building (SUB). All Streamline transit routes stop at the SUB. There are other smaller stops on the periphery of campus such as at Harrison Street and South 11th Avenue; at South 8th Avenue and Harrison Street; and at Garfield Street and South 6th Avenue. Current route information can be found at: <http://www.streamlinebus.com>.

Background Document Review

Three campus master planning efforts have been key in shaping the transportation environment for MSU: the MSU Long Range Campus Development Plan, the MSU Landscape Master Plan and the MSU Climate Action Plan. This section also provides an overview of the more recent MSU Bicycle Friendly University Feedback Report.

MSU Long Range Campus Development Plan

The following paraphrased sections of the Long Range Campus Development Plan (LRCDP) impact bicycle circulation.

Purpose

The primary purpose of the Long Range Campus Development Plan, which was completed in 2009, is to establish an overarching vision for the physical development of the campus environment over the next 25 to 50 years. It is a comprehensive, creative, useful and—most importantly—inspiring plan.

The project involved a university-wide process, which included dialogue on the community's shared physical environment and centered on questions such as:

- What do we like from the past that we have lost?
- What do we have in the present that should be preserved?
- What do we want our shared environment to be like in the future?



This Streamline Transit Bus is stopped at the SUB

Physical development of the campus is guided by a set of principles derived from the planning process of the LRCDP. These principles will ensure that the physical growth of the campus is aligned with the priority interests of our academic, research and service missions, and continues to support the goals of the five-year vision, particularly in the areas of recruitment and retention of quality students, faculty and staff. Adherence to these principles protects against short-term decisions that could impair long-term opportunities and ensure that the university is making the most efficient use of present and future infrastructure in support of physical development.

Chapter 4 of the LRCDP, Elements and Principles of the Framework Plan, details and prioritizes bicycling as a critical element of an integrated, multi-modal transportation system. The framework plan promotes the use of bicycles through a comprehensive network of off-street paths, on-street marked bicycle lanes, shared paths with pedestrians and bicycle storage areas. It recommends that bicycle routes be coordinated with the City of Bozeman's bicycle network plan to ensure that campus and community transitions are well designed, efficient and accessible. In addition, the Framework Plan acknowledges that pedestrian paths and corridors may be shared with bicycles.

Goals Relevant to Transportation

The goals of the LRCDP are set forth under ten categories: general, land use, open space, landscape, circulation, parking, housing, research, signage and sustainability. The following categories include goals relevant to transportation, particularly non-motorized.

Land Use

- Work cooperatively with the City of Bozeman, Gallatin County and other respective jurisdictional agencies when their decision involves land adjacent to the university.

- The university should link the campus physically with the many assets and amenities found in the neighborhoods, parks and other properties adjacent to campus.

Architecture

- Plan student activity, living spaces and auxiliary uses to be adaptable to multiple uses and to be located in areas where they are accessible from residence halls, student housing and other campus areas via a network of well-planned pedestrian and vehicular corridors.

Circulation

- Limit vehicle intrusion into the campus core, while retaining and protecting the pedestrian-oriented circulation.
- Provide safe access choices for pedestrians, as well as motorized and non-motorized vehicle use.
- Actively employ parking demand management techniques to encourage alternative modes of transportation.
- Provide service corridors and service access to all buildings.

Parking

- Increase alternative modes of transportation using the university's full-time employees and pertinent ratios.
- Plan, site and construct parking facilities to accommodate future university needs, which include collaborative and enterprise zone uses.
- Continue to encourage bicycle use as part of traffic and parking demand management.
- Integrate public transit to serve a series of strategic university destinations serving all areas of the campus.
- Develop traffic calming measures to improve pedestrian safety.
- Connect the university's circulation networks (vehicle, bicycle lanes, pedestrian trails, etc.) to similar networks within the surrounding community.

- Coordinate with the City of Bozeman and Montana Department of Transportation on any infrastructure through university property to ensure that MSU's needs are met.

Implementation and Plan Phasing

Specific recommendations related to the bicycling environment are planned for the 25-year Projected Build-Out Profile:

- Develop pedestrian/bicycle bridge over South 19th Avenue.
- Open Harrison Street for transit connection from South 8th to South 11th Avenues (completed in 2014).

MSU Landscape Master Plan

The MSU Landscape Master Plan (LMP), completed in 2012, provides much of the available guidance and policy for bicycle facilities currently available to the university. The following sections summarize and paraphrase this guidance.

Purpose

The purpose of the LMP is to provide a framework for the planning, design, development and maintenance of the exterior spaces of the MSU-Bozeman campus that is also fully grounded in physical realities, maintenance and budgetary constraints.

The LMP was developed as a companion plan to the LRCDP, which MSU adopted in 2009. The open planning process of the LRCDP and collaborative culture continued with the planning and production of the LMP. The LMP serves as the framework for enhancing outdoor spaces of campus in alignment with the planning principles of the LRCDP. The Landscape Master Plan includes a planning framework for transportation on campus including motor vehicles, transit, bicycling and walking.

Existing Conditions for Bicycling and Walking

Pedestrian circulation is mixed with bicycle circulation in many campus locations, creating design and planning issues for the campus; the core of campus in particular poses issues.

Major crosswalk redesign and installation has been taking place around campus to improve the quality of pedestrian crosswalks on campus and to provide safe, visible routes of travel across campus streets. In addition, the university has been trying to address the formation of "cow paths." These informal pathways are created when pedestrians cut through or take shortcuts across lawns or landscaped areas. Several mitigation techniques have been used, including installing pavement, laying down organic and inorganic mulch or using recycled concrete pieces for stepping-stones. These measures have had mixed success.

Additional bike parking facilities have been installed annually, providing more bike parking in heavily used areas. Future placement of bike racks and bike pads will endeavor to draw on this plan and provide racks where they are most needed. Transportation Connectivity in the context of the Landscape Master Plan is addressed in Chapter 5: Planning and Design Guidelines.

Bicycles

Several years prior to the Landscape Master Plan process, MSU lifted a ban on cycling through the Malone Centennial Mall. Allowing biking through the core of campus has encouraged users to bike directly to building entrances. Bikers are encouraged to park at designated racks rather than lock bikes to signs, poles and walkway railings.

The Landscape Master Plan recommends that future improvements to bicycling include use of periodic surveys of use patterns to install bike racks and parking facilities where they are needed and where funds allow. Bike lanes should be installed with street renovations where applicable and where room permits.

The Landscape Master Plan recommends that the university investigate creating a bike program on campus that emphasizes

es the advantages of owning and riding a bike, bicycle maintenance and rider safety. From a sustainability perspective, it makes sense to encourage students to bike as a way to reduce emissions and the expense of driving and parking a car.

Motor Vehicular

The university is still focused on accommodating motor vehicle users but is moving parking and roads increasingly away from the campus core. The LRCDP plans to reorganize vehicular circulation in certain areas of campus in order to create a more functional and safe pedestrian environment. As these changes take place, vehicles will access the key areas of campus differently.

The LMP states that the key to creating efficient and safe vehicular circulation is to provide linkages between major campus hubs or districts and reinforce them with a solid wayfinding plan and parking where it will best serve the campus.

Pedestrian Connections

Pedestrian connections should therefore be placed to facilitate efficient circulation and also accommodate bike use and service or emergency vehicles when appropriate. Areas for pedestrian gatherings or stopping should be provided on lengthy linear paths in order to offer the opportunity for sitting, talking and enjoying the space.

Streets

Streets provide a solid framework for university development. They are critical to spatial connections and are a dynamic and interactive public space. The careful layout of internal and external circulation routes should be put into practice at MSU, keeping in mind the intent of the LRCDP. Campus streets should be kept in good working order and should have improvements installed in the form of crosswalks and pedestrian amenities or safety devices, such as bump outs, signage and snow storage and storm water controls.

With the closing of Garfield Street to create Malone Centennial Mall, the only remaining through-street affecting the campus core is Grant Street. Future street construction should follow the basic principles of the LRCDP and/or the future transportation plan.

Using visual cues and a solid wayfinding system will help in providing a cohesive street and circulation plan for vehicles. Main vehicular entries to campus should be accentuated through clear signage and should also be coordinated with parking facilities. Cyclists should have safe and convenient bike lanes and transitions so that navigating through traffic is not dangerous.

MSU Climate Action Plan

The Climate Action Plan (CAP), completed in 2012 by the Montana State University Campus Sustainability Advisory Council, strives to document its efforts to reduce campus greenhouse gas emissions and comply with the American College and University Presidents Climate Commitment. The document proposes campus wide operational, curriculum, research and civic engagement initiatives that integrate sustainability.

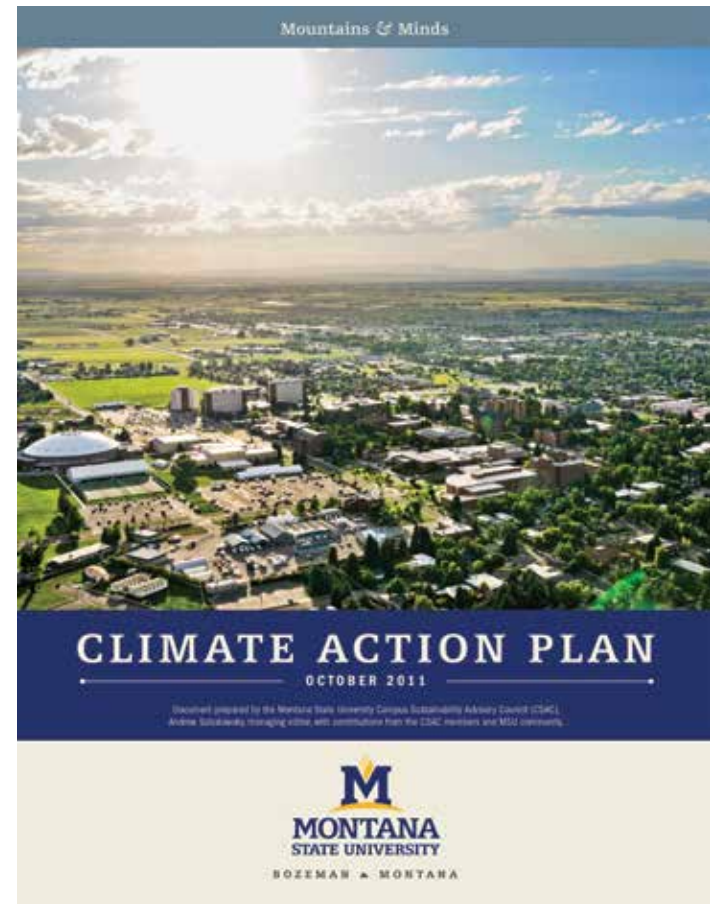
The CAP describes the results of a 2009 greenhouse gas emission baseline audit that found that transportation — including campus vehicle fleets, commuting and air travel — comprise 38 percent of MSU's net emissions. Recommendations made to reduce commuter emissions included:

- Additional online courses in sustainability
- Increased parking fees
- Subsidized public transportation passes
- Priority parking for carpools
- Restriction of student cars and parking to upperclassmen
- Installation of more bike racks and bike paths
- Education about impact of commuter choices on carbon emissions
- Subsidized on-campus housing
- Conversion of parking lots to green space

Recommendations applicable to the scope of this work included:

- Provide covered bike parking and bike lockers for commuters
- Collaborate with the City of Bozeman to improve bicycle infrastructure
- Implement an education program, including safety and cold-weather training
- Distribution of maps and lights
- Participation in bike to work events
- Increase bike to transit connections
- Integrate bicycling into campus parking and transportation plans
- Start a bike share program
- Increase safety by enforcement of speed limits

The recommendations emphasize integrating campus improvements with the City of Bozeman's infrastructure updates and taking advantage of city-wide education and encouragement programs. A detailed transportation report is included as Appendix 3 and was prepared by the Western Transportation Institute in MSU's College of Engineering.



MSU Climate Action Plan document

Bozeman Area Transportation Plan

The City of Bozeman completed an update of the Bozeman Transportation Master Plan (TMP) in April of 2017. The effort was concurrent with the production of this MSU Bicycle Master Plan and the MSU Comprehensive Parking and Transportation Master Plan. This provided an opportunity to coordinate all three efforts and their recommendations.

These plans serve as a road map for future transportation investments and many of the recommendations contained in the 2007 Bozeman plan that impact the MSU campus were implemented and include:

- The College to Huffine Trail (2010)
- Sidewalks along Cleveland Avenue (2010)
- College Street & South 11th Avenue Roundabout (2011)
- Kagy Boulevard & South 11th Avenue Signal (2012)
- South 8th Avenue reconstruction with bike lanes (2013)
- College Street reconstruction (2015)

With the recommendations of the Bozeman TMP aligning with the recommendations in this plan, there is real opportunity to work with the City of Bozeman to implement a safe and connected network of bicycle facilities linking MSU with the surrounding residential and commercial areas and the greater Bozeman community. The reconstruction of Kagy Boulevard, College Street and South 11th Avenue are all planned in the near future. The Bozeman TMP and this plan contain recommendations for these corridors and these reconstruction projects represent critical opportunities for implementation of these recommendations.

MSU Bicycle Friendly University Feedback Report

In 2014, MSU Bozeman submitted a Bike Friendly University Application and received an “honorable” mention along with this report recommending how MSU can improve. The key measures MSU should focus on to improve cycling on campus are:

- Start an official bike program encompassing all 5 E's.
- Develop an education program, including an ongoing safety and awareness campaign and regular bicycle safety and maintenance classes.
- Host a League Cycling Instructor (LCI) seminar to increase the number of local LCIs qualified to teach bicycle safety classes.
- Create a campus bike master plan that will guide future plans with a long-term physical and programmatic vision for your campus.
- Appoint a full-time, permanent staff member as official Bicycle Program Manager.
- Expand the bike network and increase network connectivity through the use of different types of bike lanes, cycle tracks and shared lane markings.

The full report may be found in Appendix A.

Bicycle Facility Inventory

A bicycle facility inventory was undertaken to determine the extent of bicycle facilities and accommodations on campus. This included striped bike lanes, signed bike routes, shared-use paths, natural surface trails and bicycle parking. In addition, there are numerous bicycle facilities on City of Bozeman streets that serve as common bicycling routes to campus, including facilities mentioned above and crosswalks on Kagy Boulevard enhanced by Rectangular Rapid Flashing Beacons (RRFB). Figures 2 and 3 show the bicycle facilities on the MSU campus and City of Bozeman streets. The maps include existing facilities and those facilities under design and/or construction.

On-Street Facilities

On-street bicycle facilities are composed of painted bike lanes or designated shared lanes (pavement marked with sharrow symbol). A bike lane provides a striped lane with bicycle pavement markings for one-way travel on a street. New bike lanes frequently occur in conjunction with pavement resurfacing or roadway reconstruction; on campus Grant Street and South 11th Avenue both have bike lanes.

Some streets, such as Koch Street and Grand Avenue, near the MSU campus, function as designated signed bike routes. A number of these streets have been upgraded with shared lane markings to further raise awareness of bicyclists using these routes.

Off-Street Facilities

In the campus context, off-street bicycle facilities are composed of shared-use paths, like the College to Huffine Trail or shared pathways within the campus that are primarily pedestrian focused, but where bicyclists are allowed.

Shared-use paths are facilities separate from roadways for use by bicyclists, pedestrians and other non-motorized user groups. They are frequently found in separate rights-of-way along railroads, utility corridors, parks and waterways but can also exist within the street or highway right-of-way with adequate separation. Shared-use paths are generally paved; however, unpaved examples function well for multiple user groups (e.g., Gallagator Trail).



This bike lane on Grant Street is unmarked other than the edge line

Many of the campus pathways are wide and provide ample room for bicyclists and pedestrians to coexist. However, some of the campus pathways are no greater than six feet in width and can cause conflicts between pedestrians and cyclists as there is not enough room for the different users to pass each other.

While not technically defined as “bicycle facilities,” bicyclists use paved walkways and plazas throughout campus. Concerns have been raised regarding the safety of pedestrians and user conflicts due to people bicycling in these pedestrian areas, particularly where paths are narrow. Conflicts are rarely reported to the University Police and it is difficult to document a substantiated conflict history.



This narrow campus path currently serves bicyclists and pedestrians between Montana Hall and Wilson Hall



The College to Huffine shared-use path was constructed in 2010 and links northwest and west neighborhoods directly with campus

Bicycle Parking

The locations and capacities of campus bike racks are depicted in Figure 4, based on a Fall 2015 inventory by Campus Planning, Design & Construction (CPDC) staff. In total, 1,932 residential and 2,378 commuter spaces were inventoried for a total of 4,310 bicycle parking spaces available for use. The inventory was predominantly confined to the campus core and residence halls, so the presence of racks farther away, such as at the Museum of the Rockies, were not tallied.

Commuter bicycle parking was analyzed at a deeper level comparing available spaces against the instructional building occupancy by campus quadrant. The campus was examined in quadrants with Centennial Mall representing the boundary

