

# Trail Usage in Bozeman

A Report for the City of Bozeman Parks Department and the Gallatin Valley Land Trust

By Susanne Cowan and Larissa Morales





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Cover Art by Larissa Morales

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Funded by a Montana State University Outreach and Engagement Seed Grant

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# INTRODUCTION

The Gallatin Valley is one of the fastest growing counties of its size in the United States. As Bozeman grows, it faces challenges to retain open space, meet transportation needs, and mitigate increasing air and water pollution. Neighborhood trails play a key role in promoting sustainable development, providing recreational opportunities and pedestrian and bike transportation networks. However, the fast rate of suburban construction necessitates careful attention to the quantity and quality of open spaces, to ensure their location, connectivity, accessibility, and amenities fit the needs of the community.

In upcoming years Bozeman will be updating the Parks, Recreation, Open Space, and Trails (PROST) plan that was last conducted in 2007. In order to ensure this plan can meet the needs of Bozeman's growth, the City of Bozeman and the Gallatin Valley Land Trust (GVLT) need accurate information about the current trail system, including its use patterns and the users' preferences. This project conducted open space mapping, trail counts, and surveys, to provide data to the City and the GVLT to use in the PROST planning process.

This research project aims to determine the need for new or improved trail infrastructure. The report includes maps of existing infrastructure to determine gaps in connectivity, accessibility, safety, or way-finding. It also explains how the trails are currently being used based on data from trail counts and surveys. Finally the research includes user preference surveys to understand the goals and concerns of the public.

This project was conducted by Dr. Susanne Cowan, an Assistant Professor in the School of Architecture at Montana State University, with funds from an Outreach and Engagement Seed Grant from MSU. Dr. Cowan worked with a research assistant Larissa Morales, who helped to compile the research and create the infographics. The data and proposals for this project were generated through service learning projects with 76 students from the School of Architecture in Dr. Cowan's classes "Arch 452: Architecture Research Methods" and "Arch 525: Participatory Open Space Planning." The trail counts and survey data are from Spring and Fall 2019.

The plan for this research has been developed in collaboration with the GVLТ, the City of Bozeman, and the Western Transportation Institute starting in Fall 2018. In particular Dr. Cowan worked with Addi Jadin, Matt Marcinek, Matt Parsons, E.J. Porth, and Taylor Lonsdale. They have helped to identify areas of geographic focus, particularly the Northwest quadrant of Bozeman. They have also highlighted the issues that the study targets: connectivity, accessibility, safety, and way-finding. Dr. Cowan worked closely with these groups to fine tune trail count techniques and survey questions. Dr. Cowan has reported in-progress findings and used the feedback from the City and GVLТ to determine the next steps in the research.

This report will present three types of results from the research: trail count data, survey data, and proposals for improvements.

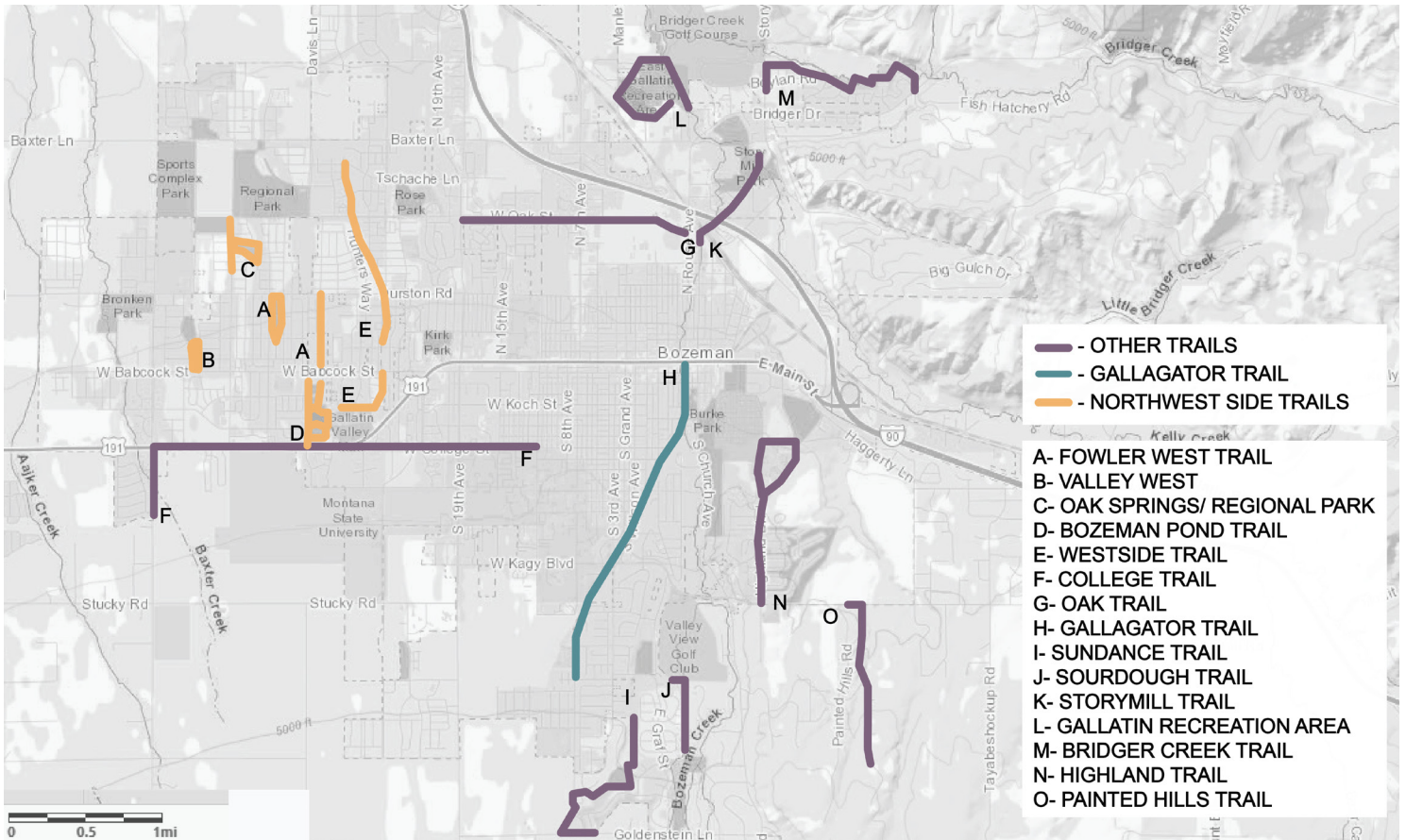
# TRAIL SELECTION AND MAP

The trails chosen for this research project include many of the longer trails within city limits that are located immediately adjacent to residential neighborhoods. The purpose of studying neighborhood trails, versus destination trails outside of town, was to examine how residents use trails as part of their daily routines, including for commuting and errands.

Because of the speed of development in the Northwest quadrant of the city, this project placed particular emphasis on trail counts and surveys in that area. The project also gave significant attention to the Gallagator trail due to its centrality to downtown Bozeman and the Montana State University campus. The project also sampled from a variety of longer trails north, south, and east of downtown to represent the diverse qualities of trails in these areas.

To help compare the trail use in different areas of the city, data from trail counts and surveys is sometimes collected into larger categories. “Northwest Trails” are located north of Huffine and West of 19th. Data for the Gallagator is sometimes given separately. The category “Other Trails” refers to all the trails except the Gallagator and those in the Northwest quadrant. The “All Trails” category is inclusive of all the trail data.