Figure 2: Existing Bicycle Facilities City-wide

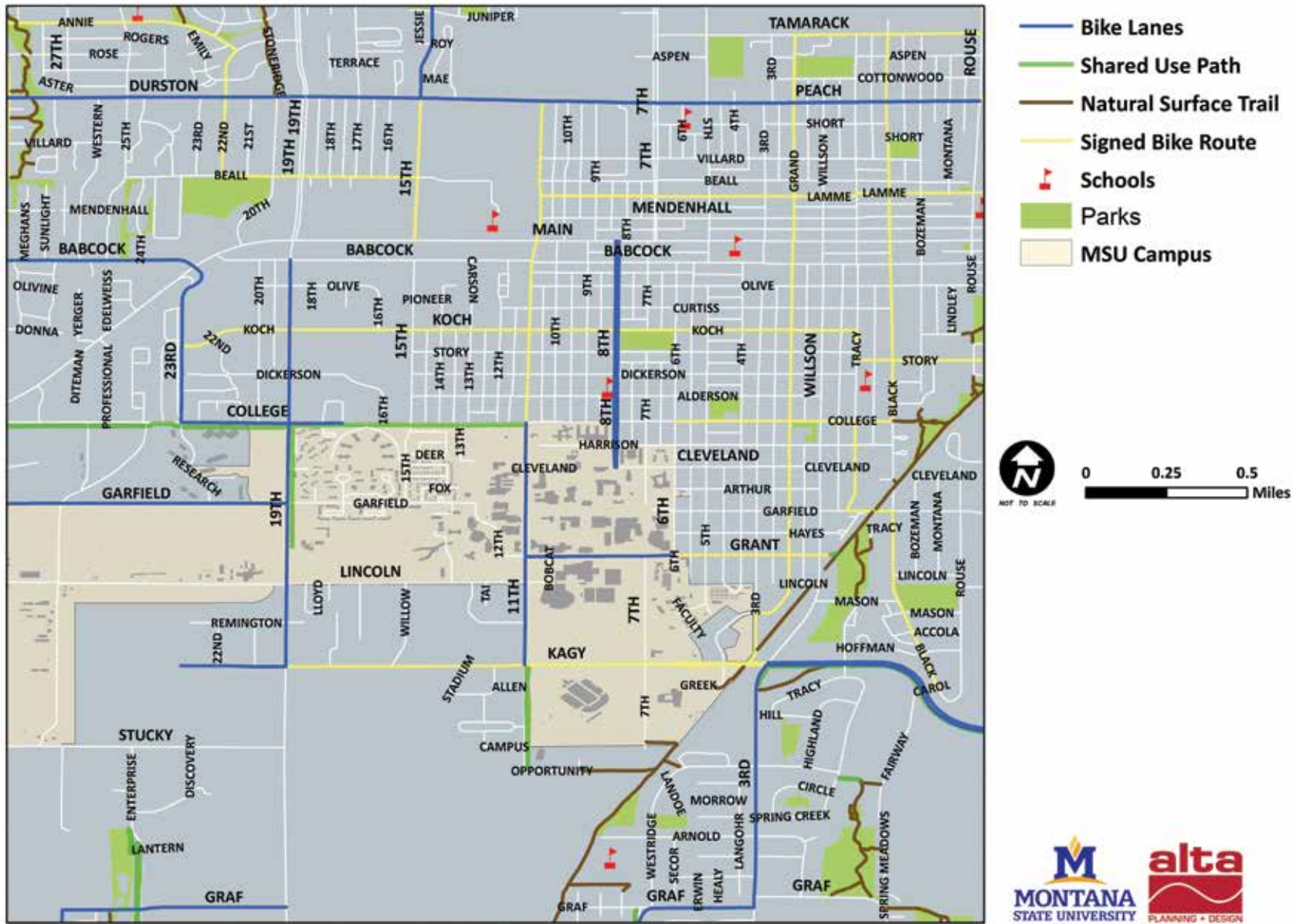


Figure 3: Existing Bicycle Facilities MSU Campus Core

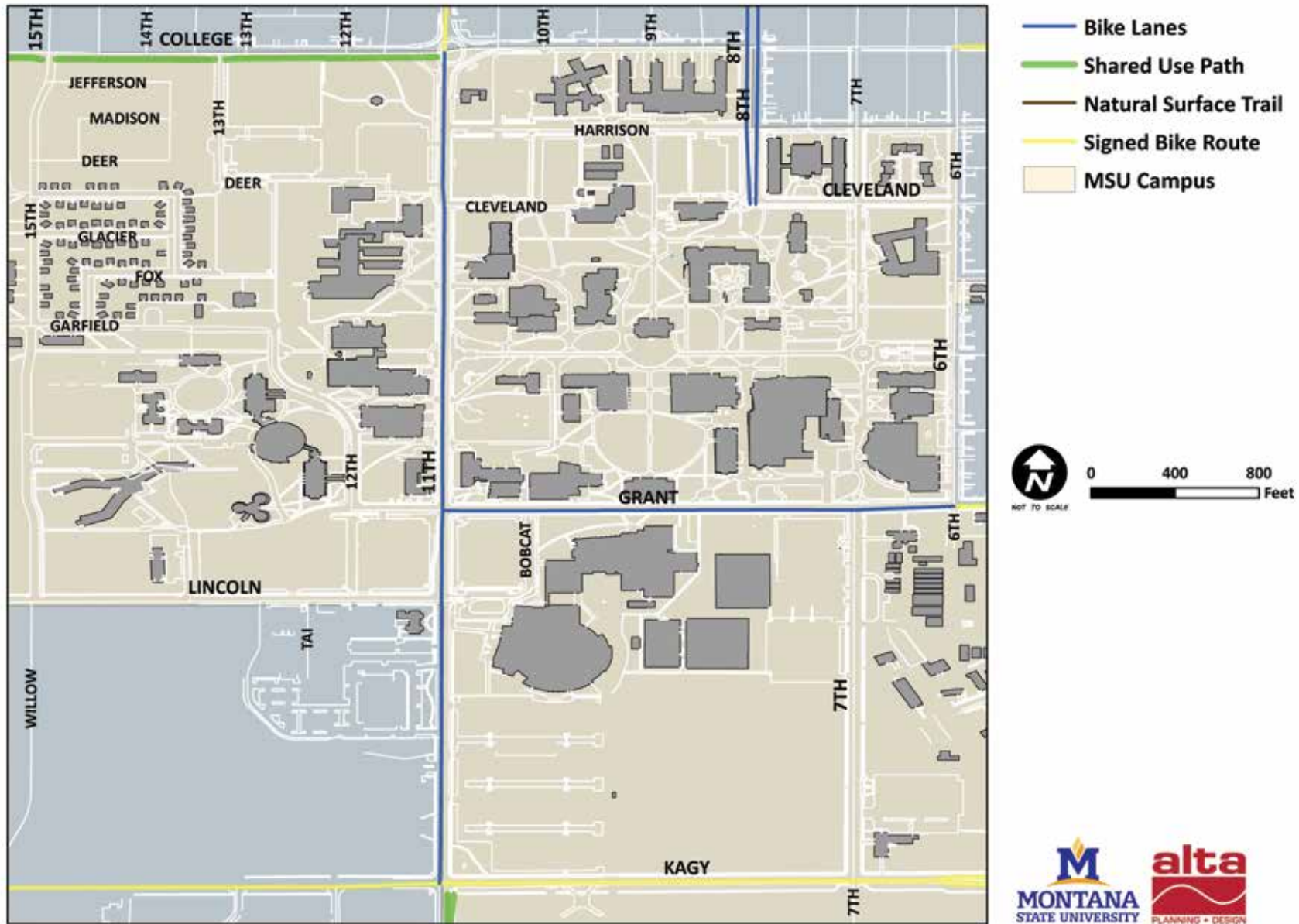
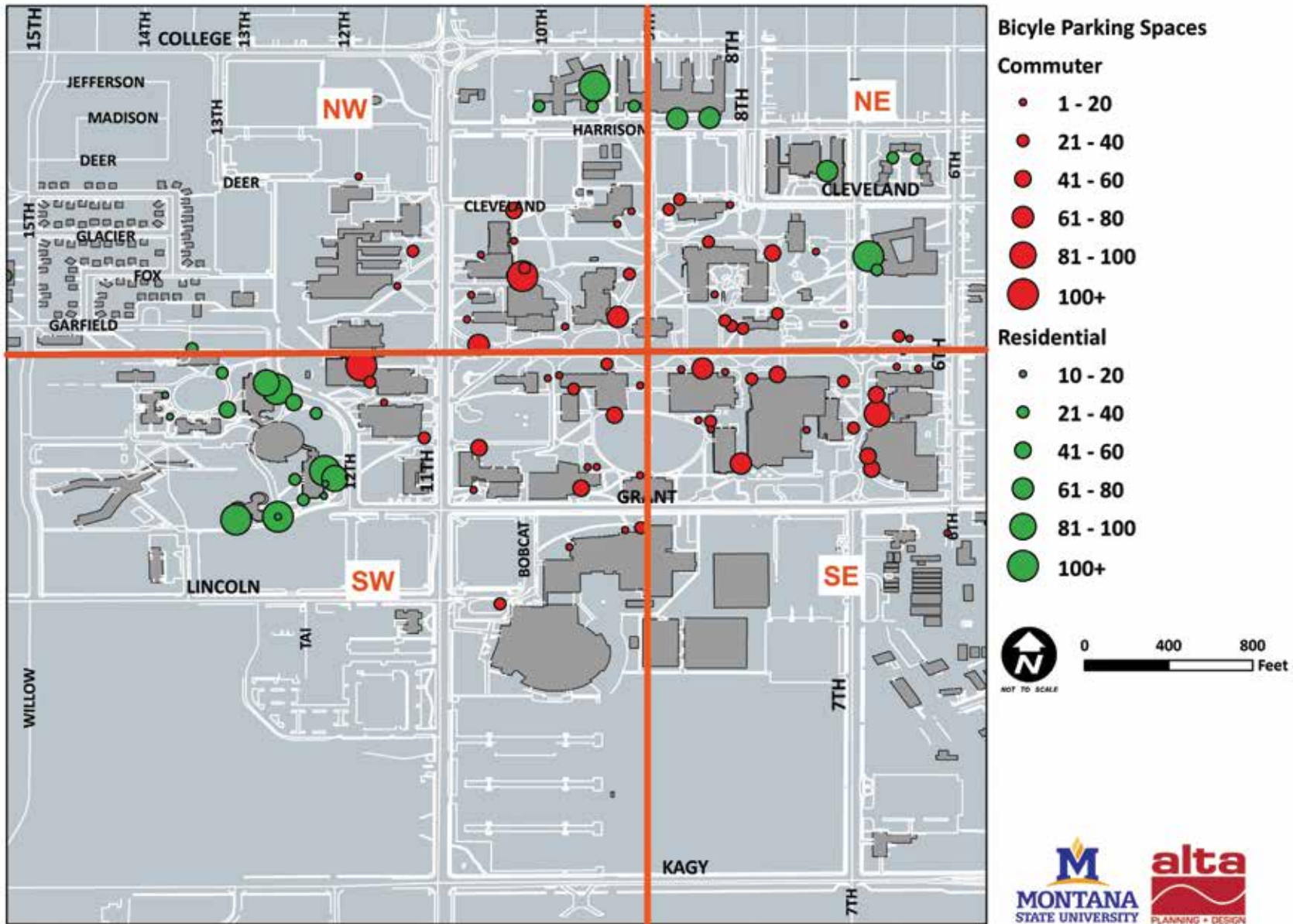


Figure 4: Existing Bicycle Parking



between north and south and South 9th Avenue representing east to west, as shown with red lines in Figure 4. Projections were provided for the number of additional spaces required to achieve a 20 percent ratio of bicycle parking versus building occupancy. This data is reflected in Figure 5, which shows that bike parking ranges from 10.3% of building occupancy in the SW quadrant to 17.3% in the NW quadrant of campus.

Bike Rack Types

MSU has historically managed demand for bicycle parking by providing numerous banks of racks located across campus. Some parking areas are of a significantly large size while others hold only ten bicycles. MSU has two main types of bicycle racks. The first type of rack used on campus is a “coat hanger” style rack, which allows locking of frame and one wheel with a U-lock. However, the top bar limits the types of bikes this rack can accommodate.



The CORA, or coat hanger, rack is free standing and supports a bike in two places if used correctly



Comb style racks in front of the Library

The second is called the “comb” rack, which supports either the front or rear bike wheel. The comb rack does not allow the frame and wheel to be locked to the rack with a standard U-lock and tends to bend the wheel if a bike tips over.

In a few isolated areas the inverted “U” style rack has been installed, such as at Jabs Hall and Gallatin Hall. These racks support bikes in two places and allow locking of a bike frame and one wheel with a U-lock. While U racks require more area than comb or coat hanger style racks, they accommodate many different styles of bikes and result in more organized bike parking with a less cluttered appearance. They are well liked by students.

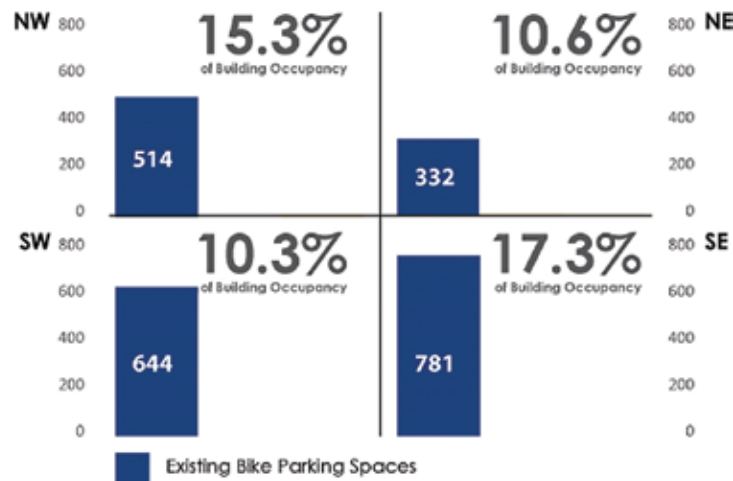
Bicycle Parking Utilization

The number of bikes in racks across campus were counted on several different occasions to better understand utilization (See Figure 5). The first count was conducted in fall semester of 2011. The second count was conducted in fall semester of 2015. A third survey of commuter and Residence Life bicycle parking was completed in fall of 2016. Utilization rates, shown below, indicate a point in time and may not be indicative of use over time. Bike rack use changes quickly depending on time of day, commuter/residential location, daily weather variation and seasonal student schedules.

The following observations were made from the bike rack utilization counts during fall semester of 2015:

- In November 2013, when the weather was cooler, rack utilization was approximately 65 percent of capacity at the racks observed.
- During the November 2013 bike rack counts, over 100 bicycles or approximately four percent, were observed locked to site furnishings other than bike racks. This number could be higher, as the inventory did not cover all areas of campus.
- Residential rack counts were conducted in the daytime and would likely have seen significant increases in the evening as students returned from outings.

Figure 5: Existing Bicycle Commute Mode Share



Bike Racks that are near or at capacity discourages bicycling and encourages illegal parking

Bicycle Counts and Mode Share

Manual Counts

From 2011 to 2016 volunteers organized by the Bozeman Area Bicycle Advisory Board conducted formal bicycle counts at several locations on the MSU campus and throughout the community. This effort adhered to protocols set forth in the National Bicycle and Pedestrian Documentation Project. The data in Figure 6 and Table 6 shows bicycle use is highest at locations near MSU, including the roundabout at College Street and South 11th Avenue, MSU's Centennial Mall and Grant Street and South 7th Avenue. Lower numbers in 2014, 2015 and 2016 are attributed to unseasonably cold and wet weather.

American Community Survey

The American Community Survey provides estimates of bicycle commute mode share. Due to the smaller sample sizes in Bozeman, five-year averages are used. This does not provide a reliable measure of year-to-year changes, but does provide an excellent picture of the city as a whole in regards to bicycle commuting. Many of the commuters shown in Figure 6 are accessing MSU; however, the numbers represent all resident's journeys to work (or campus in the case of MSU). Notable takeaways include the extremely small percentage in Valley West (below the national average of 0.6 percent) and much higher rates within Bozeman's older neighborhoods (ranging from 5.6 percent to 14.7 percent). Several of the years of data used in these averages were before critical connections such as the College to Huffine Trail, or the College Street and South 11th Avenue roundabout were completed.

Collision and Safety Analysis

One key metric in evaluating existing bicycling conditions on campus is to analyze data collected by law enforcement on crashes, either between bicyclists and cars, bicyclists and

Commuter Population Takeaways:

There is consistent commuter distribution across Bozeman's older neighborhoods where:

- Bicycle mode share is **high**
- Bicycle network connectivity is low
- Commute distance is low (up to 1.5 miles)
- Roadway complexity is low, mostly two-lane roads

There is a significant commuter population in the Valley West neighborhood where:

- Bike mode share is low
- Bicycle network connectivity is moderate to high
- Commute distance is moderate at 1 to 4 miles
- Roadway complexity is moderate with two, three, four and five lane roads

Figure 6: Bicycle Commute Mode Share Five-year Average

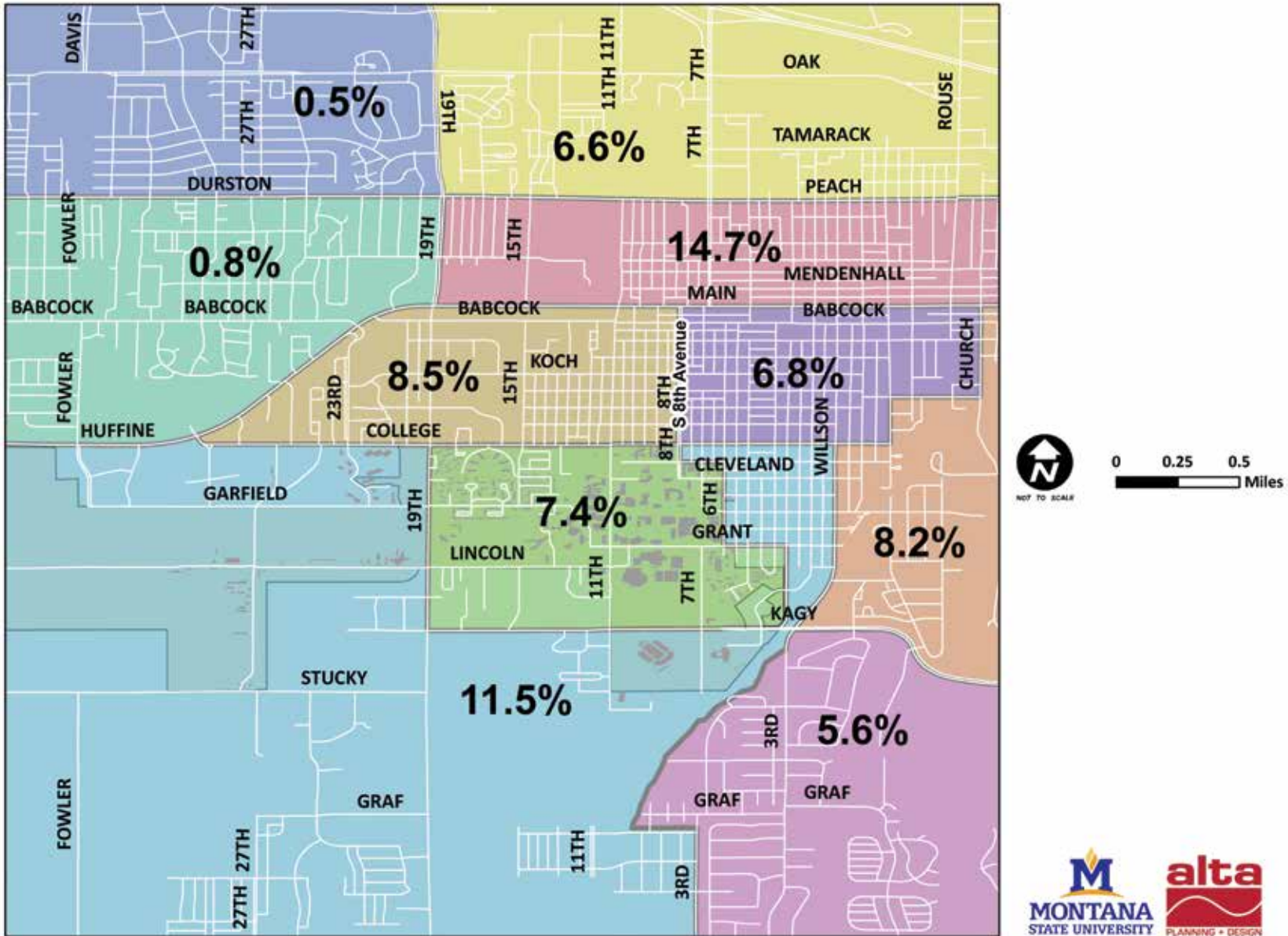


Table 6: Bozeman Volunteer Bicycle Count Summary

LOCATION	2011	2012	2013	2014
	SEPT 13-15 5-7 PM	SEPT 11-13 5-7 PM	SEPT 15-17 5-7 PM	SEPT 9-11 5-7 PM
College Street & South 11th Avenue	646	727	1012	462 *
Kagy Boulevard & South 3rd Avenue	264	268	283	93 *
Kagy Boulevard & South 7th Avenue	361	307	372	175
Lamme Street & North Grand Avenue	139	178	139	106
Peach Street & North Rouse Avenue	172	219	176	47*
Garfield Street & West Main / Huffine	97	107	155	61*
Durston Street & North 15th Avenue	198	243	222	128
Church Street & Story Street (at Gallagator trail)	441	458	548	291
Grant Street & South 7th Avenue	579	747	771	309*
Main & West Babcock Street (at S 23rd)	302	240	277	122*
Trail & Highland Boulevard (2011,2012): Kagy Boulevard & Highland Boulevard (2013, 2014)	49	85	105	53*
MSU Centennial Mall	1476	954	1112	566*
Koch Street & South 8th Avenue (Story Street & South 8th Avenue in 2012 due to construction)	NA	269	412	230
East Main & North Wallace Avenue	NA	440	473	211
East Olive Street & Willson Avenue	NA	282	359	158
Total	4724	5524	6416	3012

* Volunteers did not collect data at these locations on one day of the three-day sampling period.

pedestrians or those involving only a bicyclist. The University Police records management system does not have the ability to maintain extensive and detailed crash statistics, however, since there are very few bicycle crashes reported, this currently is not a particular concern.

An officer from University Police reported there are “a few” bicycle crashes per year, however that it is not “a rampant problem.” The most common location for bike crashes are the off-campus segments of the South 11th Avenue corridor, which sees high levels of pedestrian, bicycle and motor vehicle traffic together in a small space. Within the campus, there are a few crashes each year near the cross walks at South 11th Avenue and Grant Street. There has been a single bicyclist fatality reported in the last several years, after a bicyclist/motor vehicle collision occurred at the corner of South 11th Avenue and Kagy Boulevard, however it was determined that a pre-existing medical condition on the part of the bicyclist was the primary reason for the fatality. These are the extent of the anecdotal data of the reporting officer over the last ten years.

Chapter Highlights

The MSU campus’ central location paired with Bozeman’s semi-arid climate and abundant sunshine create good conditions and year-round opportunities for bicycle transportation.

Between 2000 and 2014, the population of Bozeman grew 45 percent. Bicycling, bus transit and carpooling will play a critical role in reducing the burden on adapting the transportation system to expected growth.

MSU’s Long Range Campus Development Plan prioritizes bicycling as a critical element of an integrated, multi-modal transportation system and other MSU planning documents support bicycle transportation.

In 2014, MSU Bozeman submitted a Bike Friendly University Application and received an “honorable” mention along with a feedback report recommending how MSU can improve, which is shown in Appendix A. One key recommendation is to create a campus bike master plan to guide future plans with a long-term physical and programmatic vision for the MSU campus.

Many of the bicycle facility recommendations in the Greater Bozeman Area Transportation Plan (2007) that impact the MSU campus have been implemented, though gaps remain in the bicycling network.



MSU PHOTO BY ADRIAN SANCHEZ GONZALEZ

Riders enjoying car-free commuting to campus on the first day of fall semester

3

“You can’t buy happiness, but you can buy a bike, and that’s pretty close.”

Unknown



NEEDS ANALYSIS

Introduction

This chapter provides an overview of the needs of people riding bicycles and specifically documents the needs of MSU students, faculty and staff. Needs were informed by the following information:

- 2014 MSU Bicycle Transportation Survey
- MSU commuter population analysis
- MSU parking permit holder analysis
- Campus outreach activities
- An overview of bike infrastructure gaps and barriers.

Types of Bicyclists

Similar to motor vehicles, people and their bicycles come in a variety of sizes and configurations. This variation ranges from the type of bicycle (i.e., road bike, mountain bike, commuter bike, fat tire/snow bike, a recumbent bicycle, tricycle, etc.) to the behavioral characteristics and comfort level of the bicyclist. People on bikes, by nature, are much more sensitive to poor fa-

cility design, construction and maintenance than people in motor vehicles. They are also more exposed to the elements and prone to physical injury compared to the automobile users.

A person's skill level on a bike, comfort riding in auto traffic, and perception of risk affect where they are willing to ride. A small portion of the population is "traffic tolerant" and willing to ride on busy arterial and collector streets (Dill and McNeil, 2012). These streets can be attractive because they are often the most direct, quickest and best lit routes. Most people are not willing to bike along busy streets because interacting with motor vehicles is too stressful. These "interested but concerned" people make up a majority of the population; they prefer quieter streets with less traffic, off street trails or bike lanes that are protected from automobile traffic (Dill and McNeil, 2012). The MSU Bicycle Task Force believes a person should not have to be "brave" to bike to school or work. This plan strives to create bike routes to and around the MSU campus where most people

feel safe riding and appropriate parking and facilities support people riding bikes at their destinations.

University campuses offer a special environment that can vary significantly in modal trends from the rest of the nation and even the general population within the same city. Students, faculty and staff on university campuses typically walk and bicycle in much higher numbers than their counterparts elsewhere. Individuals commuting to campuses choose bike/walk/bus transportation for varying reasons—to save money, to avoid the hassle of parking, for convenience and because it is more environmentally-friendly than driving. These factors support MSU's vision to create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors.

Bicycling Needs

A transportation survey was conducted in 2014 and was emailed to a random sample of 1,600 students, faculty and staff; 408 responses were received. Question 9 elicited the most response with 344 comments, "What are the top two reasons why you do (or do not) ride a bike to campus?" Results from tallying these comments indicate the three greatest challenges of cycling to and at MSU are:

- People do not feel safe riding bikes on the streets of Bozeman.
- People driving motor vehicles, people biking and pedestrians do not feel safe around one another.
- MSU lacks adequate facilities to accommodate people biking on campus.
- Other key survey results indicate 23 percent of respondents ride a bicycle as their primary mode of transportation to MSU, and almost 10 percent depend on Streamline bus, walking or biking for transportation.

Of the 348 respondents who live off campus, approximately 39 percent live within two miles of campus and about 15 percent live between two and three miles of campus. In total, about 54 percent live within three miles of campus. A two-mile bike ride at a moderate ten miles per hour pace takes 12 minutes and a three-mile ride takes 18 minutes. Biking can be quicker than driving for short trips because people may park near their destination rather than looking for a parking spot and walking further.

Respondents reported numerous reasons why they bike to campus, including:

- Saves time and money
- Good exercise
- Riding bike is easier than parking
- I enjoy it

Other respondents also reported numerous reasons that they don't bike to campus, including:

- Weather, snow and icy roads
- Too far
- Don't feel safe or a lack of continuous paths
- Need to run errands; pick up children

Respondents identified several items that could encourage people to bike more often, which include:

- Predictable snow plowing on major bike routes (81 percent reported very important/important)
- Discounts on cold weather biking accessories (64 percent reported very important/important)
- More covered bike parking on campus (54 percent reported very important/important)

According to survey respondents, a few ways that MSU could improve bike parking include:

- Place more racks in busy areas such as the Renne Library, SUB, Fitness Center, Fieldhouse and residence halls
- Place bike racks away from sprinklers
- Space bike racks further apart to allow easy entry/exit
- Install more covered bike parking

To support more bike parking, 27 percent of the 372 respondents reported they would pay up to \$20 per semester to store a bike in a secure area, protected from the weather; approximately 14 percent would pay up to \$40; and seven percent would pay up to \$60.

One element of bicycle transportation, as expressed in the MSU Bicycle Transportation Survey, is the concern over the distance bicyclists must travel to get to campus. For most healthy adults, distances of up to five miles can easily be covered by bicycle in moderate to good weather conditions, however riding enthusiasm decreases steadily over distances greater than three miles and in inclement weather.

Campus Community Outreach and Input

Input from the community on how to make bicycling a more viable mode of transportation was obtained from a campus public workshop held outdoors on April 16 and 17, 2015. The workshop sought to obtain input from students, faculty and staff. Workshop materials included maps of the campus and Bozeman, visual examples of a range of bicycle facilities and comment forms for people to fill out. In addition, staff and the consultant engaged with people, inviting them to indicate roadways and areas where they frequently bicycle, locations of concern and corridors they would like to see used for bicycle facilities.

The following comments were received during the public workshop:

Location-Specific Opportunities and Constraints

- South 19th Avenue is scary; uses sidewalk even though there are bike lanes, cars too close to bike lanes; gets even scarier at intersections
- Durston Road and Ferguson Avenue, nasty four-way stop feels unsafe
- Durston Road from Ferguson Avenue to Fowler Avenue is too narrow
- Old part of town south of downtown Bozeman is treacherous due to parked cars limiting sight distance at intersections
- Huffine Lane, Fowler Avenue and College Street need bike lanes. Currently a path is there but it's a park-type path with undulations, etc. and is inefficient.
- North 19th Avenue corridor needs bike lanes and safety facilities (many students ride to shopping at Target, etc.)
- College Street and South 19th Avenue, where bike lanes end and path starts: snow not cleared in the morning, but was cleared where the cars were
- Wayfinding needed for bike routes, e.g., Gallagator Trail to Wild Crumb Bakery on Wallace Avenue.
- South 11th Avenue is okay going northbound, downhill so keep up with cars, but southbound is treacherous (dodging mirrors)
- South 11th Avenue from College Street to Main Street is a popular bike route. Bike lanes are needed the entire length of the corridor
- Bike lanes are needed on College Street from South 11th Avenue to South 8th Avenue
- College Street from South 11th Avenue to Main Street needs bike lanes or separated path on both sides of roadway

- Separated path on south side of College Street between South 13th and 15th Avenues could use signage to indicate when to yield to pedestrians and direct bicyclists how to cross the corridor; flooding issues on separated path at South 15th Avenue
- Lincoln Street from South 11th to 19th Avenues; rough surface and lack of lighting renders the bike route uncomfortable
- Kagy Boulevard from South 3rd Avenue to South 19th Avenue; bike lanes needed, preferably buffered
- Intersection of West Babcock Lane and Main Street; markings needed to guide bicyclists in bike lanes through right-hook conflict zone
- North 19th Avenue corridor is popular bike route for students working and running errands; bike lanes and other safety measures needed
- Koch Street bike route; potholes and bad pavement surface render route uncomfortable
- Main Street; bike lanes needed from Babcock Lane into Downtown

Infrastructure Constraints, Non-Location Specific

- Uncontrolled intersections in older part of town very scary; cars going too fast, lack of sight distance
- Covered bicycle parking needed on campus
- Signs, etc. needed to tell cars where bike routes are and to respect bicyclists
- Some campus paths too narrow for bikes and pedestrians; bikes going too fast

Additional comments

- Rides bike all over town except to Downtown; will only drive there because of sight distance issues at corners in old neighborhoods and uncontrolled intersections
- South 11th Avenue feels scary because of mix of parked cars, moving cars and bikes

- Didn't know there was a bike map for Bozeman
- Bozeman is so much better than Billings
- You should use parking permit data to determine how many people live close enough to campus to not have to drive.
- Doesn't know how to use roundabout at College Street and South 11th Avenue, if it's better for cyclists to use traffic lane or get up on sidewalk
- I have good instincts and skills from growing up in Missoula but riding in Bozeman still feels scary sometimes
- Why is snow cleared for cars but not for bikes?
- I don't notice that Bozeman needs a better bike network because it's so much better than Anchorage that I can't complain
- We love the Gallagator, and the routes in old part of town work great for us
- If there's a sign that says "Bike lane ends", they should tell us where to go, or make the connection obvious to us.
- South 11th Avenue, right hooks a big problem in addition to being too narrow and needing bike lanes



Open house events were held in April 2015

- I'm worried about the door zone downtown and other streets
- Intersections need way to eliminate right hooks
- I take the "license to swerve" between cars on Main Street because I don't know how else to get across the lanes (to make left turns off corridor)
- Things are so good in Minneapolis that I'm afraid to ride in Bozeman; cars and trucks scare me here

MSU Commuter Population Analysis

Comparing locations where students, faculty and staff live in relation to campus and to existing bicycle facilities provides information about how well accommodated the population is by the bicycle system. This relationship is depicted in Figure 7, which shows the location of MSU's commuter population of students, faculty and staff as a "heat map", where higher commuter populations are darker red.