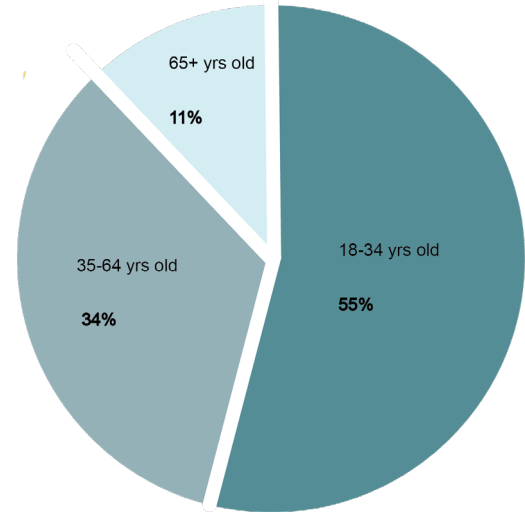
# CENSUS DATA

Data from the census is useful to understand the demographic representativeness of the survey data we collected. The data represented here is from the American Community Survey conducted in 2018.

By comparing our survey demographic data to the census data, we can see that the survey covered a relatively representative group of people by age and gender. In Bozeman we have more men than women, and we have a young median age of 28 years old, in large part because Bozeman is a college town.

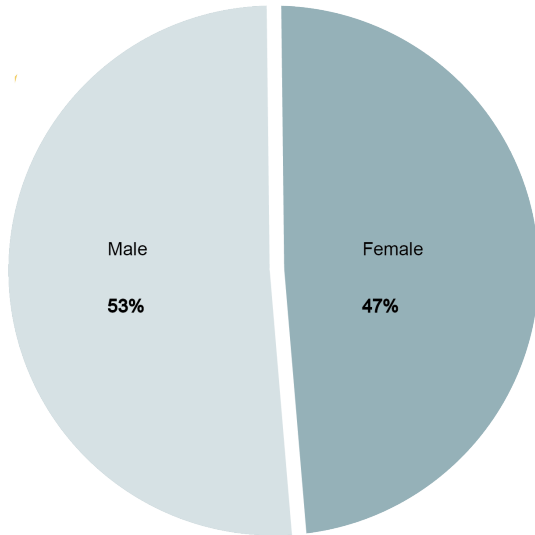
The census data reveals that walking and biking is more prevalent in Bozeman than in other places in the United States. In 2018, 13.5% of Bozeman residents reported biking or walking as their main mode of transportation to commute to work, compared to 3.1% nationally. The average time it took Bozeman workers to commute was 15 minutes, compared to 27 minutes nationally.

# ADULT POPULATION AGE GROUPS IN BOZEMAN



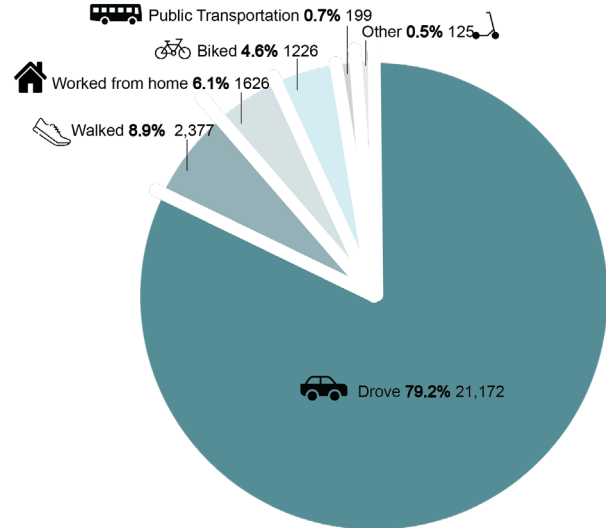
Based on the 2018 American Community Survey as reported in Social Explorer

## GENDER BALANCE IN BOZEMAN



Based on the 2018 American Community Survey as reported in Social Explorer

## TRANSPORTATION USED FOR COMMUTING IN BOZEMAN

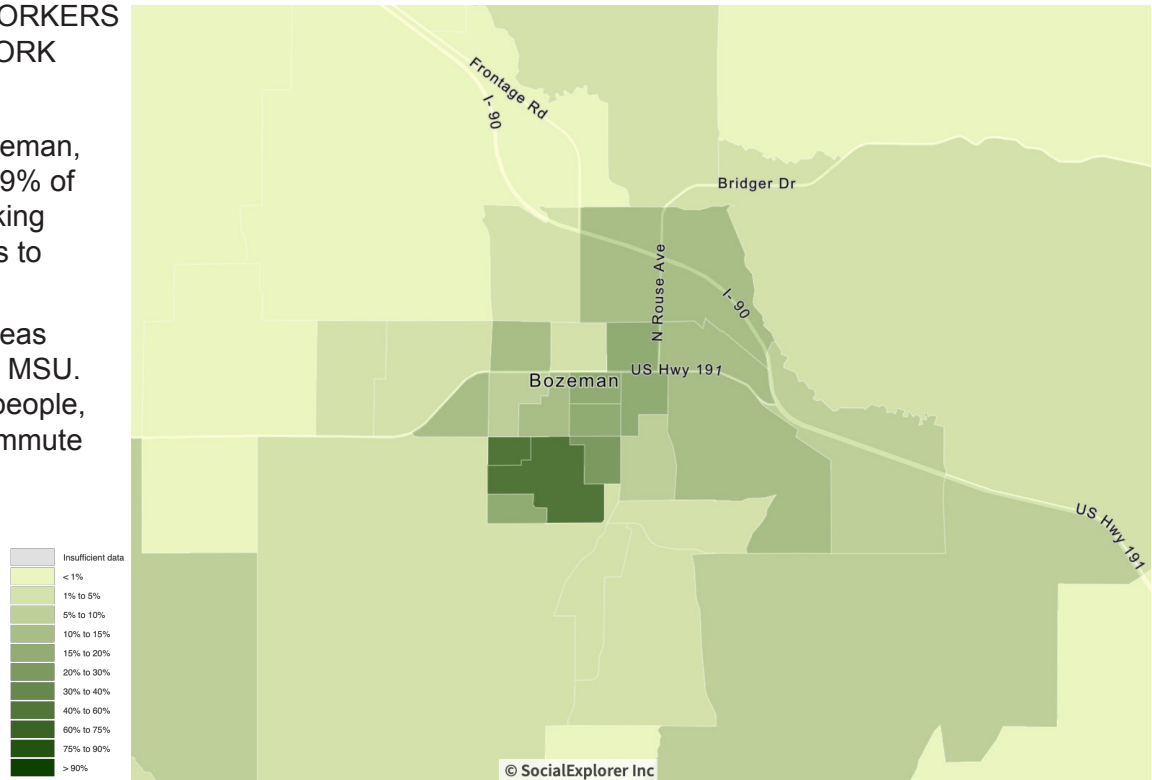


Based on the 2018 American Community Survey as reported in Social Explorer

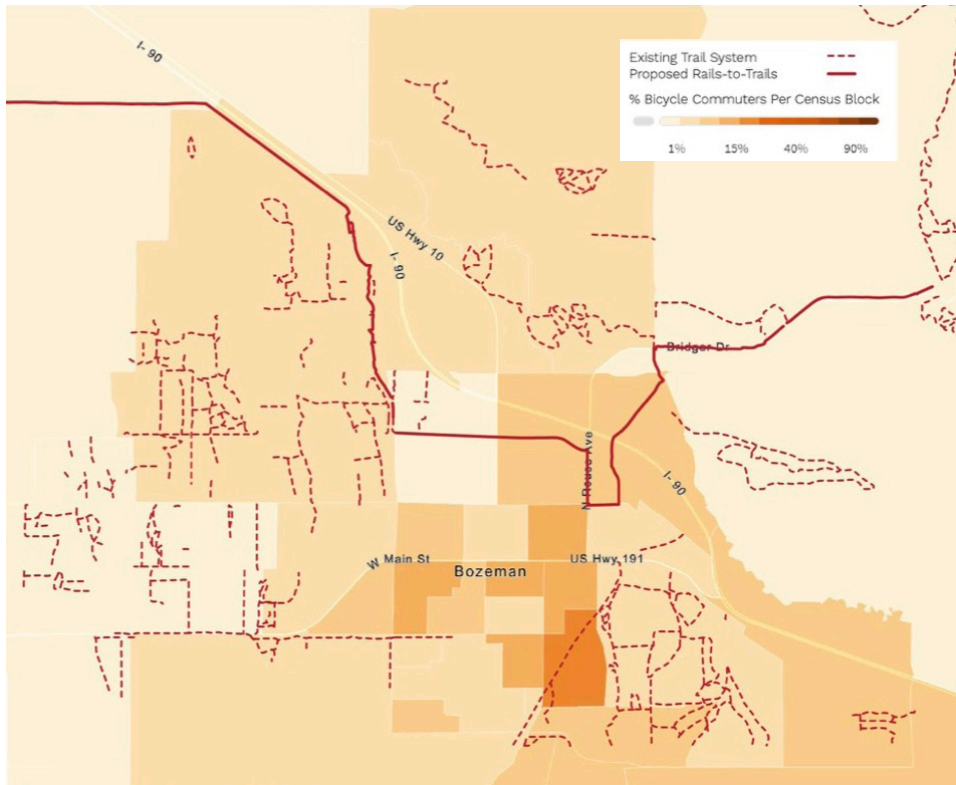
## PERCENTAGE OF WORKERS WALKING TO WORK