This map represents a snapshot in time. The addition of new residence halls, Stadium View Apartments and student housing may gradually change the distribution of students around Bozeman and bring them closer to campus, thereby changing commute patterns. Figure 7 illustrates that there is a significant commuter population across Bozeman's older neighborhoods north and east of campus. These areas consist of many quiet neighborhood streets that are low stress places for most people to bike. Figure 7 also shows significant commuter populations in:

- Family and Graduate Housing south of College Street between South 11th and South 19th Avenues
- Near Beall Street north and east of Kirk Park and west of South 15th avenue
- North and west of the Gallatin Valley Mall
- South of the Museum of the Rockies and west of South 3rd Avenue

MSU Parking Services provided residential addresses of parking permit holders for 2014. Figure 8: Parking Pass Residences vs. Distance from Campus Core — Cumulative shows the number of vehicle parking permits owned within 0.5, 1.0, 1.5, 2.0 and greater than 2.0 mile radius of campus. These data show:

- Nearly 3,000 parking permit holding residents live within a two-mile offset from the campus core.
- Nearly 1,500 permit holders live within one mile of the campus core
- Approximately 800 permit holders live within a half mile of the campus core
- A large number of people living in close proximity to campus are purchasing parking permits



College Street between South 11th Avenue and Wilson Street lacks bicycle lanes

Figure 7: Student, Faculty and Staff Distribution

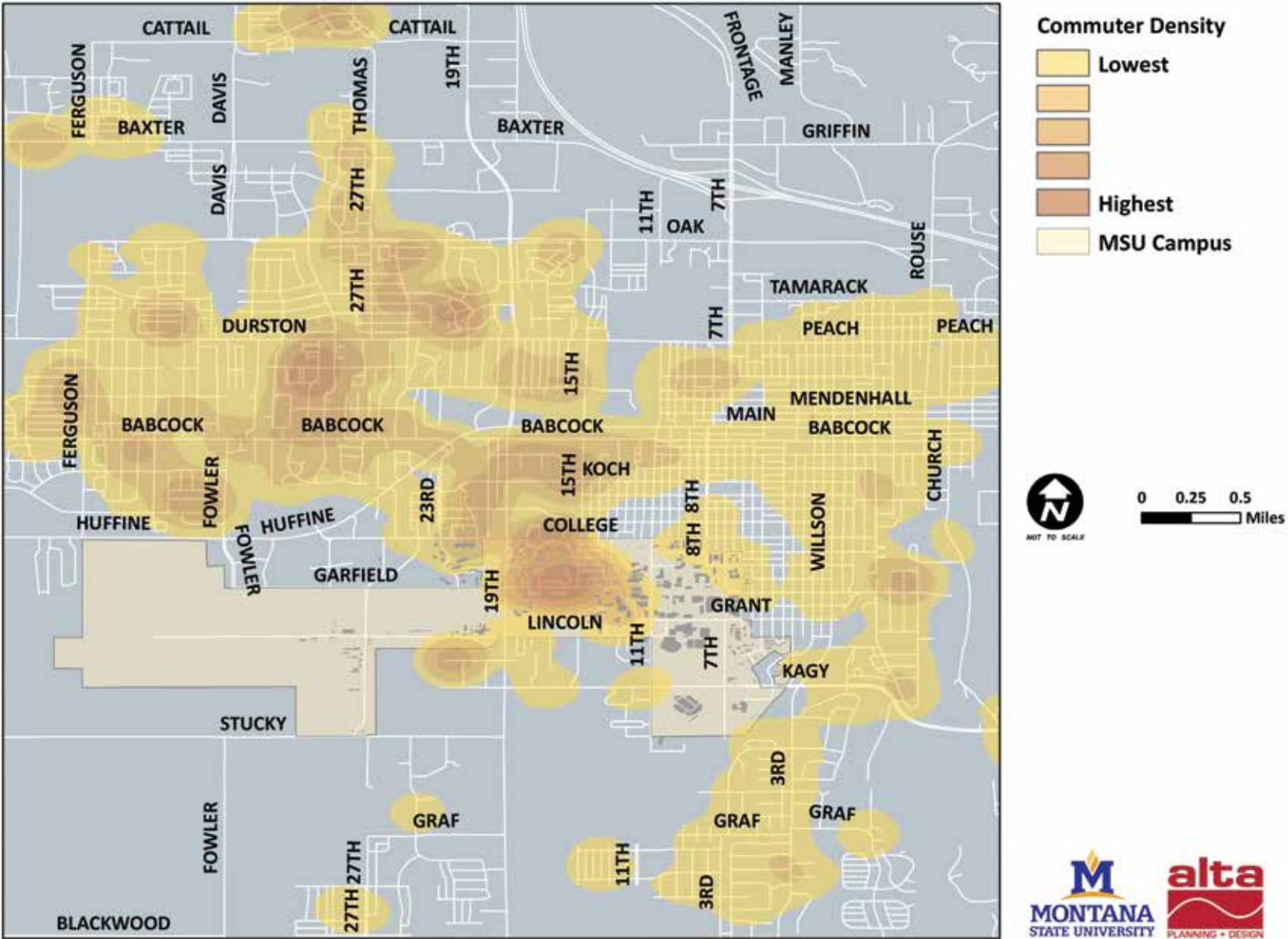


Figure 9 graphically depicts the housing dispersal of residences that own commuter (SB) parking permits. There is a high concentration of commuter permits held within family housing just west of the campus core. Students living in family housing may purchase a SB permit for a small upgrade price over the FH permit, according to the data.

It is likely that improvements to bicycle facilities, or changes in transit service/parking availability or price, could influence campus travel behavior over time.

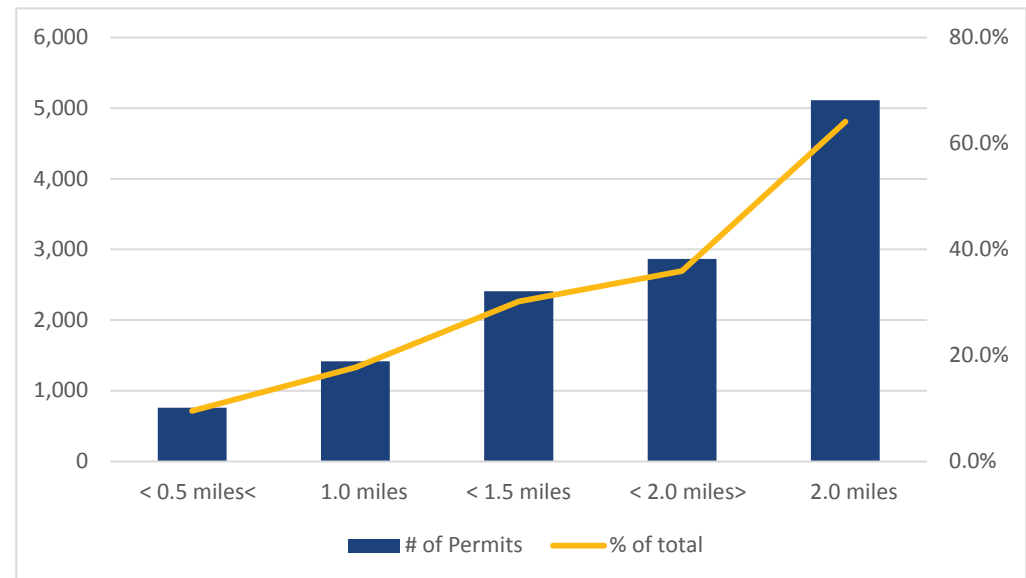
Bike Infrastructure Gaps and Barriers

Barriers to bicycling can include on-street bicycle system connectivity gaps, physical barriers such as high-traffic streets, a discontinuous off-street path and large geographic areas with few or no bicycle facilities. MSU and Bozeman also suffer from “spot gaps,” in which point specific locations lack dedicated bicycle facilities or other treatments to accommodate safe and comfortable bicycle travel. Spot gaps primarily include intersections and other vehicle/bicycle conflict areas that pose challenges for bicyclists, motorists and pedestrians. Barriers and gaps are depicted in Figure 10.

Winter Conditions

During the heavy snow months of winter, bicycle lanes and routes can be rendered unusable, or at least unsafe, if they are not plowed promptly and thoroughly. The challenge to providing bike lanes clear of snow lies in how the roadway plows push snow toward the curbs, piling it directly in the path of bicycle or pedestrian travel. Ensuing cycles of thawing and freezing can create thick icy patches in bike lanes; these hazardous conditions discourage many people from bicycling for transportation even when temperatures are tolerable. The presence of snow and ice in bike lanes and on trails was repeatedly cited as an impediment to winter commuting by bicycle in both the survey and during outreach activities.

Figure 8: Parking Pass Residences vs. Distance from Campus Core



Gaps and barriers are especially apparent during winter

Figure 9: Commuter Parking Permit Residence Locations

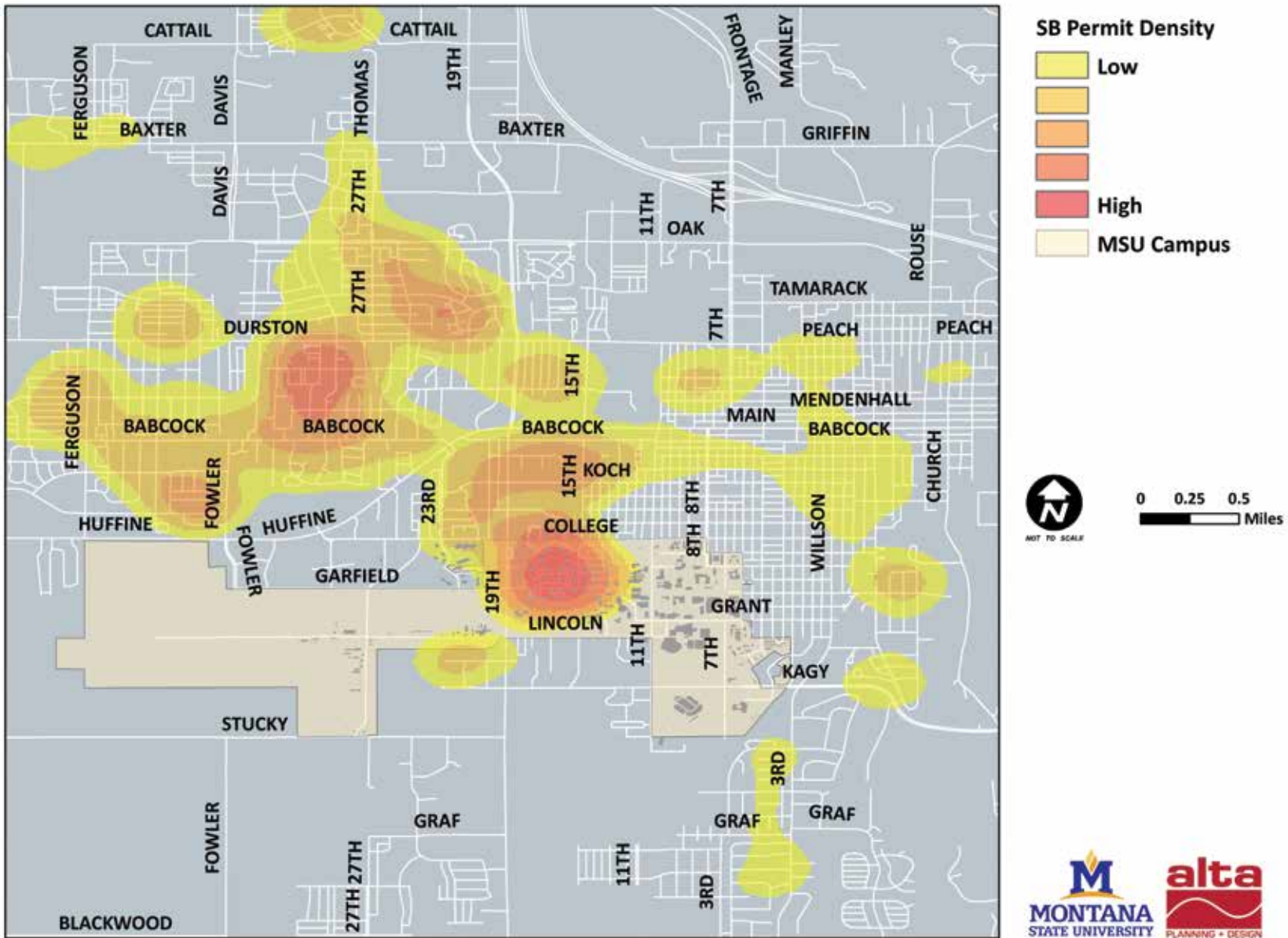
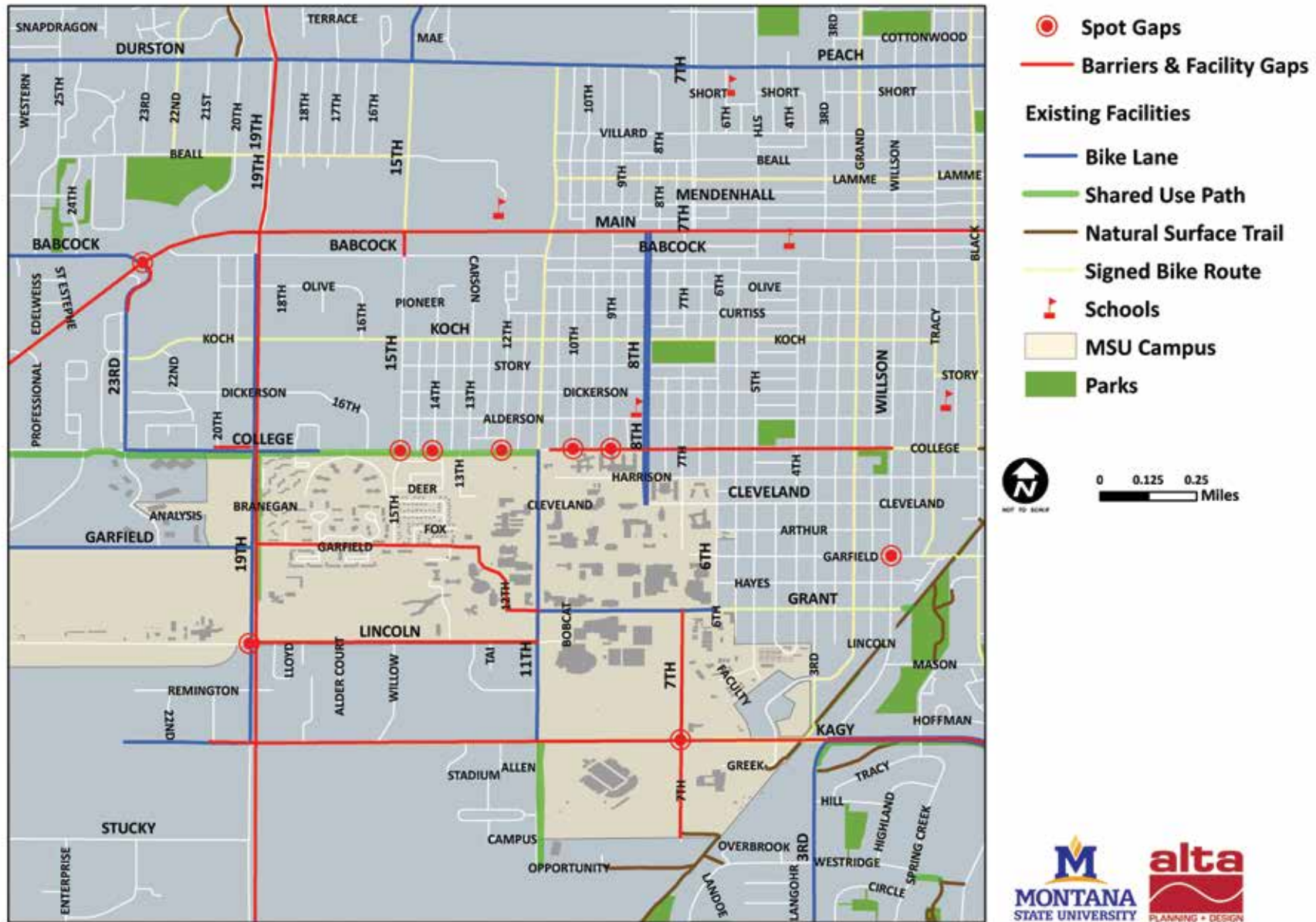


Figure 10: Bicycling Barriers and Gaps



Chapter Highlights

Transportation survey results indicate 23 percent of respondents ride a bicycle as their primary mode of transportation to MSU, and almost 10 percent depend on Streamline bus, walking or biking for transportation. Other survey results indicate a need for:

- Low stress facilities where most people would feel comfortable riding a bike
- Education for drivers, bikers and pedestrians on rules of the road and respect for each other
- On campus facilities for people riding bikes, such as adequate bike parking, showers and wayfinding signage

An MSU Commuter Population analysis shows that nearly 3,000 MSU parking permit holders live within a two-mile offset from the campus core. This presents opportunities to shift a significant number of short driving trips to biking, walking or bus trips.

While Bozeman's bicycle transportation network has improved significantly over the past decade, many gaps still exist. One way MSU can prioritize bike facility improvements is to focus on connecting bikeway gaps between campus and locations with higher density MSU affiliate housing.



MSU PHOTO BY JAY COOPER

Snow covered bikes on the MSU campus

4

*“I thought of that while riding
my bicycle.”*

Albert Einstein on the Theory of Relativity



RECOMMENDED IMPROVEMENTS

Introduction

The following sections provide recommendations for achieving the Bicycle Master Plan vision of “Montana State University will create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors. The University will be a leader in setting policy, developing programs, encouraging respectful riding and improving infrastructure to encourage bicycling to, from and within the MSU campus.” This chapter contains recommendations to improve facilities that support bicycling.

This chapter recommends short, mid- and long-term improvements that should be referenced during planning to ensure that MSU is opportunistic in accomplishing facility improvements that enhance and encourage bicycle use to, from and within campus. The bikeway recommendations in this plan consist of strategic routes that interact with the existing and

planned City of Bozeman system to provide a high-quality user experience and enable access to key destinations on and around campus. Plan recommendations focus on areas immediately adjacent to or on the MSU campus. Some of the bicycle facility gaps identified in Figure 10 and discussed in this plan are located off-campus. These are critical links to create a connected network between campus and residential areas. It is recognized that MSU may have limited influence on these projects. Some of the projects recommended in this plan will require coordination with other agencies, such as the City of Bozeman and the Montana Department of Transportation. Bike facility recommendations should work in concert with MSU’s Transportation Master Plan and the Bozeman Transportation Master Plan, which are also anticipated for completion in early 2017.

Design Philosophy and Priorities

People should not have to be “brave” to ride a bike to school or work. Facilities should be designed for people of all ages and abilities to feel comfortable and be safe riding. Speed is the single most critical factor in the analyzing the safety of a street. Higher vehicular speeds are directly proportional to a higher risk of pedestrian fatality if there is a conflict. According to an AAA study, the average risk of severe injury for a pedestrian struck by a vehicle reaches 10 percent at an impact speed of 16 miles per hour, 25 percent at 23 mph, 50 percent at 31 mph, 75 percent at 39 mph and 90 percent at 46 mph (AAA, September 2011. Impact Speed and a Pedestrian’s Risk of Severe Injury or Death.). Street design affects how fast people drive. Wide lanes lead to higher speeds. Multi lane roads lead to higher speeds. Narrower streets with fewer lanes and features like landscaping (trees), pedestrian crossings, curb

bulb outs and roundabouts lead to slower speeds and safer streets for everyone.

On streets with higher speeds and larger volumes of motor vehicle traffic people on bike or foot require more separation from traffic. Streets such as Kagy Boulevard, with a posted speed of 35 miles per hour and more than 15,000 vehicles per day, should have separated bike lanes and protected intersections. On streets with lower speed traffic, such as Grant Street, a stripe of paint delineating a bike lane may be sufficient for most people to feel comfortable. On residential streets that have low traffic volumes and low speeds, people biking and driving may share the same lane. These latter two categories that simply require pavement markings and signage are relatively low cost options that can be implemented quickly.

This plan strives to identify opportunities that improve conditions and safety for people riding bikes. Multi-modal streets specifically designed to efficiently and safely move people biking, walking, taking the bus and driving, move significantly more people within the same space than traditional auto-centric designs. Figure 11 below shows the amount of space required by the same number of people by bus, by bike and by car (Photo courtesy Australia Cycling Promotion Fund). In addition, it should be noted that people arriving by car require significant space for car storage. Arriving to campus by bus or on foot can reduce parking demand, opening up more spaces for those that need to drive. Arriving by bike can significantly reduce the space required for parking. One car parking space can typically accommodate six to 12 bikes depending on the rack configuration. The philosophy this plan embraces is well stated in the five requirements for bicycle infrastructure based on the Dutch CROW Design Manual for Bicycle Traffic:



A comparison of bus, bicycle and car travel impacts on road infrastructure

1. Cohesion – Do bicycle connections link between points of departure and destinations? Is there a complete system of bicycle facilities, providing access to all points of departure and destinations: every home, company and amenity?
2. Directness – Are bicycle facilities direct in terms of distance? In terms of time? How many intersections are there where cyclists do not have the right of way? How often do bicyclists have to stop?
3. Safety
 - Avoiding conflicts with crossing traffic (How many intersections are there and what are the traffic volumes?)
 - Separating vehicle types
 - Reducing speeds at conflict points where the cycle network crosses networks with other vehicles
 - Recognizable road category where all road users understand uniform traffic situations
4. Comfort – Does route avoid traffic fumes from automobiles? Can cyclists find their way easily?
5. Attractiveness - Is the area attractive? Are surroundings in a well-maintained public space?

Designers are encouraged to assess functionality, aesthetics and location when planning for bikes to, from and within campus.

The following section prioritizes bike facility recommendations, where short- and mid-term recommendations are often prioritized based on lower cost options or infrastructure that can be incorporated into a planned project.

Facility Comfort

The idea of user comfort has been previously introduced. The type of facility that will serve to connect the network for users of all ages and abilities will depend on the adjacent land uses as well as the adjacent motor vehicle facility. Facilities that provide physical separation from motor vehicles generally provide the most comfort for all users. Separated facilities

may not be required to provide the same level of comfort in places where motor vehicle volumes and speeds are low. Each of the following bikeway types provide differing levels of separation from motor vehicles and pedestrians.

Bikeways

The bikeways recommended in this master plan, listed in order of preference, are comprised primarily of the following classifications

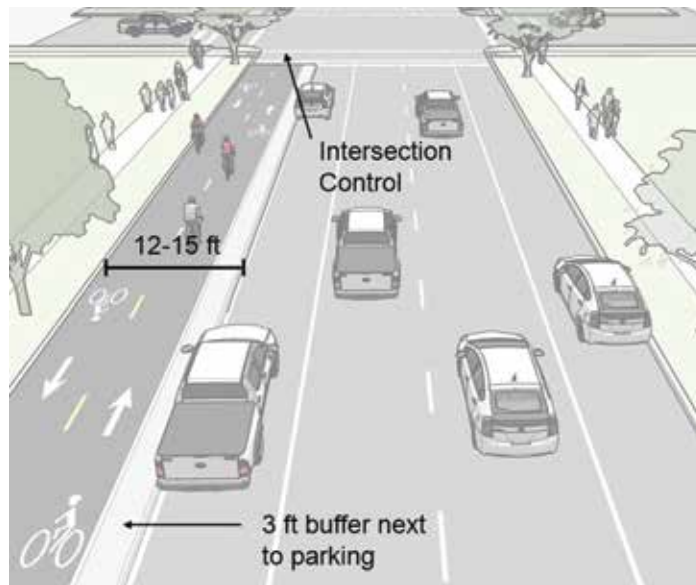
- Separated bike lanes
- Shared-use paths
- Bike lanes
- Shared lanes

Select campus circulation paths should be constructed and retrofitted to be ten feet minimum, with 14 and wider preferred to better support large numbers of students walking and bicycling. Spot improvements are recommended to enhance the linear bikeways. A key objective is to provide direct cross-campus bike paths, while reserving most of the existing system of campus pathways for local connections to buildings just as they are today. The following sections detail the different types of bikeways and provide the basis for the specific recommendations later in this chapter.

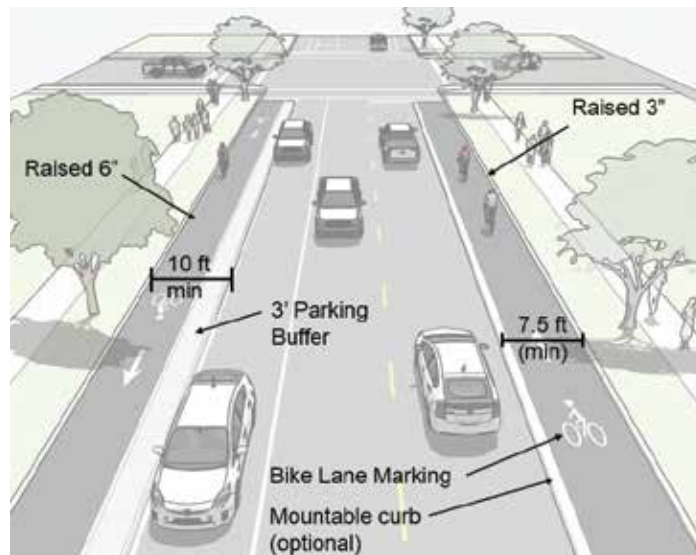
Separated Bike Lanes

Also Separated bike lanes are the preferred facility. They provide the greatest comfort for riders of all ages and abilities. When well designed, they also provide the greatest safety. A separated bike lane is an exclusive space for bicyclists along or within a roadway that is physically separated from motor vehicles and pedestrians by vertical and horizontal elements (MassDOT, 2015). Separated bike lanes include two fundamental elements:

- Separation from motor vehicles both a) horizontally, with a separated space for bicycling along the street and at intersection crossings, and b) vertically, with a physical object and/or a change in elevation from the street surface.



Two-Way Separated Bike Lane



Raised Separated Bike Lanes

- Separation from pedestrians with a vertical object, a change in elevation or visual delineation. Where separation from motor vehicles is appropriate but volumes of pedestrians and bicyclists are relatively low, a shared use path can be provided (MassDOT, 2015).

Separated bike lanes are differentiated from standard and buffered bike lanes by the vertical element. They are differentiated from shared use paths (and side paths) by their more proximate relationship to the adjacent roadway and the fact that they are bike-only facilities (FHWA, 2015). Separated bike lanes are also sometimes called “cycle tracks” or “protected bike lanes.”

Separated bike lanes may be at street level or raised at a sidewalk or intermediate level. They may be one- or two-way depending on design. Typically, if there is sufficient road space to install a buffered bike lane, a separated lane could be an option. Sometimes they are created by reallocating street space to provide the separation of bikes from vehicles. Examples of separated bike lanes are illustrated in Figure 12.

Links to two new separated bike lane design guides published in 2015 by FHWA and the Massachusetts Department of Transportation are provided in the Bikeway Design Resources section. Separated bike lanes may be designed to have the cycling facility at the same elevation as the sidewalk. Winter maintenance is simpler when the sidewalk and separated bike lane are immediately adjacent to one-another and maintained at the same elevation, which can allow for single-pass plowing.



Separated Bike Lanes and Integrated Signalization

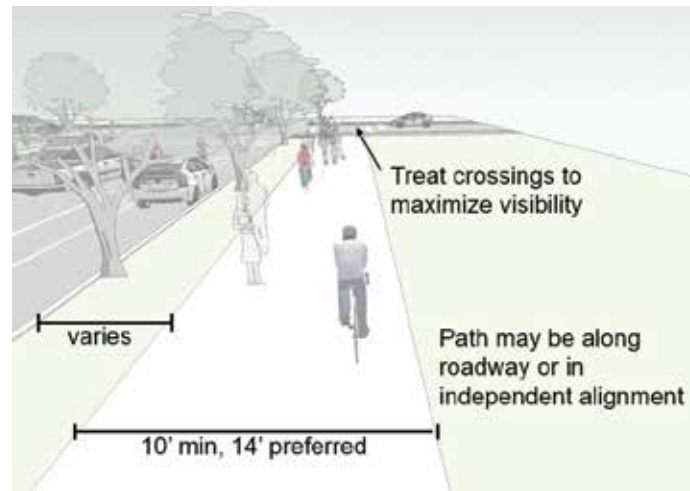
- Providing sufficient separation for users traveling at different speeds. For example, if space permits, bicyclists and pedestrians should have different lanes or pathways.
- Providing the necessary amenities for all users such as bike racks and skateboard racks.
- Considering the needs of people with disabilities within all of the user groups permitted on the path. (FHWA, 2014).

MSU shared-use path widths may range from ten feet to over 20 feet in locations with high volumes of people on bikes and walking. If shared use paths are to be a convenient form of transportation, the number of intersections where bicyclists have to stop must be minimized. Attempts to require people using paths to yield or stop at every cross-street and driveway promotes noncompliance and makes biking much less convenient than driving along the more direct parallel street. Examples of shared use paths are illustrated in Figure 13.

Shared-Use Paths

Shared-use paths serve as part of a transportation circulation system and support multiple users, such as pedestrians, bicyclists, in-line skaters and skateboarders. Typically, shared-use paths will be paved in asphalt or concrete; however, there is flexibility to determine the most appropriate surface. Shared-use paths attract a variety of users who often have conflicting needs. Planners should be aware of potential conflicts and take efforts to reduce them by:

- Providing information, including signage that clearly indicates permitted users and rules of conduct.
- Ensuring the path provides sufficient width and an appropriate surface for all users, or providing alternate paths for different types of users.



Shared-use Path or widened campus pathway

Bike Lanes

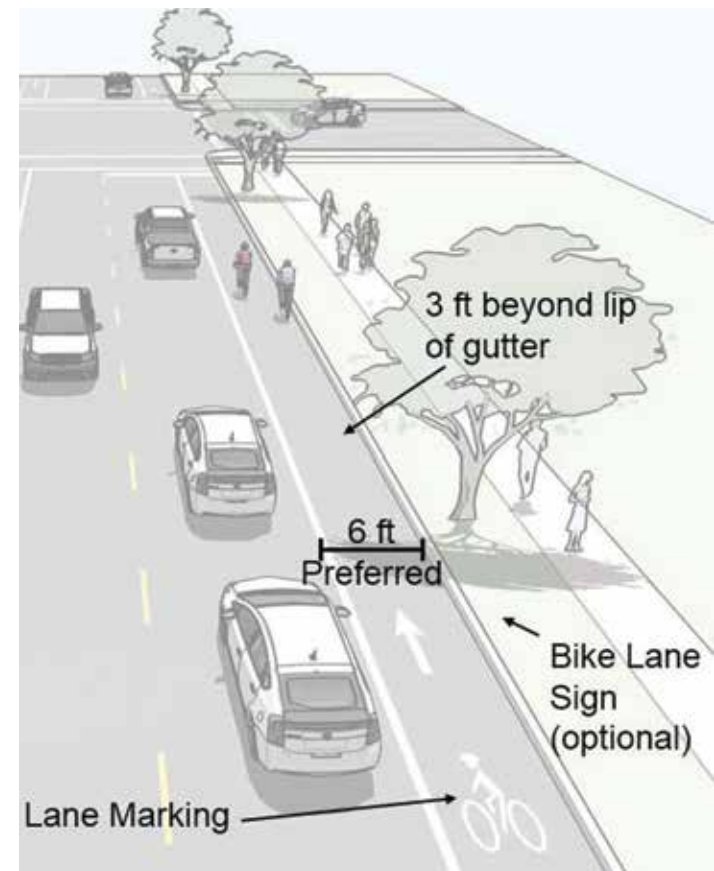
A Bike Lane is defined as a portion of the roadway that has been designated by striping, signage and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes facilitate predictable behavior and movements between bicyclists and motorists (National Association of City Transportation Officials [NACTO], 2012). Bike Lanes may be installed as standalone projects or may be coordinated with roadway reconstruction, resurfacing or restriping activities. Beyond standard bike lanes, there are options to provide a buffer space adjacent to the bike lane. Bike lanes should not be placed in between a travel lane and parking lane unless there is a buffer in order to prevent people from getting “doored” and knocked off their bike into the adjacent lane of traffic. Buffered bike lanes provide increased comfort for people from a wider range of ages and abilities. NACTO’s Urban Bikeway Design Guide provides design guidelines for conventional, buffered, contra flow and other types of bike lanes. Figure 14 illustrates examples of Bike Lanes.



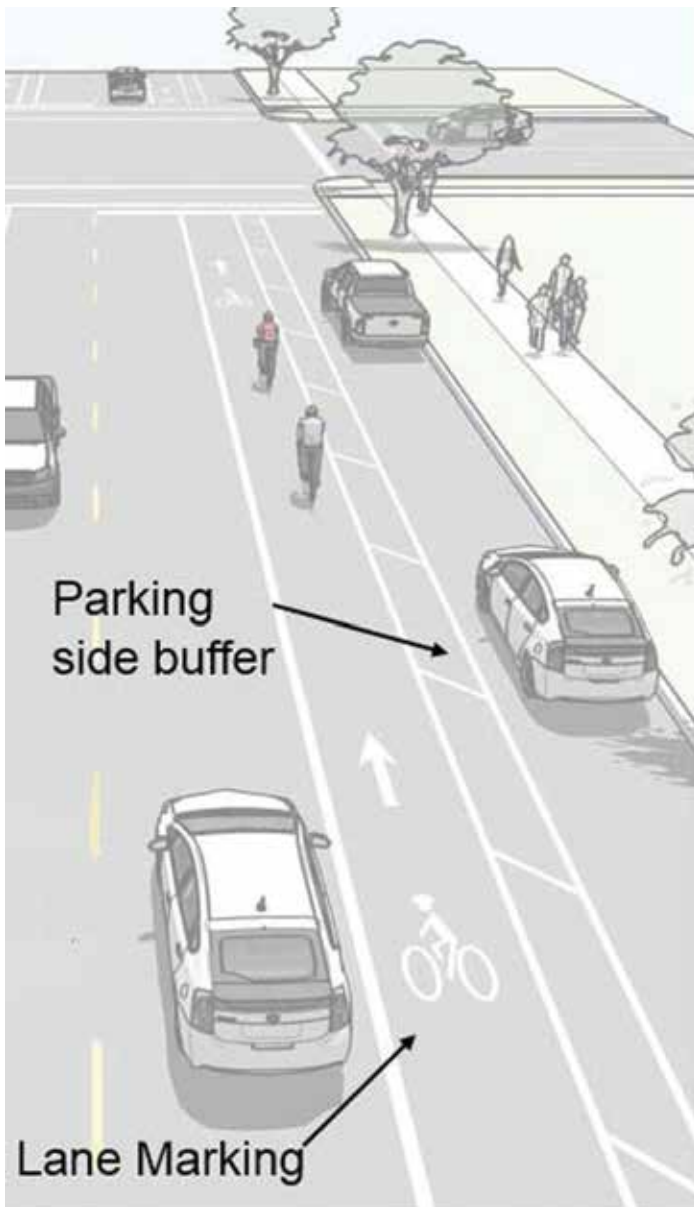
Separated bike path in Munster, Germany. Pedestrians use the right side of the path and bicycles use the left (red pavement)

Shared Lanes

Streets with low motorized traffic volumes and speeds may have lanes shared by people driving and biking. Shared Lane Markings with arrows (commonly called “sharrows”) are intended to make motorists more aware of the potential presence of bicyclists, direct bicyclists to ride in the proper direction and remind cyclists to ride further from parked cars to avoid ‘dooring’ collisions.

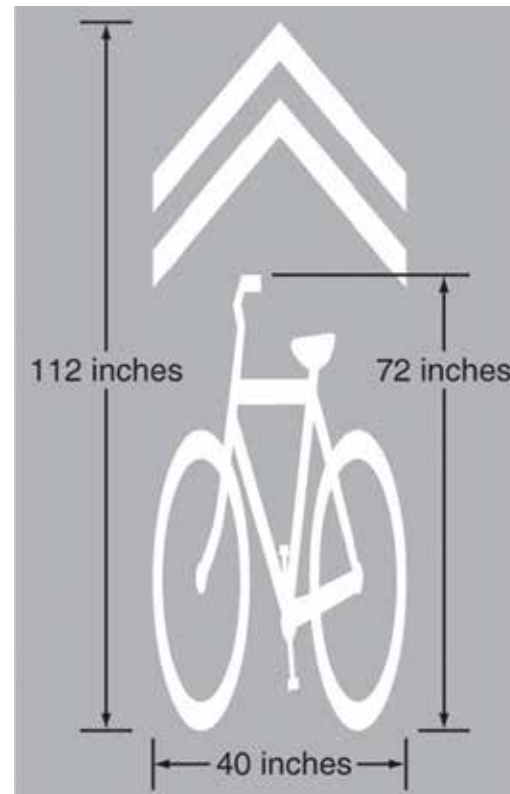


Conventional Bike Lane



Bike Lane with parking side buffer

The City of Bozeman has sharrows on several streets. In addition to shared lane markings, many other treatments can help make low volume streets friendlier for bikes. Guidance on sharrows and other bicycle specific pavement markings can be found in the Manual on Uniform Traffic Control Devices (MUTCD). The Urban Bikeway Design guide's "bicycle boulevard" section provides guidance on enhancing local streets to create safer bicycling environments for shared lanes. These enhancements could constitute quick wins for the university due to their low cost and high visibility.



Sharrow pavement marking

Campus Pathway Widening

Every pathway on the MSU campus effectively functions as a shared facility for bicyclists and pedestrians. The character of these facilities is different from a shared-use path in that it is not intended for longer distance travel, but for short, local, intra-campus travel. To function ideally, all of the main campus pathways with widths of less than ten feet should be widened. This can occur as new development on campus allows, or with strategic improvements to address areas with higher existing levels of demand. The recommendations in this plan are not intended to be a comprehensive list of campus pathways, but a list of pathways that the University may wish to prioritize to improve intra-campus transportation.

Spot Improvements

Spot improvements typically include intersection or crossing improvements and can include a variety of potential configurations. All spot improvements should have accommodations for bicyclists and pedestrians and utilize the latest standards to maximize safety and functionality. On campus, spot improvements may include small connections or improvements to existing facilities. Spot Improvements are shown on Figure 21 and summarized in Table 9 and discussed in the Connectivity and Key Corridors section of this document.

Bikeway design resources

Many new bikeway design resources have been developed in recent years and many are available online. The latest version of resources below should be referred to for more detailed design guidance.

- MassDOT, 2015. Separated Bike Lane Planning & Design Guide
- FHA, 2015. Separated Bike Lane Planning and Design Guide.
- Protected Intersections for Bicyclists, 2014. Video by Nick Falbo This six-minute video explains key concepts of protected intersections in simple language.

- NACTO, 2012. Urban Bikeway Design Guide Includes state of the practice information on bike lanes, cycle tracks, intersection treatments, signing and marking, signals and bike boulevards.
- NACTO, 2013. Urban Streets Design Guide Includes design guidance and examples of streets as public places with the goals of making streets safer, more livable and more economically vibrant.
- MUTCD, Chapter 9, contains bicycle specific pavement markings and signage guidance.
- AASHTO Guide for the Development of Bicycle Facilities, Fourth Edition, 2012 (AASHTO Bike Guide). Design resource includes shared-use paths available for purchase.

Intersections

Intersections are often barriers for people on foot or bike and are key locations to address bicycle safety and comfort. Intersections are defined as any place that bicycle traffic must cross the path of motor vehicle traffic.

Traditionally, intersection performance has been measured by motor vehicle delay. The use of this performance metric has led to the wide, high speed intersections that compromise the safety of all people using the intersection in order to minimize motor vehicle delay. Good intersection design prioritizes the safety of all road users over higher speeds. The images in this section are from NACTO's Urban Streets Design Guide, which is one of many of the design resources listed later in this chapter that provide guidance on and examples of intersections that prioritize the safety of all road users.

Low cost changes in pavement markings can be used as an interim step to improve the safety at an intersection. If the new pavement markings are well received, they may be incorporated as more permanent features in future projects. Each year MSU hires a contractor to provide pavement marking

services. This is an ideal opportunity to look for simple changes to pavement markings. Specific pavement marking changes are covered in the recommendations later in this chapter.

Connectivity and Key Corridors

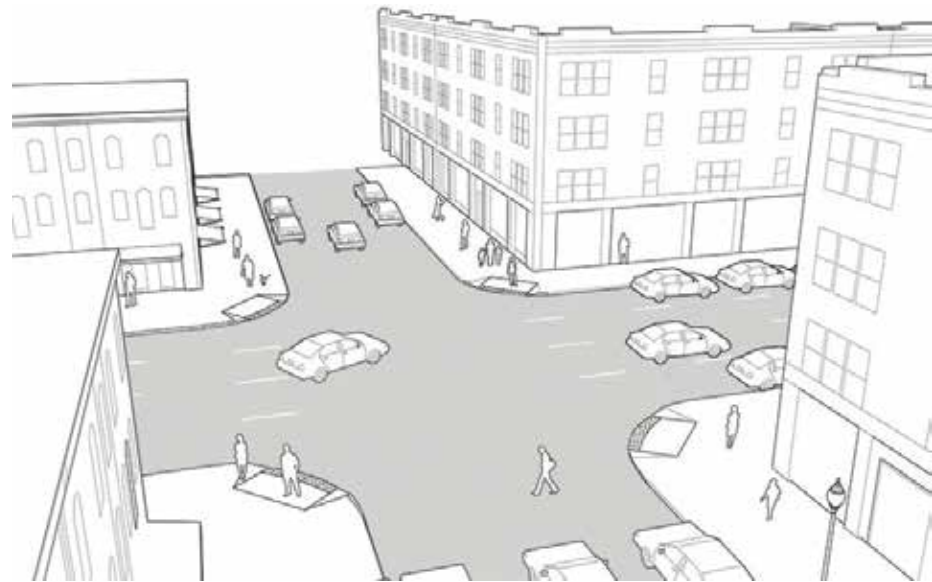
A vital element of increasing the use of bicycles as transportation to, from and within the MSU campus is improving the connectivity of the bikeway network. This section identifies key areas of Bozeman that should be well connected to the core of the MSU campus and identifies key corridors that should provide the needed connectivity.

Connectivity

The fundamental aspect of a good transportation system is connectivity, the presence of facilities connecting one's origin with their destination. Bozeman's existing street network generally has good connectivity for people traveling in motor vehicles. For people traveling by bicycle, transportation connectivity is a more complicated issue.

As discussed in Chapter 3, bicyclists have varying tolerances for riding on streets with high volume or high speed motor vehicle traffic. Even when these streets have on-street bike lanes, most people will choose not to ride. In addition, crossing high volume, high speed streets can be barriers to bicycle transportation for most. This plan identifies needed improvements to the bicycle facility network that provides connectivity via separated facilities or low volume, low speed shared streets.

While students, faculty and staff live in all areas of Bozeman, Figure 7 highlights that certain areas house higher densities of people affiliated with MSU. Ensuring that a safe and comfortable network of bicycle facilities link these areas with the campus core is critical to increasing the ability of people to choose bicycles as transportation.



Intersection designed to minimize motor vehicle delay (NACTO)



Intersection designed to prioritize safety for all users (NACTO)



Space for bikes and pedestrians is clearly delineated through a protected intersection

Southeast of campus is a traditional area of student, faculty and staff housing. Areas to the southwest of campus are rapidly developing with student housing. Stadium View Apartments (southwest of South 11th Avenue and Kagy Boulevard) is the first of what are likely to be a number of developments targeting campus-related housing. The northwest part of Bozeman is developing quickly and also houses a large contingent of MSU commuters.

In addition to connecting residential areas with campus, future areas of campus growth need to incorporate bicycle connectivity into planning and construction. The current construction of the Norm Asbjornson Hall on the corner of South 7th Avenue and Grant Street will anchor the future of the south campus area. Providing connectivity to, from, and within the south campus is critical. Much of the new and

planned student housing is south of campus. Additionally, the fieldhouse and stadium parking lots are seeing increasing usage. MSU's long range plan lays out the future for the MSU property that lies west of South 19th Avenue. Much of the planned development in that area will be residential. As this development is planned and constructed it is crucial to ensure high quality, comfortable bicycle facilities are incorporated as part of that growth.

Key Corridors

Figure 11 identifies key corridors that serve as routes to, from and within the MSU Bozeman campus. These corridors identify general routes taken by people on bicycles and consideration should be given to the best ways to accommodate this in the near-, mid- and long-term. This section describes each corridor and its purpose with regard to bicycle transportation to, from and within the MSU campus.

Several of these corridors include roads or rights of way that may not currently belong to MSU. In these cases, it is understood that MSU does not have direct influence over how these corridors will develop. They are included here and illustrated in Figure 12 because they play a vital role in bicycle transportation to and from the campus. It is envisioned that MSU could play a role in identifying recommended improvements as priorities for Bozeman.

East-West Corridors

College Street Corridor

The College Street corridor connects areas of housing north of College Street and west of South 19th Avenue, the Technology Park and the growing commercial center on Huffine Lane with campus. The shared use path on the south side of College Street provides a relatively low stress connection to the neighborhoods north of Huffine Lane and west of Fowler Avenue.

College Street: West Main Street to South 19th Avenue

College Street was recently reconstructed to a three-lane principal arterial section from Main Street to South 19th Avenue. This section has bike lanes the full length and a shared use pathway on the south side. The north side has a shared use path, which narrows to sidewalk in some places. In the near term, signage and pavement markings along the path should be changed where appropriate to give path users the right of way through intersections. Attempts to require people using the path to yield or stop at every cross-street and driveway promotes noncompliance by cyclists and increases travel times for people walking and biking. The photo below shows pavement markings and signage giving Oak Street path users the right of way across an entrance to the fairgrounds. In the mid-term, widen the north sidewalk to match the ten feet shared use path width to create connectivity for people riding bikes. It is not technically legal for adults to ride a bike on sidewalks in Bozeman. A paved connection to the path should be installed at Professional Drive to allow people to access the path. The bike and travel lanes on this section of College Street are wide. Within the existing curb lines, there is enough width to provide a buffer for the bike lane. This change of striping will provide an additional level of comfort for some users. While this section of College is not located on campus, these improvements are important to create bike connectivity between off campus residential areas and campus.

College Street: South 19th to South 11th Avenues (north edge of campus)

This section has a shared use path along the south side only and no sidewalk on the north side. The roadway has no curb and gutter and has sub-standard shoulders. The road is approximately 32 feet in width. Existing shoulders receive heavy bicycle traffic. This section of College Street acts as a barrier to MSU campus from the neighborhoods to the north. The pedestrian crossings are poorly marked and there are few

connections to the pathway from the street, forcing people to walk through vegetation, mud or snow to access the path or to walk on the roadway.

In the near term, signage and pavement markings along the path should be changed, where appropriate, to give path users the right of way through intersections. Attempts to require people using the path to yield or stop at every cross-street and driveway promotes noncompliance and increases travel times for people walking and biking.

With no sidewalk on the north side, pedestrians currently cross at all intersections. In the near term, install high visibility pedestrian cross walks. At the intersection of South 15th Avenue also install a Rectangular Rapid Flashing Beacon (RRFB) as this location sees is particularly high pedestrian and bicycle crossing traffic. A paved connection should be provided to the path at South 14th Avenue.



Pavement markings and signage on Oak Street (WTI)

Figure 11: Key Corridors and Commuter Density

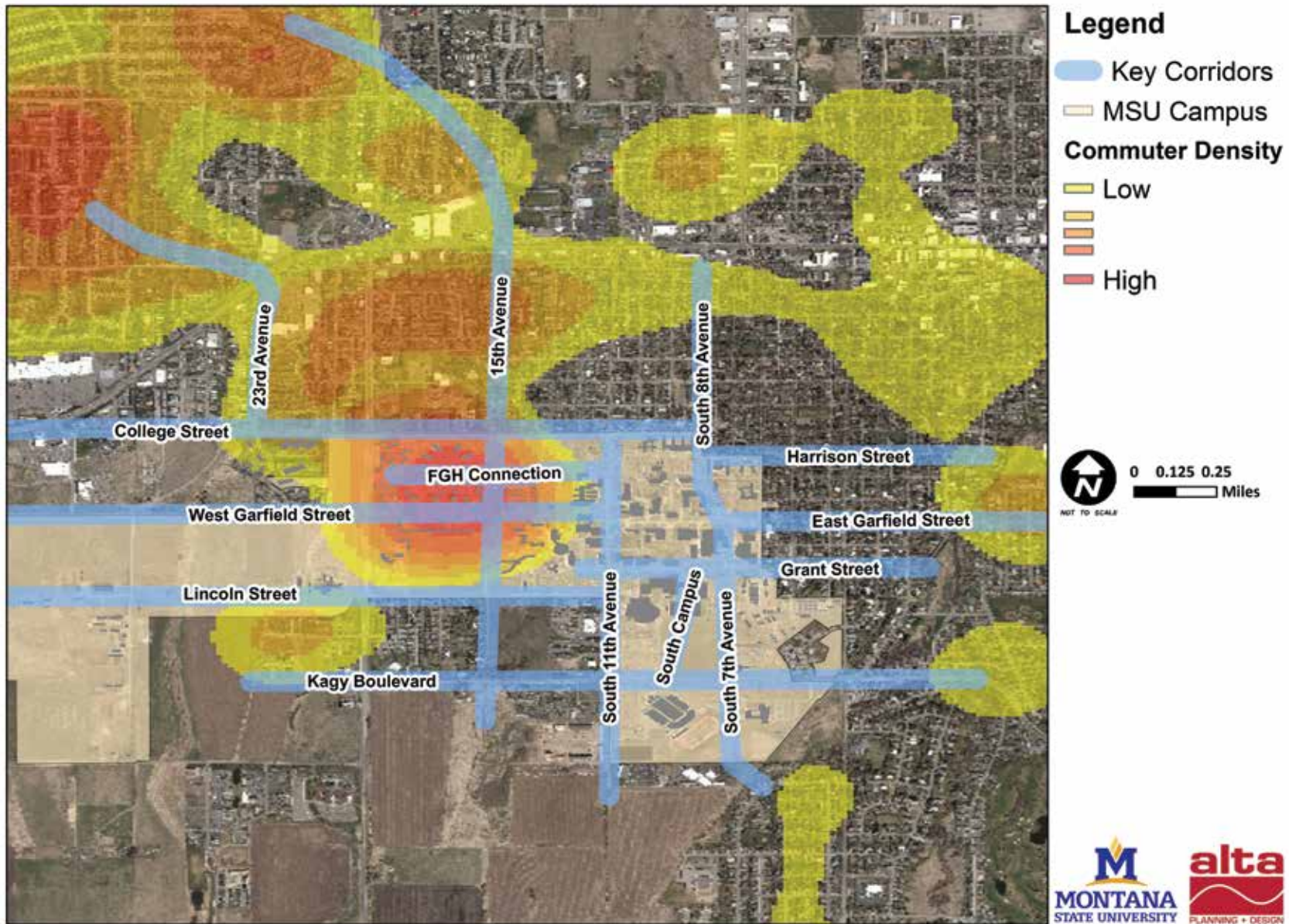
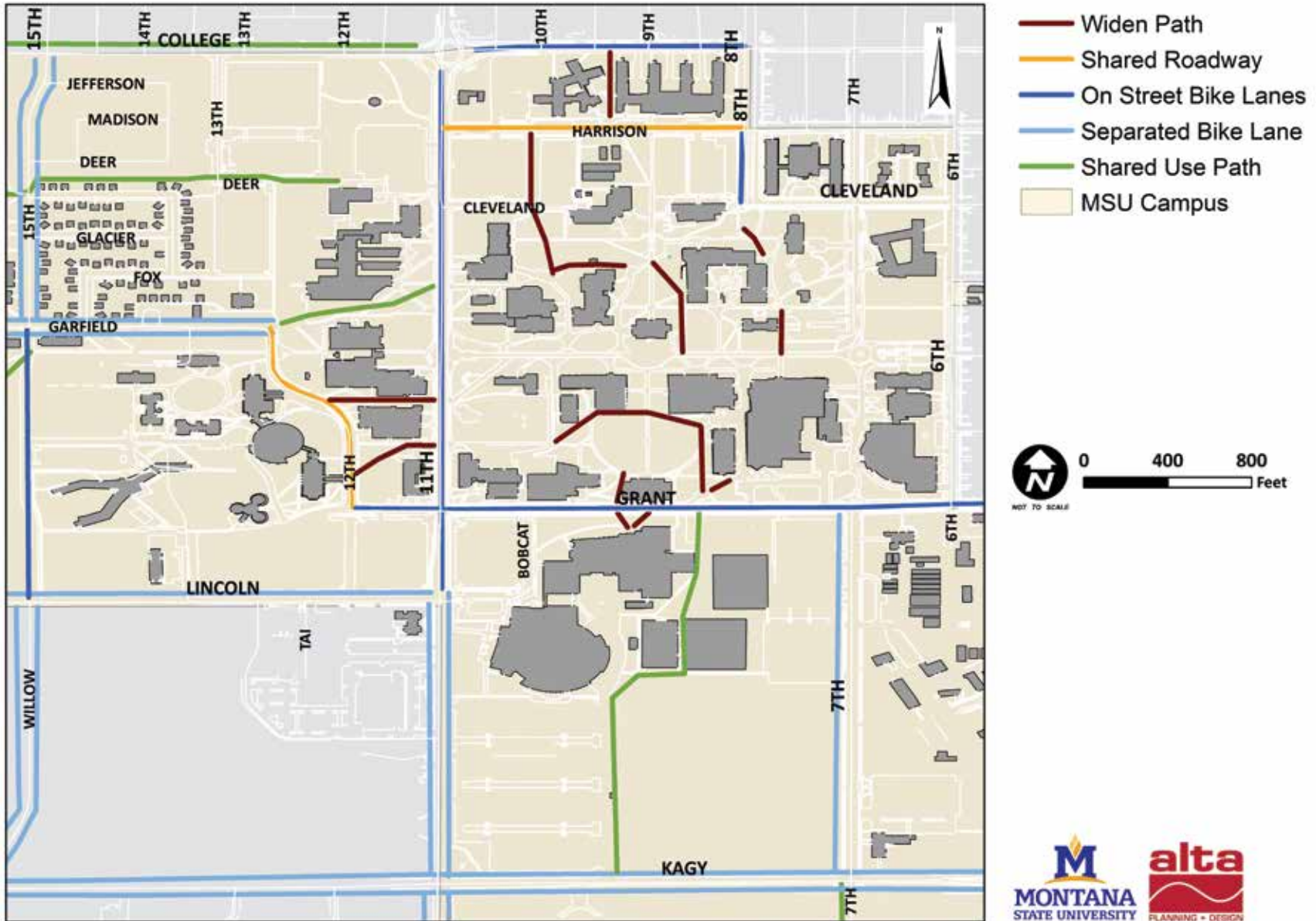


Figure 12: Recommended Corridor Facilities



In the near term, restripe shoulders as designated five-foot bike lanes with 11-foot travel lanes. Remove parking on the south side of the street on the approach to the roundabout. This parking does not require an MSU parking permit and is therefore highly desired, causing many people to drive by to look for free spaces. Approximately 12 spaces exist on the south side of College Street, which have been replaced by the new Bison Lot (parking) nearby.

In the long term, as this section is reconstructed, it should include separated facilities on both sides. The reconstruction should also ensure that the connections to the neighborhoods to the north are maintained with high quality crossings. Parking should be prohibited except for in front of the residences on the north side of the street between South 13th and 12th Avenues.

***College Street: South 11th to South 8th Avenues
(north edge of campus)***

This section of College Street is on the City of Bozeman's Capital Improvement Program (CIP). This section does not currently accommodate the high bicycle and pedestrian volumes using the street, especially people crossing to and from the neighborhoods and businesses on the north side. The reconstruction of this street is a prime opportunity to improve the function of College Street for all users. In the near term, along with reconstruction, consider removing parking on the north side. This side hosts the bulk of the driveways and due to sight distance restrictions, only hosts about eight parking spaces on the north side. Several of these parking spaces would probably not meet current standards for setbacks from side streets. With removal of parking, about 40 feet exists. Add six-foot minimum bike lanes on both sides, with the south side protected by parking. Add high quality pedestrian crossings that incorporate curb extensions, which offer opportunities to create additional public space for items such as

landscaping, seating and bike parking. In addition, curb extensions narrow the crossing distance and make College Street a far more comfortable place to walk and bike.

Harrison Street Corridor

Harrison Street connects adjacent neighborhoods directly to the MSU campus. It is a quiet residential street that extends from South 11th Avenue on the west all the way to South Black Street to the east. However, as of fall 2016, Harrison Street pavement was in very poor condition, putting people on bikes at greater risk for crashes. When Harrison Street is repaved, additional treatments could be used to improve Harrison Street further as a "Bicycle Boulevard". Cleveland Street, one block south of Harrison Street is residential street that is an attractive place to ride a bike for many reasons such as its pedestrian oriented lights, mature boulevard trees and well maintained homes. Given the pavement condition on Harrison Street, Cleveland Street is a good alternative. Both Harrison and Cleveland Street are better alternatives for biking than College Street.

West Garfield Street Corridor

This corridor connects Family and Graduate Student Housing, the Tech Park and planned future campus expansions west of South 19th Avenue to the campus core. It also connects neighborhoods with a high density of MSU commuters north of Main Street and north and west of the Gallatin Valley Mall/Bozeman Ponds to the campus core. A new traffic signal, installed in 2015, makes it easier for people biking to cross South 19th Avenue, making this more important as a bike route into campus. In the near- or mid-term, low cost options have potential to greatly improve connectivity on existing road sections.

West Garfield Street: Ferguson Avenue to Fowler Avenue

The MSU Long Range Campus Development Plan identifies the western region of campus as the location for future expansion campus residences. West Garfield Street will be a key connector to the academic campus. When this section is developed, a separated bike lane should be provided to accommodate the high demand for travel along the corridor.

West Garfield Street: Fowler Avenue to South 19th Avenue

A bike lane currently exists on the north side, but not on the south side. This is due to the road being constructed by development to the north, with the expectation that future development on the south side by MSU would bring the street up to City of Bozeman Street Collector standard with curb and gutter, bike lane and sidewalk. There is currently space to stripe the bike lane in both directions while still allowing for future improvements, which may be years away.

In the near term, a bike lane should be striped on the south side of the road. In the long term, as the western region of campus develops, a separated bike lane should be provided to accommodate the high demand for travel along the corridor. The intersection of Garfield Street and South 19th Avenue will require particular attention. Grade separation should be considered as an option.

West Garfield Street: South 19th Avenue to South 12th Avenue

As of fall 2016, there are no bike facilities on this section. This section of West Garfield Street is approximately 35 feet wide, runs through campus housing and has relatively low motor vehicle volume. Near term options could include advisory bike lanes or sharrows as described below.

- Option One: Install advisory bike lanes. These are dashed bike lane lines which prioritize people on bicycles. Motor vehicles can encroach, after yielding if needed for passing. This option could preserve parking on one side of the

street. The cross section would include an eight-foot-wide parking lane, five to six-foot-wide bike lanes and 18-foot wide driving area.

- Option Two: Install shared lane markings (or sharrows). Sharrows could be installed every 150 feet and at far sides of minor intersections and keep both parking lanes, however this is less desirable and provides less continuity.
- Option Three: Remove parking on both sides and provide full bike lanes on both sides. This would consist of 11-foot travel lanes and 6.5-foot bike lanes.

In 2013 MSU Campus Planning, Design & Construction hired TD&H Engineering to produce design development plans for West Garfield Street (Project PPA#13-0197) These plans layout various improvements for this corridor and include some bicycle facilities. It is recommended that the design for West Garfield Street be revisited prior to a final design. The on-street bike lanes included in this preliminary design should be removed and replaced with separated bike lanes for the entire length from South 19th Avenue to South 12th Avenue and that the intersection of West Garfield Street and South 12th Avenue be designed to connect the separated bike lanes to future bikeway connections to South 11th Avenue.

A mid- to long-term solution to bicycle connectivity on this section of West Garfield is to connect the existing shared use path from South 12th Avenue to Paisley Court with South 19th Avenue. This path could be routed south of Paisley Court, connecting to the existing path on South 19th Avenue. This is a less desirable solution as it does not provide a convenient connection for residents living on Julia Martin Drive.

East Garfield Street Corridor

This corridor connects the east edge of MSU to housing in the areas reaching east of Willson Avenue and south toward Kagy Boulevard. It also creates a connection to the car-free

Centennial Mall, which routes people through the center of campus. East Garfield Street connects MSU to the Gallagator Trail, a popular route for people on bike and foot going to and from East Main Street. This corridor should be developed as a bicycle boulevard with bicycle traffic prioritized.

Recent curb bulb outs and mini traffic circles that were part of the North Wallace Avenue reconstruction are a good example of traffic calming techniques that could transform Garfield Street into a bicycle boulevard. In addition, traffic diverters could be considered to eliminate cut through motor vehicle traffic. The intersection at Willson Avenue should be improved to increase comfort for people crossing on bike and on foot. Installation of a Rectangular Rapid Flash Beacon should be considered.

West Lincoln Street Corridor

This corridor connects areas of existing student housing, Marsh Labs and future campus development west of South 19th Avenue to campus core. It also connects the Lincoln Lot at the intersection South 19th Avenue to campus. This corridor is likely to go through several phases of growth as development occurs south of Lincoln Street and west of South 19th Avenue.

This phased approach could include widening of the existing path on the north side, installation of painted bike lanes and perhaps buffered bike lanes or additional separated facilities with the reconstruction of Lincoln Street. Ensuring coordination between MSU, the City of Bozeman and developers will be important in looking for opportunities to improve the bicycle facilities on Lincoln Street. MSU's TMP recommends a standard City of Bozeman Street Collector section with bike lanes, parking and a ten to 14-foot path on the north side.

West Lincoln Street Corridor

West Lincoln Street: Ferguson Avenue to South 19th Avenue

Longer term, as this section of West Lincoln Street develops, continue the separated path on the north side and construct street as recommended in the City of Bozeman Transportation Master Plan. Longer term, signalization of the West Lincoln Street/ South 19th Avenue intersection is recommended to improve safety and comfort for people crossing South 19th Avenue.

West Lincoln Street: South 19th Avenue to South 11th Avenue

A large numbers of students use this corridor to access campus from their residences and also from the remote Lincoln Lot.

This section of Lincoln Street currently has two distinct sections, the west end has no curb and gutter and is approximately 30 feet wide. The area has residences and sports fields bordering it. In the near term, restripe the roadway to include five-foot minimum bike lanes, the resulting 10 to 11 feet travel lanes will help to encourage lower motor vehicle speeds which will improve safety for all users. The current shoulder is four feet or narrower.

In the mid-term, create a safe and comfortable connection for people biking and walking along the north side of Lincoln Street. This could be accomplished with a shared pathway with a width appropriate to accommodate both bicycles and pedestrians. In the long term, Lincoln Street should include separated bike lanes. Consideration should be given to these being bi-directional bicycle traffic.

Kagy Boulevard Corridor

This corridor connects housing south of Kagy Boulevard, east of Willson Avenue and future housing and campus expansion west of South 19th Avenue to campus. Kagy Boulevard is a principal arterial that currently carries approximately 15,000 vehicles per day with a posted speed limit of 35 miles per hour. It has a narrow shoulder and lacks bike lanes between Willson and South 19th Avenues. Long sections of sidewalks are missing between South 11th and South 19th Avenues. A significant number of people walk and bike along and across Kagy Boulevard to access campus. Kagy Boulevard is the main east-west corridor on the south side of Bozeman. It is a primary route between Bozeman Deaconess Hospital and to the MSU Campus.



Example of a separated shared-use path

The section of Kagy Boulevard between South Willson Avenue and South 19th Avenue is a high priority for City improvements and was in the planning stages in 2016. During the public meeting in April 2016, there was strong public support to include high quality bike/pedestrian facilities along and across this corridor. The project has been delayed due to the high cost of the proposed design.

Kagy Boulevard is a key transportation corridor for Bozeman and Montana State University. For some, this corridor is a special place and plays an integral part in the MSU Campus experience, especially during Bobcat football games. The design of Kagy Boulevard offers MSU and Bozeman the opportunity to place a priority on bicycle, pedestrian and transit transportation.

Private motor vehicles will always be the mode of choice for many people and the design of Kagy Boulevard must consider this, but it should prioritize other modes while accommodating private motor vehicles. As was introduced earlier, this can be accomplished by shifting the primary design criteria away from reducing motor vehicle delay to prioritizing multi-modal efficiency and safety of all road users.

The focus of this plan is to provide recommendations for bicycle facilities but as previously discussed, appropriate facilities are often based on the character of the roadway. User comfort is significantly affected by proximity of high volumes of high speed motor vehicles. Because of this it is recommended that a two to three lane configuration be selected for Kagy Boulevard.

A three lane street has many benefits over a four lane street, including:

- An overall crash reduction of 19 to 47 percent (FHWA, Road Diet Informational Guide, 2014).
- An overall crash reduction of 53 percent on suburban roadways (Persaud, B., Lana, B., Lyon, C. and Bhim, R. "Comparison of empirical Bayes and full Bayes approaches for before-after road safety evaluations." Accident Analysis & Prevention, Vol. 42, Issue 1, pp. 38-43 (2010)
- Reduction of rear-end and left-turn crashes through the use of a dedicated left-turn lane.
- Fewer lanes for people on foot to cross and space for pedestrian refuge islands.
- Improves speed limit compliance, as one person driving within the speed limit sets the speed for following motor vehicles.
- Reduces crash severity.
- Allows more space for high quality, low stress bicycle facilities, trees and landscaping.

Kagy Boulevard should have separated bike lanes on both sides of the roadway extending from South 19th Avenue to Willson Avenue. Particular attention should be given the design of these facilities through the intersections at South 7th and South 11th Avenues. The intersections at South 19th and Willson Avenues will require a comfortable and safe transition from the separated lanes to existing facilities. Separated bike lanes are recommended due to high volumes of pedestrians, bicycles and motor vehicles on Kagy Boulevard combined with the nature of the corridor as a transportation link between destinations. Providing bike lanes separated from pedestrians will eliminate conflicts created by the speed differential.

Increasing numbers of people are crossing Kagy Boulevard between the growing areas of residential development and campus. As previously mentioned, providing a three lane de-

sign for Kagy Boulevard will improve safety for people crossing street. The three lane design will also allow for safe and comfortable at grade crossings. If Kagy Boulevard becomes a wide four-lane corridor prioritizing motor vehicle through travel, then grade separated crossings are recommended at South 7th Avenue, South 11th Avenue and at Bobcat Stadium.

Grant Street Corridor

Grant Street runs through the south side of campus, connecting neighborhoods from the east to popular campus destinations such as the Strand Union Building and the Fitness Center. It receives high bicycle and pedestrian use.

Grant Street: South 11th Avenue to South 6th Avenue

In the near term, restripe the bike lane using a six-inch stripe and add bike lane signs and stencils every 200 feet, or after pedestrian crossings and on the far side of intersections. At the intersections of South 7th and South 11th Avenues, the stop bar for motor vehicles should be set back to provide six feet of bicycle forward stop bar. In the mid-term or when road is resurfaced, add a buffer to the bike lane with the following cross-section: five-foot bike lane, two-foot buffer (double white line) and ten-foot travel lane. Alternatively, the bike lanes could be six feet and vehicle lanes 11 feet.

Grant Street: South 6th Avenue to Willson Avenue

In the near or mid-term, extend existing bike lanes from Campus to South Willson Avenue in accordance with Bozeman Area Transportation Plan. Currently there is parking on the north side, however parking is prohibited on the south. The road is approximately 35 feet wide.

- Option 1: Work with homeowners to understand if they would support prohibiting parking on the north side of Grant Street. All homes have side street frontages and/or alley parking opportunities and Grant Street is in the City's MSU residential parking district. If homeowners are ame-

nable to this idea, provide buffered bike lanes on both side measuring, seven-foot wide and ten-foot travel lanes.

- Option 2: Parking would remain on the north side of Grant Street. Cross section should be made similar as Peach Street on the north side, with a combined 12-foot bike/parking lane, two (2), nine-foot 9 wide travel lanes and a five-foot wide bike lane on the south side. This option is not preferred because the bike lane would be in the door zone.

In the near to mid-term, install a Rectangular Rapid Flashing Beacon (RRFB) and marked crosswalks along with sidewalk/pathway connections across Willson Avenue.

The MSU Transportation Master Plan recommends permanent closure of Grant Street to vehicular traffic between the east approach to the North Fieldhouse Lot and the west approach to the Student Union Building. Bicycle and pedestrian traffic would still be permitted here.

Family and Graduate Housing Connection

An existing asphalt path connects the residential complexes between College Street and West Garfield Street to South 15th Avenue. In the near term, this path should be repaved. Consideration should be given to widening the path to 12 to 14 feet as part of the repaving. In the long term, a safe and direct connection should be made across South 15th Avenue connecting to Deer Street and continuing to South 11th Avenue.

North-South Corridors accessing MSU campus

South 23rd Avenue Corridor

This is the most direct north-south corridor connecting people on bikes across Main Street from northwest neighborhoods to the College Street path. South 19th Avenue is the primary north/south corridor for motor vehicles on the west side of town, but it is not a comfortable place for most people to bike

due to high traffic volume, high speed traffic and a lack of separated or even continuous bike facilities.

South 23rd Avenue: Main Street to College Street

South 23rd Avenue becomes West Babcock Street on the north side of Main Street. West Babcock Street was reconstructed in 2005 with bike lanes and sidewalks, resulting in a 256 percent increase in bike and pedestrian use (City of Bozeman, WTI. 2005–2006 West Babcock Street Pedestrian & Bicycle Monitoring Project). In both directions the bike lanes on South 23rd Avenue and Babcock Street end prior to the intersection at Main Street, leaving people on bikes to mix with motor vehicles. This intersection needs improvements to accommodate people traveling by bike.

- Option 1: Re-stripe the intersection approaches to include bike lane markings through the intersection. Re-striping should utilize the latest design and marking ideas that can be found in many of the resources listed at the end of this chapter. This may include the use of green paint to highlight areas of potential conflict.
- Option 2: Provide separated shared path leading into and exiting the intersection. The separated facility should transition back to the on street bike lanes at a location that provides a safe and comfortable transition. This option should include the addition of an advanced walk signal or lead bike/pedestrian interval to the traffic signal. This treatment initiates the walk phase several seconds before the motor vehicle green, giving people walking or biking a head start making them more visible to drivers.

South 23rd Avenue: College Street to West Garfield Street

South 23rd turns into Technology Boulevard south of College Street, a winding road through a tech park with access to various businesses. This low volume street could be a good bicycle boulevard street connection between the College Street and West Garfield corridors.

South 19th Avenue

South 19th Avenue is not highlighted on the corridor map, because it is not a comfortable place for most people to bike due to high traffic volume, high speed traffic and a lack of continuous bike facilities. A painted bike lane adjacent to high speed traffic on this multi-lane road creates a high stress environment, where most people are not willing to ride a bike. It is especially challenging to merge across traffic to make a left turn on a bike on South 19th Avenue.

In the longer term, South 19th Avenue should have separated bike lanes or shared use paths on both sides. Intersections should be designed to promote a two-stage left turn, where people on bikes aren't exposed to high speed traffic. The east side has a shared use path from College Street to south of West Garfield Street, then it narrows down to a sidewalk as it extends south to Kagy Boulevard. The sidewalk on the east side should be widened to create a continuous shared use path all the way to Kagy Boulevard.

South 15th Avenue Corridor

The South 15th Avenue corridor is an ideal north-south corridor on the west side of town that could make a key connection for people on bikes from north of Main Street to the College Street path and the MSU campus.

South 15th Avenue: Main Street to College Street

South 15th Avenue is a neighborhood street between College Street and Main Street and has potential to be a high quality bicycle boulevard. There is a short gap in South 15th Avenue, where a parking lot and businesses create a barrier for travel between West Babcock Street and Main Street. There are a number of different "desire lines" that demonstrate the demand for this connection. A bicycle/pedestrian connector through this gap should be formalized. It is acknowledged that South 15th Avenue is not an MSU facility. Given the potential of this connection to improve

community connectivity to MSU, it is envisioned that MSU should participate in facilitating this connection.

South 15th Avenue: College Street to West Lincoln Street

South 15th Avenue from College Street to West Garfield provides access to MSU Family and Graduate Student Housing. The middle segment between West Garfield Street and West Lincoln Street is missing. In the near term a bicycle and pedestrian connection should be created. In the longer term, South 15th Avenue should have separated bike lanes from College Street to Lincoln Street. Willow Avenue is the extension on South 15th Avenue from College to Kagy Boulevard. This street is currently under the jurisdiction of the county. It serves as a connection from residential locations near Kagy Boulevard and South 19th Avenue to campus. In the long term, as residential development continues south of Kagy Boulevard and west of South 19th Avenue this demand will grow. Willow Street should have separated bike lanes connecting Kagy Boulevard and West Lincoln Street.

South 11th Avenue Corridor

South 11th Avenue is a key north/south corridor that connects MSU to neighborhoods to the north and the high school. It forms the west edge of the historic campus core and is the major internal north-south roadway through campus between College Street and Kagy Boulevard. A significant number of students walk across South 11th Avenue in between classes, which often slows motor vehicles to a standstill.

South 11th Avenue: Main Street to College Street

This section runs through a residential area and receives relatively high traffic volumes. It currently has parking on both sides of the street. Future options could include reallocating parking space to bike lanes. Another option would be to route bikes along a parallel, local street that receives fewer motorized vehicles.

South 11th Avenue: College Street roundabout to Kagy Boulevard

Survey results indicate that the South 11th Avenue and College Street roundabout is confusing for people on bikes. In the near term, consider changes to current signage/merging and discuss other options for design of any new roundabouts.

For the section of bike lane between the roundabout and the southern parking access just south of Harrison Street, South 11th Avenue is approximately 45 feet wide. The bike lanes could be significantly wider here and be buffered to provide a more comfortable entrance to the MSU Campus.

In the near term, stripe seven-foot bike lanes with three-foot striped buffers. This leaves 12.5 feet travel lanes in each direction. Also, add pavement markings and signage to the existing bike lanes on South 11th Avenue between College Street and Kagy Boulevard. Add bike lane signs and stencils every 200 feet, or after pedestrian crossings and at the far side of intersections. At the intersections with Grant Street, Lincoln Street and Kagy Boulevard, the stop bar for motor vehicles should be set back to provide six feet of space for bikes forward of the stop bar for cars. When restriping of these bike lanes occurs, the stripe should be repainted six inches wide rather than the standard four-inch line. Additionally, the sidewalk on the east side between Kagy Boulevard and Lincoln Street should be widened to allow space for bikes.

In the mid to long term, replace the on-street bike lanes with separated bike lanes between Kagy Boulevard and Lincoln Street. This could be accomplished by widening the existing sidewalks or adding a separated bike lane. The grassy boulevard next to the traffic lane provides space for snow storage. A bike lane could be constructed on the same level as the sidewalk, but clearly delineated for bike only use by different pavement or striping.

South 11th Avenue: South of Kagy Boulevard

This street connects Stadium View Apartments to campus. It currently has a sidewalk on the west side, an asphalt path on the east side and bike lanes. The bike lanes are currently in the door zone, which is not recommended. In the future, as South 11th Avenue is connected through to the south and receives more traffic, it should be reconfigured to have separated bike lanes or shared use paths on both sides. One option is to separate the bike lanes by using parked cars for separation. This removes the potential for a rider to be hit by a car door and knocked into the path of oncoming traffic. In the near term, the asphalt path on the east side requires maintenance.

South Campus Corridor

This key corridor lies on the north side of Kagy Boulevard between South 7th and South 11th Avenues and connects the South Fieldhouse lots, Kagy Boulevard, Bobcat Stadium and the emerging area of housing growth south of Kagy Boulevard with the core of campus.



South Campus Corridor Typical Section

The development of Stadium View Apartments area combined with growing use of the stadium lots for commuter parking is leading to a significant increase in the number of people using this corridor on foot and bike. As South Campus continues to develop this corridor will be a vital link and such should be developed as a premiere facility and provide enough width to provide a multi-direction bikeway and separation between people walking and biking.

This separation could be physical or visual. Variation in materials, color or texture can be used to differentiate bike and pedestrian space. The bikeway portion should be at least 12 feet wide to accommodate people on bikes in both directions. The current construction of Norm Asbjornson Hall and the parking garage as well as the reconstruction of Kagy Boulevard are key opportunities to begin the development of this vital campus corridor.

South 8th Avenue Corridor

This corridor connects areas of housing with campus. South 8th Avenue was reconstructed several years ago, with MSU constructing their section first and the City following a couple years later. The City of Bozeman included bike lanes in their reconstruction, making South 8th Avenue much more comfortable for many users. The one block section of South 8th Avenue between Harrison and Cleveland Streets does not have bike lanes on it. This is a simple change as the width of the street will accommodate the addition of bike lanes. Campus pathway widening will help to create better connections from the end of South 8th Avenue to the core of campus and future key bike parking areas.

In the near term, add bike lanes on South 8th Avenue from West Harrison Street to West Cleveland Street. This is a continuation of the bike lanes on South 8th Ave and connects to pathways on campus. The existing travel lane is 15 feet wide.



Varying treatments to bike lane on South 8th Avenue

This provides enough room for a five-foot bike lane and a ten-foot motor vehicle lane.

South 7th Avenue Corridor

This corridor connects the north and south sides of campus across Centennial Mall for people walking and biking. It will be the main access to the Norm Asbjornson Hall and the parking garage for motor vehicles coming from Kagy Boulevard. It currently has two driving lanes and two parking lanes. Given the high traffic anticipated going to and from the parking garage, safe and comfortable bikeways separated from motorized traffic are recommended on both sides. In any case, existing trees should be maintained or replaced, as they add significant value to the campus and streetscape. The connection from the Hamilton Lot to Centennial Mall should be improved to improve the safety for people on bicycles. This could be as simple as removal of a single parking space or the construction of a new path connection.

Table 7: Near and Mid-Term Recommendations for East-West Corridors

CORRIDOR/ FACILITY TYPE	PROJECT TYPE	MSU	CITY	DESCRIPTION
Pavement Marking Projects	Annual Restriping	X		MSU regularly contracts to have pavement markings repainted. In all future contracts, the white line between the motor vehicle lane and the bike lane should be six inches wide.
College Street/Spot Improvements	Pavement Markings/ Small Construction	X		Improve crossings of College Street at South 12th, 13th, 14th and 15th Avenues. Improvements shall include high visibility cross walks and paved connections with the pathway along College Street. Install Rectangular Rapid Flashing Beacons (RRFBs) at the intersection of College Street and South 15th Avenue. Signage and pavement markings should be added at pathway crossings to indicate that motor vehicles should yield to pathway users.
West Garfield/Bikeways	Pavement Markings		X	Add striping and signage to south side of roadway from Fowler Avenue to South 19th Avenue. There is 40 feet of pavement, allowing for the center section (with no turn lanes) to be five-foot bike lanes with three-foot buffers and 11-foot travel lanes. The buffers should be removed on the approach to South 19th Avenue, if needed, to provide space for the left turn lane. Lanes may need to be narrowed in this location.
West Lincoln Street/ Bikeways	Pavement Markings		X	From South 19th Avenue to South 11th Avenue, restripe roadway to include five-foot wide minimum bike lanes, this may result in ten to 11-foot travel lanes depending on location.
Grant Street/Bikeway	Pavement Markings		X	Add pavement markings and signage to the existing bike lanes on Grant Street between South 11th and South 6th Avenues. Stencils and signs should be added after every intersection and additional stencils between intersections. At all intersections, the stop bar for motor vehicles should be set back to provide six-foot bicycle forward stop bar. When restriping of these bike lanes occurs, the stripe should be repainted six inches wide rather than the standard four-inch line.
Kagy Boulevard from South 19th to Avenues/ Bikeway	Large Construction		X	The redesign of Kagy Boulevard is an ideal opportunity to provide high quality, high comfort separated facilities for people on bicycles. Consider a bicycle-only facility that is separated from motor vehicles and separated from pedestrians. Particular attention should be given to the accommodation of people on bicycles at intersections. The design of this street should include high quality crossing treatments.

Table 8: Near and Mid-Term Recommendations for North-South Corridors

CORRIDOR/ FACILITY TYPE	PROJECT TYPE	MSU	CITY	DESCRIPTION
South 12th Avenue/ Bikeway	Pavement Markings	X		Add shared lane markings on the newly paved section of South 12th Avenue between West Garfield Street and West Grant Street.
South 11th Avenue/ Bikeway	Small Construction	X		Widen the sidewalk on the east side between Kagy Boulevard and West Lincoln Street to allow space for bikes.
South 11th Avenue/ Bikeway	Pavement Markings	X	X	Add pavement markings and signage to the existing bike lanes on South 11th Avenue between College Street and Kagy Boulevard. Stencils and signs should be added after every intersection and additional stencils between intersections. When restriping of these bike lanes occurs, the stripe should be repainted six inches wide rather than the standard four-inch line.
South 8th Avenue/ Bikeway	Pavement Markings	X		Add bike lanes on South 8th Avenue from West Harrison Street to West Cleveland Street. This is a continuation of the bike lanes on 8th Ave and connects to pathways on campus. The existing travel lane is 15 feet wide. This provides enough room for a five-foot bike lane and a ten-foot motor vehicle lane.
South Campus Corridor/ Bikeway	Construction	X		As identified in the corridor description, construct a facility that will accommodate high volumes of bicycles and pedestrians. It is recommended that the users' types be separated either physically or visually. It is recommended that the initial phase of this connection be constructed as part of the Norm Asbjornson Hall and the Kagy Boulevard reconstruction.
South 7th Avenue/ Bikeway	Construction	X		Create a bikeway along the South 7th Avenue corridor from Kagy Boulevard to Grant Street in accordance with the corridor description above. This should be coordinated with the construction of the parking garage, Norm Asbjornson Hall and the Kagy Boulevard reconstruction.
South 7th Avenue; Bobcat Stadium; South 11th Avenue/Spot Improvements	Large Construction	X	X	The redesign of Kagy Boulevard is an ideal opportunity to provide high quality, high comfort crossing treatments. It is recommended that if Kagy Boulevard is designed as a wide, high speed arterial street, the ideal solution is to provide grade separation for people on bicycles.

Table 9: Near and Mid-Term Recommendations for Campus Path Widening and Spot Improvements

CORRIDOR/ FACILITY TYPE	PROJECT TYPE	MSU	CITY	DESCRIPTION
Pavement Marking Projects	Annual Restriping	X		MSU regularly contracts to have pavement markings repainted. In all future contracts, the white line between the motor vehicle lane and the bike lane should be six inches wide.
Family and Graduate Housing Connection/ Shared Use Path	Construction	X		Repave the existing east-west shared use path through Family and Graduate Housing. The existing pavement is cracked, broken and severely deteriorated. This improvement should include improving the crossing at South 15th Avenue.
Family and Graduate Housing Connection/ Shared Use Path	Large Construction	X		Construct a shared use path connecting from the intersection of Grant Chamberlain Drive and South 15th Avenue to South 11th Avenue. This path generally follows Glacier Court and Deer Street and should include widening of existing campus sidewalks. This project could include a pedestrian connection to the Bison Lot.
Campus-wide Pathways	Small Construction	X		Projects should be regularly planned to widen key campus connections to provide additional room for bicycles. These projects can be programmed individually as small projects or maintenance activities or aggregated to larger projects.
South 15th Avenue; Main Street to Babcock Street/Shared Use Path	Construction	X	X	Create a bicycle and pedestrian connection between Main Street and Babcock Street.
South 7th Avenue at Centennial Mall/Spot Improvements	Small Construction	X		Improve bicycle access from South 7th Avenue/Hamilton Lot to Centennial Mall. The current pathway is blocked by parking. This will improve safety and accessibility for both bicycles and pedestrians at this location.

Bicycle Parking

Designated bicycle parking may not be used if it is less appealing or less convenient than the nearest railing, tree or trash can. Providing the appropriate quantity of high quality bicycle parking in convenient locations will reduce instances of this “bicycle clutter” near entrances to buildings. This section describes and defines several types of bicycle parking. Depending on the location on campus and the use of the adjacent buildings, bicycle parking will serve different users for varying lengths of time. For that reason, this guide identifies bicycle parking by facility type rather than duration. Table 10 shows performance criteria for bike parking racks based on the Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guidelines.

When properly designed and installed, the racks shown in Table 11 typically meet all performance criteria and are appropriate for use in nearly any application (APBP Bicycle Parking Guidelines).




Standard Bicycle Parking

Standard bicycle parking utilizes high quality racks and is the most widely used bicycle parking solution. Bicycle racks should be visible from the building entrance they serve and be placed relatively close (50 feet or less is best). Rack designs can vary in security, density and aesthetics. Racks are available in single or double-sided, as well as straight in or angled. Arrays of this style rack can result in improved efficiency, increased convenience and allow for flexibility to meet desired aesthetics and site constraints. Thoughtful layout will reduce the appearance

Table 10: Performance Criteria for Bicycle Racks

CRITERIA	NOTES
Supports bike upright without putting stress on wheels	The rack should provide two points of contact with the frame—at least six inches apart horizontally. Or, if a rack cradles a bicycle’s wheel, it must also support the frame securely at one point or more. The rack’s high point should be at least 32 inches.
Accommodates a variety of bicycles and attachments	Avoid designs and spacing that restrict the length, height or width of bicycles; attachments or wheels.
Allows locking of frame and at least one wheel with a U-Lock	A closed loop of the rack should allow a single U-lock to capture one wheel and a closed section of the bike frame. Rack tubes with a cross section larger than two inches can complicate the use of smaller U-locks.
Provides security and longevity features appropriate for the intended location	Steel and stainless steel are common and appropriate materials for most general use racks. Use tamper-resistant mounting hardware in vulnerable locations.
South 7th Avenue at Centennial Mall/Spot Improvements	First-time users should recognize the rack as bicycle parking and should be able to use it as intended without the need for written instructions.

Table 11: Recommended Bicycle Racks for all Applications

	<p>Inverted U, staple or loop racks have two points of ground contact. Can be installed in series on rails to create a free-standing parking area in variable quantities. Available in many variations.</p>
	<p>Post and Ring racks are a common style appropriate for many uses; one point of ground contact. Compared to inverted-U racks, these are less prone to unintended perpendicular parking. Products exist for converting unused parking meter posts.</p>
	<p>Wheelwell secure racks include an element that cradles one wheel. Design and performance vary by manufacturer; typically contain bikes well, which is desirable for long-term parking and in large-scale installations (e.g. campus); accommodates fewer bicycle types and attachments than the two styles above.</p>



Higher-Density Racks such as the Peak Rack — Campus Rack can provide order and density



“Inverted U” racks are used at Jobs Hall on campus

of “bicycle clutter” and facilitate repositioning and maintenance. The individual design of the rack offers the opportunity for customized features that can enhance the identity of bicycling at MSU. MSU should update their bicycle rack standards to include one or more of the rack types in Table 11 and ensure that all future bicycle racks meet the performance criteria of the latest APBP Bicycle Parking Guidelines.

High-Density Parking

While the rack types highlighted in Table 11 provide maximum convenience and usability, some locations demand higher density bicycle rack parking. For these locations, racks that stagger the handle bar height of adjacent bicycles can offer an increased number of bicycles parked within the same footprint.

Other high density options include racks that hang bikes vertically or offer two levels of bikes in the same footprint. High density racks are also available in single and double sided, straight or angled. MSU should install high density racks where space is constrained and demand is high. A number of high density racks were installed at Renne Library during the 2016 fall semester.



Covered bike parking combined with a vending machine

Covered Bike Parking

MSU can improve bicycle rack parking options by providing shelter over groups of bike racks. Covered parking protects bicycles from sun, rain and snow, contributing to the bike’s lifespan and makes bicycling a more attractive option during inclement weather. Covered bicycle rack parking offers additional benefits by reducing the cost and effort required to remove snow at these bicycle parking locations. MSU should install areas of covered bike parking. This can be accomplished through utilizing areas such as existing building overhangs or through the addition of partially attached or freestanding cover structures. Additionally, covered bicycle rack parking should be considered as part of all new building construction. Centralized or “hub style” areas of covered bicycle rack parking may serve to reduce the demand near building entrances as some users will choose covered parking over proximity to buildings.



Covered bike parking at a university in Ede, The Netherlands

Covered bike parking is recommended for the following locations (additional locations should be evaluated on an individual basis as opportunities or campus development allows).

- West side of Cobleigh Hall
- Between Wilson and Herrick Halls
- North side of Animal Bioscience Building
- East end of Centennial Mall
- South side of Renee Library
- East side of Reid Hall
- North Side of Visual Communications building
- East side of Linfield Hall near Service Drive
- Northeast corner of Gaines Hall
- Between Roskie Hall and Hedges South (Residence Life)
- All new Residence Halls

Secure Bicycle Parking

As suggested by the name, secure bicycle parking provides an enhanced level of security for the bicycles. Secure bicycle parking can take varying forms, ranging from bicycle lockers to secure storage rooms. It is designed to meet the needs of employees, residents, public transit users and others that may leave bikes for several hours or longer or simply value added security and protection from weather. Bikestation (www.bikestation.com) is a model that combines a secure bike parking room with storage lockers and optional access to bike repair facilities, parts, supplies and often shower facilities. Facilities that align with the Bikestation model would enable MSU commuters to leave a bicycle on campus for use during the day. Options such as this can be of high value to commuters that utilize transit or vanpool/carpool to access campus.

In the last two years, MSU has implemented two secure bicycle parking solutions. In 2015, MSU installed two double bike lockers that can store a total of four bikes near Grant Street and South 7th Avenue (close to Skyline and Streamline bus stops). The lockers were purchased with Federal Transit Administra-

tion funds and are intended to better integrate bike and bus travel connections. They were moved to another location due to construction of Norm Asbjornson Hall in fall 2016.

Yellowstone Hall opened for the 2016 fall semester and includes a secure storage room for bicycles. Yellowstone Hall also includes a room that is available for bicycle maintenance and repair. All new residence halls should have secure bike parking included as an integral part of the design. A separate outside entrance to these facilities may be a good design alternative. All other campus construction projects should consider including secure bicycle parking areas.



Secure bicycle parking at the University of British Columbia, Canada



At MSU's distant parking lots secure bicycle parking is needed



Covered and secure bicycle parking in Munster, Germany

Secure Parking Areas

Secure Parking Areas are a specific type of secure bicycle parking. They are often free-standing structures or enclosed areas within a larger structure (for example, an enclosed portion of a parking garage or a room in an existing building with exterior access). Accessible via key-card, combination locks or keys, Secure Parking Areas provide high-capacity parking for ten to 100 or more bicycles. Increased security measures encourage bike transportation for those whose biggest concern is theft and vulnerability. Ideally each SPA should have a service area around it and be equipped with a fix-it station and lockers to stow gear. Access should be controlled by a single entity, such as Parking Services or the Bicycle Program Manager.

Secure Parking Areas located in the campus core are ideal for University staff, students and faculty who will be working/attending class in one sector of campus and have little time-sensitive, cross or off campus travel during a typical day.

Secure Parking Areas may be placed in parking lots perceived as too far to walk, where biking would provide quick access to campus. MSU is already experiencing a growing number of commuters who drive to campus and park their motor vehicle in remote lots, such as the Lincoln Lot or the Stadium Lots where they have a bike parked. Secure Parking Areas provide a secure location to leave a bicycle throughout the day or overnight. MSU should install several pilot Secure Parking Areas. Potential Secure Parking Areas sites include:

- Stadium Lots
- Lincoln Lot
- Antelope or Bison Lot
- South Fieldhouse Lot
- Parking Garage
- Lewis and Clark Lot
- Existing Residence Halls or Family and Graduate Housing
- New Residence Halls or Family and Graduate Housing

Areas identified for covered bicycle parking should also be considered as possible locations for construction of a Secure Parking Area.

Installation Guidelines

Proper bicycle rack installation also involves situating them appropriately with respect to buildings and to other racks. Racks should be installed reasonably close to main entrances to buildings in well-lit, visible parts of campus with high pedestrian volumes to deter theft and enhance the rack's overall convenience. Figure 13 depicts installation guidance for racks showing rack configuration, and critical distances to walls and trees.

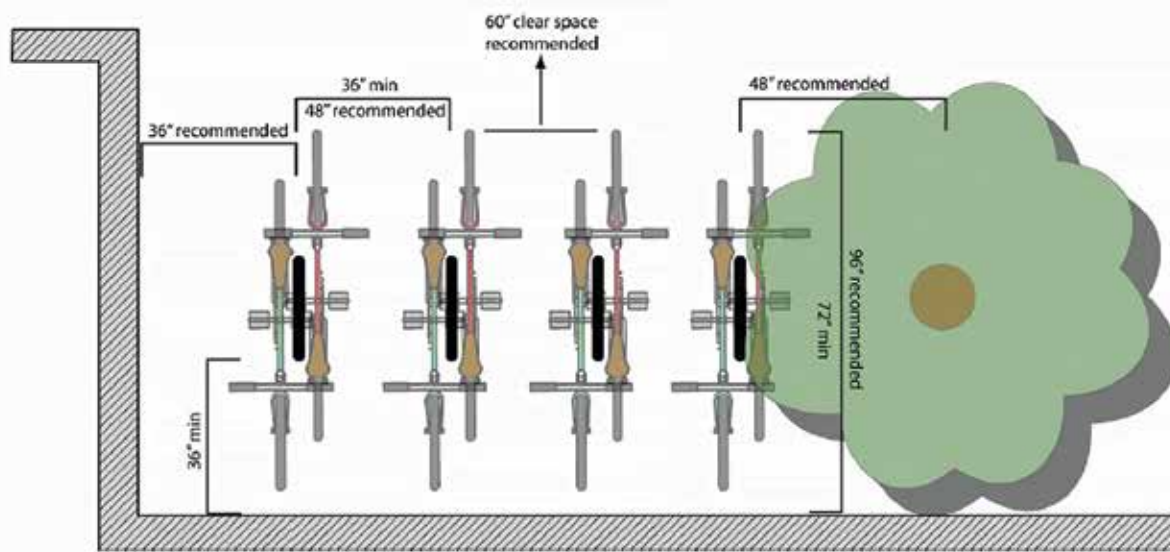
Bike Parking Needs

It is a useful exercise to estimate the number of bike parking spaces needed to accommodate future growth at different bike mode share goals. Table 12 shows the overall bike parking supply based on several potential mode share goals. In the fall of 2015 university students, faculty, staff and other employees totaled 18,513 individuals.

Core Campus Bicycle Parking Projections

The use of bicycles for transportation continues to grow at MSU. In a 2009 survey summarized in MSU's Climate Action Plan, an average of 15% of respondents reported they com-

Figure 13: Standard Bicycle Parking Layout



mute to MSU by bike. In the more recent 2014 MSU Transportation Survey, 23% of respondents reported that bicycling is their primary mode of transportation to MSU. Table 12 indicates that the MSU campus currently has bicycle parking to accommodate a bicycle mode share of around ten percent. In the near term it is recommended that the available bicycle parking in the core of campus be increased to provide enough spaces to accommodate a 20 percent bicycle mode share. The increase in available spaces should include the addition of covered and secure bicycle parking options. Implementation of this recommendation may take time. Priority should be given to high demand locations at the core of campus.

As the MSU campus becomes better connected to the rest of Bozeman through bikeway improvements, demand for bicycle parking will increase. Given the moderate growth campus enrollment projections, as presented in the MSU Transportation Master Plan, campus could experience a 1.5 percent increase in student population and a 1.76 percent increase in faculty and staff by 2025. It is recommended that MSU consider increasing bicycle parking to meet this increased demand with the ultimate longer term goal of accommodating a 25 percent bicycle mode share. To accomplish this, MSU may need to invest in approximately 3,400 additional bicycle parking spaces. If the campus has ambitions of growing in excess of this number, additional bike parking should be budgeted and installed. Bike parking must be evaluated and adjusted on a regular basis to meet demands as they change over time.

Residence Hall Bicycle Parking Projections

Since many students bring a bike with them to campus, residence halls require more bicycle parking spaces than other campus buildings. In general, there is less daily turnover of the bike parking at the residence halls. Additionally, some students bring expensive recreational bicycles to campus

and value covered bike parking and the increased security of secure parking areas. For these reasons, it is important to provide secure parking areas for residence halls.

The new Yellowstone Hall, completed in 2016, has 400 additional beds. The residence hall features both standard bicycle parking and a secure bicycle storage room. Yellowstone Hall also includes a bike maintenance room. This will be an important case study to understand the reception to these facilities with MSU students.

Overall MSU will be maintaining residence hall capacity for 4,200 students beginning in the fall of 2016. Using the suggestions in the following section for 0.6 bike parking spaces per resident indicates a need for 2,520 bike parking spaces oriented at campus housing. Given the high demand and often limited space at residence halls, high density bike parking options should be used. It is recommended that the available bike parking at existing residence halls be increased and that any future residence halls provide bike parking in accordance with Table 13. Covered or secure bike parking facilities should be considered in the efforts to increase available bicycle parking at existing residence halls.

Bike Parking Requirements

Some universities have adopted guidelines to ensure proper bike rack supply throughout their campus growth and expansion. These guidelines can take many forms, but most of them associate a fixed number of racks or bike parking spaces with a given size or use of the building. This allows the university to estimate usage and place racks where the greatest demand is likely to occur. In practice, additional bicycle parking may be needed or relocated to meet actual demand.

Table 12: MSU Bicycle Commuter Goal and Parking Supply

COMMUTE RATE GOAL	FALL 2015 CAMPUS POPULATION ¹	NUMBER OF BIKE COMMUTERS AT MODE SHARE TARGETS ²	EXISTING NON-RESIDENT HALL BIKE PARKING SPACES ³	SURPLUS/ (DEFICIT) ⁴
10%	18,513	1,851	2,378	64
15%	18,513	2,777	2,378	(1,093)
20%	18,513	3,703	2,378	(2,250)
25%	18,513	4,628	2,378	(3,407)

1. Based on 2014 campus population for students, faculty and staff.
2. Number of bike commuters is generated by multiplying the Mode share target rate by the existing campus population.
3. Based on inventory provided by MSU in Fall 2015.
4. The number of new bike parking spaces is generated using the following formula: (Number of Bike Commuters x 10 / 8) - Existing Bike Parking Spaces; 80 percent rack utilization is a best practice goal for peak period bike parking. This goal ensures there is a perception of bike parking availability and rack capacity issues, such as abandoned bikes on racks which accumulate over the course of a semester, can be accommodated.

Table 13: Recommended Bicycle Parking Requirements

BUILDING TYPE / ACTIVITY TYPE	SHORT-TERM PARKING
Residence Halls	0.60 spaces for each resident (0.05 spaces of standard bicycle parking and 0.10 spaces of secure bicycle parking for a total of 0.60 spaces per resident)
Higher Education Buildings (e.g. library, classrooms and other university academic buildings)	Two spaces for each 10 employees/students of planned capacity (planned building capacity multiplied by 0.2, i.e. 20%) Also, new buildings should consider providing some number of covered and/or secure bicycle parking as part of this total
Assembly (e.g. stadiums)	Space for 5% of maximum expected attendance (can be temporary parking such as valet parking for football games)

Recommended standards for MSU bike parking are adapted from the APBP Bicycle Parking Guidelines, 2nd Edition (2010). These guidelines were developed based on surveys and best practices from around the United States and formed the foundation of the following bicycle parking recommendations. Table 12 outlines the number of bicycle parking spaces that should be provided based on the functional use of the building. These recommendations look to provide adequate parking spaces for a 20 percent bicycle mode share goal. Table 14 outlines the general near and mid-term bike parking recommendations in regards to geographical placement to help achieve a 20 percent bicycle mode share.

Rack Consolidation & Relocation

In recent years, MSU has attempted to serve bicycling demand by locating bicycle parking as close to building entrances as possible. While this works well in some locations, it has

resulted in overcrowded racks and bikes locked to a variety of other furnishings. Racks in front of each building encourages bicycling in many of the more constrained areas of campus such as the Romney Oval and passages near Montana Hall. Some campuses have endeavored to offer larger banks of high quality bike parking in key areas of campus which are accessible by the bicycle network and keep bikes on the periphery of higher use pedestrian areas. Such strategies seek to reduce potential pedestrian conflicts and reduce numbers of people biking in the campus core. MSU is a compact campus where students have little trouble on foot during transition periods between classes. Providing higher-quality bike parking in a reduced number of strategic locations may be a sound strategy for both encouraging bicycling to, from and within MSU and reducing some of the conflicts, real or perceived, with pedestrians. The parking recommendations in this plan look to supplement this strategy.

Table 14: Near and Mid-Term Recommendations for Bicycle Parking

CORRIDOR/ FACILITY TYPE	PROJECT TYPE	DESCRIPTION
High Density Bicycle Parking/Campus-wide	Parking Expansion	As opportunity allows, install additional high density bicycle parking in the core areas of campus.
Cobleigh Hall/Linfield Hall or Willson Hall/ Covered Bicycle Parking	Construction	Add more high capacity, high quality, covered bike parking at campus arrival points. These locations have existing high use bicycle parking areas and provide opportunity to create magnet parking areas that will draw people arriving by bike to park there. These have the potential to reduce the number of bikes parking in the core of campus. The covered bicycle parking could be developed as a student let project with the involvement of engineering students in the layout and design.
Remote "F" Parking Lots/Bicycle Parking	Construction	Bicycle parking areas are recommended for the East and West Stadium Lots, the Lincoln Lot and the new Bison Lot. Increasing numbers of commuters are utilizing bicycles to access campus from these distance lots. Providing quality bicycle parking could encourage increased use of these distance lots.

Support Facilities

For those biking longer distances to campus, having end-of-trip facilities such as showers, lockers and fix-it stations that support riding can encourage more people to ride more often. Access to tools and bike pumps allows bike riders on campus to fix unexpected mechanical issues or inflate tires with air.

As MSU moves forward, the provision and location of shower (and locker) facilities should be a consideration in new and retrofitted buildings. Any new Secure Parking Areas (SPA's) that are developed should (ideally) have a shower and locker facility nearby, either in the same building or an adjacent building.



MSU's first bike fix-it station

Wayfinding and Signage

Wayfinding and signage are an important part of a safe and efficient bicycle network. It is recommended to develop a plan for wayfinding, guidance and directional signage on campus that compliments off-campus wayfinding and signage. Wayfinding signage should be used to indicate bikeways, junctions and major destinations on campus. Guidance signage should assist users in understanding bicycling etiquette, such as yielding, dismount zones, bicycle parking and general policies and regulations. Directional signage should be used for pavement markings and transportation related communication as bicyclists interact with pedestrians and other modes of travel. All campus construction projects should also, where applicable, include directional or informational signage for cyclists if the project impacts existing bicycle facilities, particularly on bicycle routes or at street intersections.



Clear Wayfinding and Signage in Munster, Germany (top) and pavement markings at an underpass at U of Colorado in Boulder (bottom)

Chapter Highlights

A vital element of bicycle transportation to, from and within the MSU campus is bike network connectivity. This chapter identifies key areas of Bozeman that should be well connected to the MSU campus and identifies key corridors that should provide the needed connectivity.

Key east-west bikeway corridors accessing MSU campus include:

- College Street
- Cleveland Street (or Harrison in future)
- East and West Garfield Street
- West Lincoln Street
- Kagy Boulevard
- Grant Street

Key north-south bikeway corridors accessing MSU campus include:

- South 23rd Avenue
- South 15th Avenue
- South 11th Avenue
- South 8th Avenue
- South 7th Avenue

This chapter describes the types of bikeways recommended for MSU including shared use paths, separated bike lanes, conventional bike lanes and shared lanes. It recommends near, mid and long-term improvements to the corridors as well as other spot improvements and paths within campus. It provides criteria for bike parking racks and discusses short and long term bike parking strategies. It recommends specific goals for bike parking and locations for bike parking improvements.



High density, double stacked bicycle racks near Utrecht Central Station in The Netherlands

5

*“The bicycle is a curious vehicle.
Its passenger is its engine.”*

John Howard



RECOMMENDED PROGRAMS AND IMPLEMENTATION STRATEGIES

Introduction

This plan has set the vision that “Montana State University will create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors.” Accomplishing this will take not only improvements to the physical environment but will also require programs and policies that support safety and encourage the use of bicycles as transportation.

This chapter provides program recommendations with potential strategies for their implementation. Each section identifies specific program or policy recommendations that will help fulfill the objectives identified in Chapter 1. The implementation ideas include potential program locations within specific university departments or outline potential partnerships between

MSU departments. The intent is to recommend implementation strategies that could be used as a starting point and a means to foster discussion. The final implementation strategies will come from further exploration and discussion of available resources and potential partnerships.

Bicycle Program Manager

The recommendations in this plan are comprehensive and involve partnerships across many departments of Montana State University, as well as external partnerships and outreach. A growing number of universities around the country staff a part- or full-time Bicycle Program Coordinator position. To take full advantage of current bicycle planning and safety efforts and to assist with implementation of the programs outlined in this plan, MSU should prioritize creating and staff-

ing an ongoing Bicycle Program Manager position. A coordinated and prioritized strategy for implementation of this plan is most likely to be successful with oversight from one person.

Given the need for coordination across MSU departments and staff, it is strongly recommended that the paid position be an MSU staff position with responsibility for moving MSU toward the vision of being a “leader in setting policy, developing programs, encouraging respectful riding and improving infrastructure to encourage bicycling to, from and within the MSU campus.”

Currently, the responsibility for bicycle issues is shared between University Services, Parking Services, the Office of Sustainability, Auxiliaries Services, ASMSU and the MSU Bicycle Taskforce.

We recommend that the University integrate the Bicycle Program Manager position within University Services to centralize bicycle issues and also facilitate the position to work closely with other departments. It may be necessary to have the Bicycle Program Manager fulfill other responsibilities as well. This position could also be expanded to encompass pedestrian and transit issues, a Multi-modal Coordinator. However, the University should dedicate a full-time employee to the Bicycle Program Manager position as resources allow. If funding the position proves to be a challenge, it may be possible to gain financial support from various departments, such as the Office of Sustainability, with each department providing a portion of the money required.

The following is a brief list of anticipated benefits associated with having a dedicated bicycle coordinator:

- Single point of contact to assume responsibility for implementing bicycle projects and programs
- Improved coordination of bicycle issues on capital projects

- Coordinated and proactive management of bicycle infrastructure
- Increased bicycle mode share
- Reduced motor vehicle parking demand from attracting vehicle commuters to bicycling modes. This has two primary benefits:
 - Saves the University from adding additional parking capacity at high cost
 - Allows the University to allocate land for purposes other than vehicle parking
- Commitment to sustainability and reducing the University’s greenhouse gas emissions.
- Assist in establishing the University as a regional leader in bicycle issues

The Bicycle Program Manager’s responsibilities will evolve as plan implementation progresses but should include the following key tasks:

- Oversee implementation of the Bicycle Master Plan
- Work collaboratively with students, faculty and staff to engage students in the planning, design and implementation of bicycle programs or projects on campus.
- Identifying new projects and programs that would improve the University’s bicycling environment and improve safety for bicyclists, pedestrians and motorists
- Organize and facilitate Bicycle Advisory Committee meetings
- Coordinate bike infrastructure and programming with campus constituents and departments including, but not limited to, Parking Services, University Services, University Police, ASMSU, Office of Sustainability, Auxiliary Services and Residence Life.
- Developing and maintaining website and social media outreach on campus for bicycling

- Developing and managing a database of information related to implementation of the plan, especially as it pertains to performance measures and project planning. The database should include the following information:
 - Bicycle counts
 - Bicycle parking inventory and utilization rates
 - Event participation such as Bobcat Bike Check and Bike to School participation
 - Education program participation
 - Additional metrics to track goals set out in the MSU Climate Action Plan

Bicycle Advisory Committee

A Bicycle Advisory Committee should be formed to provide support and perspective from across the university. The Bicycle Advisory Committee (BAC) be created to ensure continued progress toward the University's vision to create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors. It is recognized that until a Bicycle Program Manager position is created and staffed, the BAC will provide guidance and support to the campus on bicycle matters. The BAC should be composed of a diverse membership from across campus departments. This will enable the BAC to foster the conversations needed to identify where the best opportunities to incorporate bicycle program implementation within existing university programs and departments. The goal will be to identify campus departments whose existing responsibilities best match with the specific programs from this plan. The BAC can also help to identify appropriate funding sources for the programs. The BAC will be instrumental in prioritizing and implementing Bicycle Master Plan projects and programs and in evaluating and updating components of the plan.

Bicycling Website

The BAC and Bicycle Program Manager should establish and maintain a centralized web resource for bicycle information at Montana State University. Currently bicyclists can access multiple webpages related to bicycling within the www.montana.edu domain. The resources and information on these webpages should be combined under a single resource and utilize cross-links to current university policies. The new webpage should be the comprehensive authority on bicycling issues. MSU's bicycle website should directly include or provide access to the following information:

- Information on how to safely and courteously ride your bike on campus, including rights and responsibilities, where bicycling is permitted and areas where it is suggested to walk your bike
- Information on riding your bicycle on the road including laws as well as techniques for increasing your safety
- Maps, including links to:
 - Campus Cycling Map showing suggested routes and locations of bicycle parking facilities.
 - Bozeman Area Cycling Map showing suggested bike routes and pathways
 - Bozeman Area Trail Maps showing in town trails
- Information how to ride Streamline with your bike
- Best practices for locking your bicycle
- Secure Bicycle Parking Access & Registration. As MSU implements secure long-term parking areas, information about access and costs should be available on the webpage
- A list of campus events including clinics or workshops, group rides/walks, campus-wide events (such as Bike to School Week) and volunteer opportunities
- A copy of the most recent Bicycle Master Plan
- A current list of local bike shops, including phone number and address
- A current list of all local bicycling groups, including clubs and advocacy groups

Other information that will bring value and maintain interest in the webpage could include:

- Bike buddy matching service
- Repair tutorials
- Message board
- Blog featuring stories and news
- Photo galleries from events and submitted by readers
- Information and/or a forum for buying/selling bicycles

Creating a one-stop bicycling resource website will take time to establish but can be a valuable resource for engaging students, soliciting input and generating support for continued efforts. Webpages are most successful when it is both easy to use and updated regularly. All website content should be reviewed regularly for accuracy.

Education Programs

Education of all road users is a key element to improving safety. Motor vehicle drivers, people on bicycles and other wheeled modes along with people walking have a shared responsibility for the safety of everyone. Education efforts should also focus on the idea of courtesy and respect for each person using the transportation system.

New Student Orientation

Montana State University has a concerted effort to introduce all new students to the MSU Bozeman Campus. New student orientation and other beginning-of-year activities should include an increased availability of information on walking and biking to, from and within campus.

A variety of outreach methods and materials can address important topics such as safety and courtesy, rights and responsibilities and proper security measures. This information is a natural fit with orientation efforts that are already in place at MSU.

MSU should create a mandatory bicycle safety web tutorial for all new students. This web tutorial would be similar to the Substance Abuse, Haven and Transit mandatory online programs required as part of new student orientation to campus.

The Bicycle/Pedestrian efforts during orientation should include the distribution of information including:

- Promotion of safe and courteous bicycling and walking on campus.

The screenshot shows the UC Davis Transportation Services website. The header includes the university name and a search bar. A navigation menu is located at the top. The main content area is titled 'BICYCLE PROGRAM' and features a 'News & Events' section with several bullet points. Below this is a list of links for various services and resources, such as 'Bicycle Lock Cutting Service', 'Summer Bicycle Storage', and 'Other Campus Bicycle Services'. At the bottom, there is a 'Join the goClub' section.

Bicycle program website from the University of California, Davis (<http://bikes.as.ucsb.edu>)

- Safe and legal practices for riding on the road with cars
- Safe and legal roadway crossing behavior
- Campus facilities such preferred bikeways, covered and secure bicycle parking areas and repair stations
- Ways to prevent bicycle theft including bicycle registration and best practices for locking bicycles
- Campus resources for bicycle repair and maintenance clinics as well as off campus options including the Bozeman Bike Kitchen
- Promotion of the MSU bicycling website as the resource for all bicycle related information on campus

Potential methods and opportunities include:

- Distribution of information tables at campus events such as Catapalooza, during Bike to School Week each spring and in prominent locations such as the SUB, residence halls and dining facilities
- Beginning of the year/semester email and newsletter communications with students, faculty and staff
- Residence hall bulletin boards
- Bike lights and helmets sold at cost or below cost at tabling events, through the campus bookstore and ASMSU Outdoor Recreation



Adult bike safety education clinic held in Bozeman



Proud new owner of a raffled bike at MSU's Sustainabilibash 2016

Bike Safety Education

Riding a bicycle for transportation is a healthy and fun option for many people associated with the MSU Bozeman campus. For many people, there is nothing quite like the freedom that you get from riding a bike. Regardless of age, proper bicycle safety is a very important consideration in ensuring that riding remains fun and healthy.

Bicycle safety includes a number of factors:

- The bicycle must be in proper working order
- The person riding the bike should choose appropriate safety equipment/clothing
- The rider should understand how to safely negotiate the network of roads and paths on their chosen route.

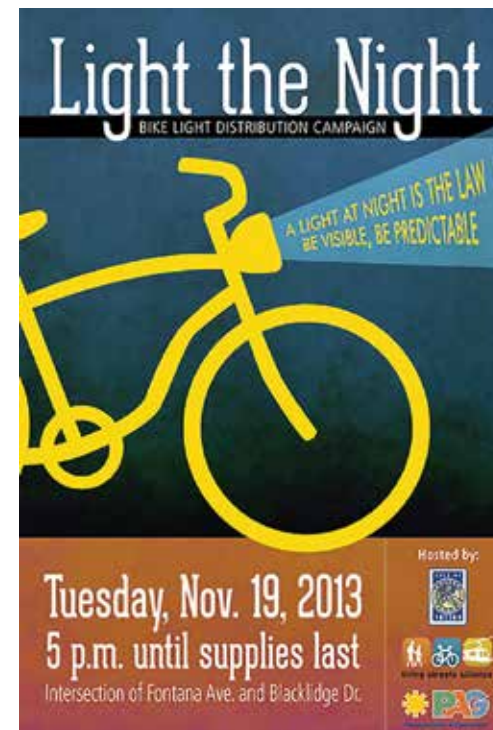
Many people in the United States receive in-depth training before receiving a driver's license. Bicycles are also vehicles that are used on the roads, but most Americans do not receive any training about the rules of the road, how bicycles work or how to ride a bicycle on the roadway. The MSU community includes many people that come to Bozeman from around the world, from communities with different rules, expectations or conditions for riding a bicycle. Comprehensive bicycle safety education opportunities should be available to all people at MSU. To achieve wide exposure to these opportunities, the bicycle education program at MSU should include several formats of delivery. Formats could include:

- The mandatory online safety class identified previously
- Simple distribution of printed materials at tabling events or with orientation materials
- One hour classes offered at residence halls during the first week of the year
- One hour lectures offered at various times of day at varying locations on campus
- Discussion forums during Bike to School Week or as part of the MUS Wellness program

- Education classes such as those offered by the League of American Bicyclists (<http://www.bikeleague.org/ridesmart>) or the American Bicycle Education Association (<http://cyclingsavvy.org/>).

Regardless of the format, the effort should include information on:

- Mechanical safety including brakes, tire pressure, gearing, bicycle fit, etc.
- Safety equipment including helmets, lights and reflectors and visible clothing
- Riding safety including rules of the road, road positioning, pathway etiquette and safe operation of a bicycle



Campaign at the University of Arizona

The printed material should offer the most critical safety considerations as well as longer information on how to access additional resources through the MSU Bicycling website.

Bicycle safety lectures can be included into the curriculum for many classes across campus departments. Courses in Health Enhancement, Education, Human Development, Sustainability, Outdoor Education and University Studies all offer opportunities to include bicycle safety education within existing curricula. The longer format sessions can include more in depth coverage of the various safety considerations and should include opportunities for on-bike education. Bike education should include instruction on the critical bike handling skills (braking, turning and shifting) and opportunities for on road practice of safe road position, signaling and route finding. Community rides offer a fun and interactive way to accomplish this on road education.

In addition to the comprehensive education program the following subject specific campaigns should be implemented.

Lights-on Campaign

Many bicyclists, especially students, are unaware that lights are required by law, or they simply do not purchase lights. Research shows that bicyclists who do not use lights at night are at much greater risk of being involved in bike-car crashes. The goal of a bike light campaign is to encourage light use through marketing, outreach and the distribution and on-the-spot installation of free or low-cost bike lights. This multi-pronged outreach effort should take place every October, as the days are getting shorter. MSU staff and student volunteers could lead the outreach efforts, while coordinating with the proposed Bicycle Program Manager.

The MSU bike light campaign is part of the overall education effort and should include the following elements:

- Well-designed graphic ads throughout campus
- Outreach to students, faculty, staff and visitors through roving Bicycle Ambassadors, tabling, orientation and the MSU Bicycling Website.
- Involvement of the University Police Department in the distribution of bike lights
- Discounted or free bike lights and reflective gear distributed on campus and available at local bike shops during the beginning of the academic year or term
- Bicycle Ambassadors stationed at key locations who thank bicyclists for using bike lights and distribute award incentives

Slow Your Roll Campaign

The core of campus, and particularly Centennial Mall, is a crowded place during the transition between classes. Frequent complaints are received regarding bicycles traveling too fast. Fortunately, crashes are infrequent as they can result in serious injury. A concerted effort should be made to reduce the speed of any wheeled traffic in these locations. "Slow Your Roll" is an example of a campaign that could be utilized to promote safe and courteous riding on campus. Campaigns such as this can be very successful when students are involved in the messaging and distribution of the information. Student involvement ensures that the campaign is relevant to students and builds buy-in from the student body.

In addition to developing bicycle education and etiquette classes, the University should take every effort to minimize negative car and bicycle, bicycle and pedestrian interactions through improved infrastructure. Providing improved infrastructure as recommended throughout Chapter 4 will not only increase ridership but also decrease the negative interactions between cyclists and pedestrians that currently occur in the core of campus.

Winter Cycling

For much of the school year in Bozeman, winter cycling conditions exist. Despite the cold, snow and ice that are often part of winter cycling, there are many days when the sun is shining, the air feels warm and the roads are clear.

Winter cycling education should be included in an effort to increase the number of people using bicycles as transportation. As with other efforts the winter cycling education program should include promotional materials as well as in-person classes. Information about special equipment, bicycle maintenance, clothing, lights, riding techniques and route choices specific to winter conditions should be included in printed material, on the website and in the classes. Winter cycling can seem daunting, for this reason, community or buddy rides can provide a supportive environment for people to experience the joys of riding through winter in Bozeman.

Bicycle Maintenance Classes

ASMSU Outdoor Recreation maintains a bike shop that is accessible to students wanting to learn about bicycle maintenance and repair or for students needing help with maintenance and repair.

ASMSU Outdoor Recreation has expressed an interest in developing a series of maintenance classes. These classes could include short workshops on flat repair, the basics of brakes and shifting and a more in-depth workshop series to provide a deeper understanding of bicycle repair and maintenance. ASMSU Outdoor Recreation could work with Residence Life to offer the basic workshops during the first weeks of school and again in the spring. Workshops could potentially be held in the Residence Halls or other locations around campus. ASMSU Outdoor Recreation offers training using the Park Tool School curriculum for its staff. Park Tool is a bicycle tool manufacturer who provides hands-on training to shops. This provides

shop staff, such as those that work in the Outdoor Recreation shop, with the knowledge and training to help others learn basic maintenance skills that will help eliminate frustrating situations such as being stranded by a flat tire. In the long term, ASMSU Outdoor Recreation could offer the Park Tool course as a class open to all MSU students, faculty and staff.

Encouragement Programs

For many people one of the largest barriers to using a bicycle for transportation is trying it for the first time. For most people, driving to campus has been the default choice and is viewed as the most convenient option.



Commuter challenges and Bike to School/Work week encourages group and community participation



Fall Semester Bike Buddy Program 2016

recommended that MSU increase the visibility of this event on campus and also participate in or champion a “Winter Bike to Work Day,” potentially in January or February. This event should be held indoors and focus on equipment to allow safe and comfortable riding during the winter months and advice on route selection and other snow related issues.

Bike Buddy Program

An MSU Bike Buddy program would match inexperienced or new riders with a trained volunteer familiar with riding in Bozeman. Bike Buddies could help with:

- Selecting a comfortable route
- Riding safely in traffic
- Basic maintenance such as fixing a flat tire
- Understanding what gear could make bike commuting more enjoyable
- Taking your bike on the bus
- Winter cycling

Bike Buddies could be matched based on location and to help reduce anxiety. Bike Buddies might just meet and talk or they may choose to ride together to build confidence and experience.

Several examples of Bike Buddy Programs are profiled below.

TBARTA Bicycle Buddy Program

(<http://www.tampabayrideshare.org/bike.html>)

The Bike Buddy Program is a free service through Tampa Bay Area Regional Transportation Authority (TBARTA) that matches bicycle commuters with one another. The goal of the Bike Buddy Program is to encourage more residents in the Tampa Bay region to try bicycle commuting and to ultimately increase the number of trips made by bicycle.

University of Washington Bike Buddy

(<https://www.washington.edu/facilities/transportation/bikebuddy>)

For Bike Month 2016, University of Washington Transportation Services is piloting a new program called Bike Buddy. Bike Buddies are UW students, faculty and staff who have bike commuting figured out and want to help others who live near them bike commute to campus. Often, figuring out a comfortable bike route from your neighborhood to campus is the biggest barrier in bike commuting.

Commuter Benefit Program

Commuter Benefits are a federally approved employer-provided incentive for employees to save money on their transit, vanpool and parking expenses. Effective January 1, 2013, the IRS pre-tax deduction limit is \$245/month for transit and vanpool expenses and \$245/month for parking expenses. \$20/month may be offered as a subsidy to employees who commute via bicycle. Commuter benefits encourage people to walk, bike, ride share and take transit to work. Many universities also extend the program to their student body. Two campus programs are profiled below.

Stanford University

(http://transportation.stanford.edu/alt_transportation/Commuter_Club.shtml)

Stanford University has established the Stanford University Commute Club. By not purchasing a Stanford parking permit, and joining the Stanford University Commute Club, members help reduce emissions, minimize the number of vehicles traveling to and from campus, and benefit financially by not driving alone. Rewards can reach up to \$300 (\$25/month) a year in Clean Air Cash or Carpool Credit.

Oregon Health & Science University (OHSU)

(<http://www.ohsu.edu/parking/bike/OHSUBikeSite2010.pdf>)

Oregon Health & Science University (OHSU) provides an incentive for employees who choose to bike to work for at least two miles of their trip. Bicyclists are reimbursed for their commute with one of three incentives for each 30 trips biked. Members of the parking program are refunded one month's parking. Members of the transit pass program received \$35 (in addition to the overall subsidy on their passes). Bicyclists who are members of neither program receive \$50.



The MSU Bobcat Bike Check has become very successful

Bike Valet for Events

Bike valet operates similar to a coat-check at an event. Volunteers set up a secure area of bike racks, and offer valet service to event goers who arrive by bike.

Adding bike parking allows them to be positive and friendly when directing bicyclists to the parking corral. As a bonus, most people who would have locked to poles and fences will seek out the corral instead.

Patrons receive a branded claim ticket and leave their bikes in a secure location. Bike valet brings convenience and peace of mind to event patrons, and provides a secure, orderly site plan for event planners.

Bike valet can be offered as a free service or as a fund raiser for various campus groups with a minimal fee of \$2 to \$5/ bike. Bike Valet would make most sense to launch as a pilot at MSU football games. Bicycles can currently be observed locked to a variety of furnishings.



Temporary event parking in Utrecht, The Netherlands



University of Minnesota's Bike Center

Campus Bike Center

Campus bike centers provide an additional opportunity to support both on-campus and commuter bicycle populations. They are often located in central areas of campus or complement a parking garage facility in the form of a multi-modal transportation program.

The University of Minnesota's Campus Bike Center is located in a parking garage on the first level. This facility offers a variety of services and amenities, including a retail area with supplies, a repair and service shop, a public meeting space, bicycle repair classes and showers. It also acts a collection point for the abandoned bicycle program.

At the University of Wisconsin-Madison's University Bicycle Resource Center, located on the first level of a library and parking garage facility, students, faculty and staff have access to showers, secure bike storage, supplies, bicycle registration assistance, maps and repair tools and stands.

Montana State University has the opportunity to develop and construct a campus bike center to serve its growing bicycle user population. The current facility that is used for repairs is

located in the Outdoor Recreation building on the west side of campus. It is recommended that the university investigate the possibility of locating a larger and more conveniently located facility in the core of campus or near the SUB, in order to appeal to a larger user group.

Bike Loan and Rental Programs

A few approaches that MSU should consider to make bikes more readily available to students, faculty and staff at MSU are discussed below.

Loan Programs can make bikes available to students, faculty and staff for a few hours up to a full semester at low cost. These programs may procure bikes from local shops for approximately \$250-\$600 and up depending on style of bike and associated features such as fenders, locks, helmets and lights. MSU already has a few different bike loan programs on campus for employees. MSU should continue to build on these programs aimed at making bikes more convenient for employees and expand them to include other departments.

- MSU Facility Services purchased bicycles that are available for use by staff in that department for no cost. This small fleet of bicycles of various styles are for staff to use to access areas of campus that are close to the Facilities Services buildings but have limited parking. The program was launched in 2008 and each bike cost roughly \$425. A \$4,000 APPA Effective and Innovative Practices Award initially funded the program. Three bikes have gone missing since the project began five years ago. MSU contracts annual maintenance to a local bike shop.
- Campus Planning, Design & Construction — CPDC has five bikes available for employee use on campus. The bikes were purchased through a local bike shop. They are equipped with racks and signs identifying them as CPDC bikes. CPDC has a contract with the local shop for maintenance of the bikes to ensure that the bikes are safe and functional.

- The Western Transportation Institute has an informal bike loan program, where used bicycles are procured from the MSU police and/or the Bozeman Bicycle Kitchen, typically for less than \$50 each. Bikes are marked with yellow tape and/or a small sign and made available to employees or students working at WTI to travel to and from campus and for around-town errands. There are typically five to six bikes available. One staff member volunteers to maintain the bikes, which is a challenge because these older bikes typically require more work to maintain in good working order. This model may not work well long term. If the individual running the program leaves, it is unlikely the program will continue, as it has not been institutionalized.
- Athletics/Events — There are now 14 bikes available for staff to use. The bikes are generally assigned to a specific building for use by the staff in that building. The bikes were purchased locally beginning in 2011. The bikes are all collected each spring to one location and a local bike shop comes and services them all. For maintenance issues during the year the bikes are taken to the local shop for needed repairs. The bike shop provides free flat repair on the bikes.



Departmental loaner bikes at MSU

The University of Montana in Missoula has two bike rental operations. The first is a Yellow Cruiser Bike program that was launched in 2001. The program has a fleet of fifty, one-speed cruiser bikes available to students free of charge for up to two days. The University also has a long-term rental program with thirty, three-speed Kona commuter bikes. These bikes are available to rent for a length of between one month and a full school year. Rental fees are \$20 for one month or \$60 for one semester. The Office of Transportation has partnered with Missoula Federal Credit Union to offer Interest-Free Bike Loans for students as well.

Duke Bikes is a bike-loan program launched in 2006 to offer students no-cost opportunities for exercise and car-free commuting at Duke University in Durham, North Carolina. Duke University has approximately 14,200 students, thus is comparable in size to MSU. Appendix C contains a case study on the Duke Bike program with information from 2011. It appears that Duke has discontinued this program and changed to a bike sharing model.

Bike Share Programs

Bicycle sharing programs for the purpose of this document are defined as a form of public transportation, supplying bikes for short-term rental through a network of automated bike parking stations. People can check out a bike from one automated parking station and return it to another, allowing for one way trips. Modern systems have unattended parking stations and bicycles equipped with technology that can confirm the identity of users (thus deterring theft). These smart bike programs can track mileage, which can be used to calculate calories burned, gas saved and emissions reduced.

Many universities in the US have experimented with bike sharing systems to varying degrees of success. Some have been stand-alone campus systems, with others integrating with



Bicycle sharing station in Minneapolis

a city-wide system. The cost to implement automated bike sharing systems ranges from \$4,200 to \$5,400 on average per bicycle based on information from several U.S. cities. This cost includes all system components (bikes, stations and kiosks), staff and technical support. Operating costs ranged from an average of \$1800 to \$2400 per bike per year (Gleason, Miskimins, 2012). These systems require a strong commitment from stakeholders, political leaders and local champions in order to be successful. When compared to the cost of a typical bike, this may seem expensive but when compared to other transportation investments, such as widening roads and building parking lots, bike sharing can be a cost effective option.

For example, using a cost of \$5,000 per bike and \$1,800 per bike annual operating costs, an investment of \$12 million could fund implementation and operation of an automated bike share program with 300 bikes for almost 20 years or a program with 500 bikes for 10 years. (Appendix C contains a case study on Zotwheels, a bike sharing program at the University of California at Irvine.)

Several MSU student projects have focused on bike sharing and rentals in Bozeman and at MSU. In the summer of 2012, two students completed the Bozeman Bicycle-Sharing Feasibility Study (Osendorf, Pezzella, Gleason, August 2012). The students conducted a community survey to examine interest in a bike-sharing program and organized two focus group meetings to collect input to determine stakeholder support. Based on this information, evaluated in the context of four bike program case studies from other communities and a general review of available literature on bike-sharing programs, it was concluded that a pilot program with drop-off and pick-up stations located at MSU and in downtown Bozeman, could be feasible economically and socially.

In 2013, another MSU student followed up on the above study and completed a paper called the Development of a Bicycle Share Program at Montana State University (Kelly, 2013). This study explored more options and feasibility of various types of biking programs in Bozeman. Given the identified student interest in and the rapidly evolving options for bike rental and sharing programs, ASMSU should be engaged in discussions regarding the optimal size, type of bicycle, technology, organizational structure and funding of some form of bike rental or sharing system for Montana State.

Enforcement Policies and Programs

Illegal Bicycle Parking

Bicycles are being locked to railings, tree trunks, light posts and a variety of other furnishings on the MSU campus daily. In many places this is due to an insufficient amount of quality bike parking. Locking to trees and furnishings can cause damage to the trees and render the furnishings inaccessible. As more quality bike parking is added at high demand locations and in the core of campus, these illegal parking practices need to be discouraged. An initial campus-wide education effort should be implemented to inform campus users of the policies against locking bicycles to trees, campus furnishings and railings. Following the information campaign enforcement activities should be initiated. It is understood that enforcement activities require resources and that campus law enforcement may not have the capacity for a sustained effort on this. Some high profile enforcement activities will help increase the impact of the time invested. Options for involving personnel from other departments such as Facility Services or the Bicycle Program Manager's office should be explored to provide the resources needed to make this a sustained effort. The specific methods for enforcing these policies will need to be established through discussion with law enforcement and ASMSU.



Illegally parked bicycle in front of Romney Gym

Abandoned and Inoperable Bicycles

Abandoned bicycles appear on bike racks throughout the school year and seasonally as students transition and leave unwanted bicycles behind. Inoperable bicycles are defined as those without air in the tires, those missing key components (seats, wheels, etc.) or those in a general state of considerable disrepair. Abandoned and inoperable bicycles take up valuable rack space, are unattractive, often impede access to the racks and discourage use by making the rack look unsafe or neglected.

MSU should adopt a guideline for removing abandoned and inoperable bicycles from all campus bike racks. The policy will need to address the difference between long-term parking locations such as near residence halls and short term parking adjacent to academic buildings. Universities such as Texas A&M have marked some racks as "NO OVERNIGHT PARKING" with the objective of keeping the racks, which are in popular areas, clear of abandoned bikes. These racks are given more frequent enforcement. This effort results in more available rack capacity for daily use. The policy should include consideration for removal of bicycles from racks to facilitate snow removal at bicycle parking locations.



Abandoned bikes should be removed at regular intervals

The Association of Pedestrian and Bicycle Professionals Bicycle Parking Guide recommends:

“Post a notice on the bicycle at least two weeks in advance of removing the bicycle. The notice should state that the bicycle will be removed by a certain date and provide the name and contact information for the owner to contact in case the bicycle is mistakenly identified as abandoned.”

MSU currently has a policy and procedure for removing abandoned bike at the end of each academic year. The following ideas are offered to initiate discussion on the specifics of an updated MSU Policy on Abandoned and Inoperable Bicycles. In areas generally used for short term bicycle parking, bikes that have been parked in the same location for more than two weeks should be tagged for removal. After one week, any remaining tagged bicycles should be locked to the rack with a University lock that provides information for gaining access to the bicycle again. After an additional week, any remaining locked bicycles should be removed and impounded.

A different approach would be to remove inoperable bikes at the end of each month. The policy should allow for immediate removal and impoundment of bicycles locked to trees and site furnishings other than University-installed bike racks. Impounded bicycles should be stored for 90 days to provide owners the opportunity to reclaim their bicycle. Bicycles that go unclaimed could be resold at the MSU Bike Auction, donated to the Bozeman Bike Kitchen or used to fund raise during the annual GVBC Bike Swap in May.

Enforcement of Bicycle Laws

The education and encouragement programs outlined earlier in this chapter aim to provide incentives for people to bicycle in a safe and courteous manner. These incentives need to be paired with enforcement activities that provide a consequence

for not following the law or expected behavior. University Police currently cites people on bicycles for traffic law infractions and riding at night without lights. These enforcement activities should be continued and if possible expanded. The Bicycle Program Manager should work with campus law enforcement to identify potential opportunities to increase resources for these enforcement activities.

Winter Facility Maintenance

Winter maintenance on the MSU Bozeman campus is a significant and complex effort. Bozeman’s winters are often very snowy with alternating cold and warm spells. These temperature fluctuations bring additional challenges in winter maintenance. Snow removal is critical to the functioning of campus paths, bikeways and streets. A system of prioritized bike routes has been established for snow removal. Priority is given to key pedestrian routes through campus to ensure that MSU faculty, staff and students can move about campus. Additional priorities include key streets and motor vehicle parking areas.

As mentioned in Chapter 3, many people consider weather a barrier when choosing bicycle transportation through winter. While this is understandable, there are an increasing number of people choosing to ride year-round. From the survey, 81% of respondents listed predictable snow removal as important or very important and several comments indicated that better snow removal would enable them to ride year-round. Additionally, there are many days in the winter when the roads and paths are clear of snow and ice and the temperatures are warm enough for many to choose to ride.

Route clearing priorities

MSU has clear priorities for snow removal. It is recommended that bicycle facilities be clearly identified in these priorities. Predictable snow plowing on major bike routes was an



Bicycle Lanes are usually plowed after streets



Winter break snow clearing in bicycle parking areas

important factor for 81 percent of survey respondents. It is recommended that MSU Facility Services coordinate with City of Bozeman to prioritize snow removal for some of the main bikeway corridors identified in Figure 18.

The City of Ottawa, Ontario uses an approach where they maintain segments of the bike network based on existing standards for roads and sidewalks. Thus any segment of the bike network on a multi-use pathway is maintained to sidewalk maintenance quality standard and if it is on edge of roadway it is maintained to the road's maintenance quality standard.

The MSU Bicycle Program Manager should work with Facility Services to produce a map that highlights priority snow clearing routes. Providing people with a map showing the routes where they can expect to find cleared pathways will help people feel confident in riding during snow events.

One particular consideration that should be included is ensuring that snow removed from priority walkways does not block bike lanes. As discussed, snow removal is a major undertaking and is often a balance between competing desires. MSU snow removal efforts should seek to minimize situations where wind rows or piles of snow left by plows obstruct bike lanes.

Snow removal at Bicycle Parking

As has been previously discussed, providing accessible, secure bicycle parking is a key element in increasing the number of people choosing bicycles as transportation to, from and within campus. As has been mentioned, consistent snow removal is an important factor in enabling people to choose to ride. Winter brings an additional challenge to bicycle parking as the racks are often buried in snow. Many times racks are located in places that become snow storage in the winter, rendering

the racks unusable. In other places the wind row from plowing or sweeping of the pathways creates a physical barrier to accessing the bicycle racks.

While it is understood that ensuring clear pathways is the priority for snow removal, it is recommended that MSU Facility Services develop a policy and procedure to minimize the impact of snow clearing on access to bicycle parking. In addition, it is recommended that Facility Services develop a policy and procedure for snow removal at bicycle parking locations. This policy should include identifying priority locations for snow removal, focusing on high use and high turnover bicycle parking locations such as the SUB, Renne Library and Marga Hosaeus Fitness Center.

These policies and procedures should consider rack placement and organization to optimize opportunities for snow removal. Given the reduced bicycle parking demand in the winter, this may include removal of some racks to facilitate snow removal and storage. The bicycle parking snow removal policy should also consider opportunities to clear all racks on campus. Times when students are gone and use is low are ideal opportunities. The policy should also be linked to the abandoned bicycle removal policy to ensure that abandoned bicycles are not creating additional difficulty for snow removal efforts.

Evaluation and Planning

All too often plans such as this Bicycle Master Plan are well intentioned, well thought out, well written and still languish on the shelf. One key to avoiding this is the inclusion of specific methods and metrics to evaluate plan implementation. Chapter 1 identified specific objectives that the plan aims to accomplish. The MSU Bicycle Program Manager should establish a biannual Benchmarking Report for the Bicycle Master Plan implementation based on the Goals and Objectives. This report will serve two purposes. Using data collected annually and progress

made toward specific project and program implementation, the report will track progress on implementation of the Bicycle Master Plan. The Benchmarking Report will also be an opportunity to identify needs or opportunities that emerged during the previous two years.

Bicycle Friendly University Designation

MSU's progress towards achieving Bicycle Friendly University status can track a great deal of the changes and improvements to campus bicycling. The evaluation criteria for the BFU program is based on the five E's: Engineering, Education, Encouragement, Enforcement and Evaluation that were used to categorize goals and objectives in Chapter 1. A university must show a comprehensive approach to bicycle-friendliness to rate highly. The University must complete a detailed questionnaire developed by the League of American Bicyclists in order to apply for recognition. There is one opportunity per year to apply, which is typically in August. Submitted applications



The League's feedback report on MSU heavily influenced this plan

are reviewed and universities are either: designated one of four medal categories (Platinum, Gold, Silver or Bronze), given an honorable mention or do not receive recognition. While awards are valid for four years, it is recommended that MSU apply every two years in coordination with the Benchmarking Report. The Bicycle Friendly University Program could provide a solid framework on which to base the Benchmarking Report.

Relationship to Climate Action Plan

The MSU Climate Action Plan identifies a significant set of goals for increasing the efficiency and convenience of the MSU's bikeway system. To reach these goals, we recommend creation of performance measures to be tracked within the Bicycle Friendly University Applications and allow the university to track its progress towards sustainability.

Chapter Highlights

This chapter provides program and policy recommendations to achieve the vision that "Montana State University will create a campus environment where bicycling is a safe, convenient and comfortable transportation option for students, faculty, staff and visitors." The recommendations in this chapter are intended to provide opportunities for people across the campus departments to provide input on the final implementation of these programs. It is vital that students, faculty and staff are engaged in planning and implementing the programs outlined here. The following highlights key recommendations from this chapter.

MSU should prioritize creating and staffing an ongoing Bicycle Program Manager position. This is the highest priority recommendation in this plan. The recommendations of this plan will require communication and coordination with a broad range of departments across the university as well as outside the university with the City of Bozeman. A coordinated and prioritized plan for implementation of this plan is most likely to be

successful with oversight from one person. To facilitate this coordination, MSU should establish a Bicycle Advisory Committee with broad representation.

MSU should increase efforts to provide information on bicycling to students, faculty and staff. The existing web resources should be centralized to provide a single point of access to online resources on bicycling. The information on bicycling that is included in orientation should be expanded. Safety Education is a key component of the increasing bicycle use at MSU. A comprehensive safety education program should be established that will use a variety of formats to educate the MSU community about bicycle safety.

For many people, using a bicycle for their transportation needs is a new idea. Encouragement activities provide an incentive for people to try riding a bicycle to campus. Events such as Bike to School Week, a Bike Buddy Program and inclusion of bicycle activities in the MUS Wellness Program are examples of possible opportunities to encourage people to explore the idea of using a bicycle for their transportation to, from and within campus. In conjunction with encouragement, there are recommendations regarding enforcement and facility maintenance. It is recommended that MSU implement updated policies to address illegal bicycle parking and abandoned bicycles, increase enforcement of bicycle laws and establish priority routes for snow removal.

In an effort to encourage active implementation of the Bicycle Master Plan, it is recommended that every two years MSU produce a Benchmarking Report and apply for Bicycle Friendly University designation. These represent opportunities to reflect on the progress made and identify new opportunities for "the University to be a leader in setting policy, developing programs, encouraging respectful riding and improving infrastructure to encourage bicycling to, from and within the MSU campus."



MSU PHOTO BY ANDRIM SANCHEZ GONZALEZ

Winter cycling on MSU campus

6

*“On a bike no one ever asks,
‘are we there yet?’”*

Unknown



GLOSSARY

AAA American Automobile Association

AASHTO American Association of State Highway and Transportation Officials

APBP Association of Pedestrian and Bicycle Professionals

ASMSU Associated Students of Montana State University

CAP Climate Action Plan

CPDC Campus Planning, Design & Construction

CROW A Dutch non-profit national information and technology platform for infrastructure, traffic, transport and public space

Bozeman CIP Bozeman Capital Improvement Plan

FHWA Federal Highway Administration

LRCDP Long Range Campus Development Plan

MassDOT Massachusetts Department of Transportation

NACTO National Association of City Transportation Officials

MUTCD Manual on Uniform Traffic Control Devices

7

“Life is like riding a bicycle, to keep your balance you must keep moving.”

Albert Einstein



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Photos taken are credited to members of the Bicycle Task Force unless otherwise noted.



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