Over the whole of Bozeman, only 2,377 people, 8.89% of workers, reported walking as their primary means to commute to work.

This is higher in the areas around downtown and MSU. Around campus, 623 people, 48.79% of workers commute by walking.



2018 American Community Survey 5 year estimate as mapped by Social Explorer



## PERCENTAGE OF WORKERS USING BIKES TO COMMUTE TO WORK

Over the whole of Bozeman, only 4.59% of workers reported using bikes as their primary means to get to work.

This is higher in the areas around downtown and MSU. Biking was most common in the census block group near the Gallagator trail between College and Mason and Rouse and Church. In this area 129 people, 16.06% of workers reported commuting by bike.

Map by Sina Seyedian, Sam Stretch, Riley Waznek, and Hannah Riley  
2018 American Community Survey 5 year estimate as mapped by Social Explorer

# TRAIL COUNT METHODS

Students from the School of Architecture conducted counts at 15 trails for a total of 75 hours. The counts were conducted in late March through April and late September through October of 2019.

The trail counts were conducted at a variety of times with a focus on weekday commute hours and weekends. Of the trail counts collected at least 20 were taken during the weekday commute hours, and at least 27 were taken on weekends.

The trail count data collection sheet we used is based on the one used in Bozeman for the National Bicycle and Pedestrian Documentation Project. The counts included here are for pedestrians and bikers who crossed the trail intersection. Not all the users were on the trail; some may have been on a sidewalk or street that intersected with the trail.

**Surveyor Name:** \_\_\_\_\_ **Date and Times:** \_\_\_\_\_  
**Trail Name:** \_\_\_\_\_ **Intersection:** \_\_\_\_\_  
**Temperature (F):** \_\_\_\_\_ **Weather:** Sunny Cloudy Raining Snowing  
**Directions:** Tally every person that goes *into* the intersection for each 15 min. block. Please total the tallies in the box provided after each 15 minute block is completed.  
 ○ = Other (skateboard, scooter, etc.) If it is a 3 way intersection cross out the side not present.

The form consists of four identical 15-minute count sheets arranged in a 2x2 grid. Each sheet is a cross-shaped diagram representing an intersection. At the center of each cross is a box labeled with a time interval: 0:00 - 0:15, 0:15 - 0:30, 0:30 - 0:45, and 0:45 - 1:00. Four arrows point outwards from the center, representing the four directions of travel. Each arrow points to a 'TOTALS' box. Each 'TOTALS' box contains three smaller boxes for counting: a bicycle icon for bikers, a pedestrian icon for pedestrians, and a circle with a dot for other users. On the left and right sides of the grid, there are labels 'Trail or Road Name:' with lines for writing. A north arrow is located in the center of the entire grid.

# HOURS SPENT CONDUCTING TRAIL COUNTS DURING EACH TIME CATEGORY



Students spent a total of 75 hours conducting trail counts. 13 hours of counts were conducted at unknown times.

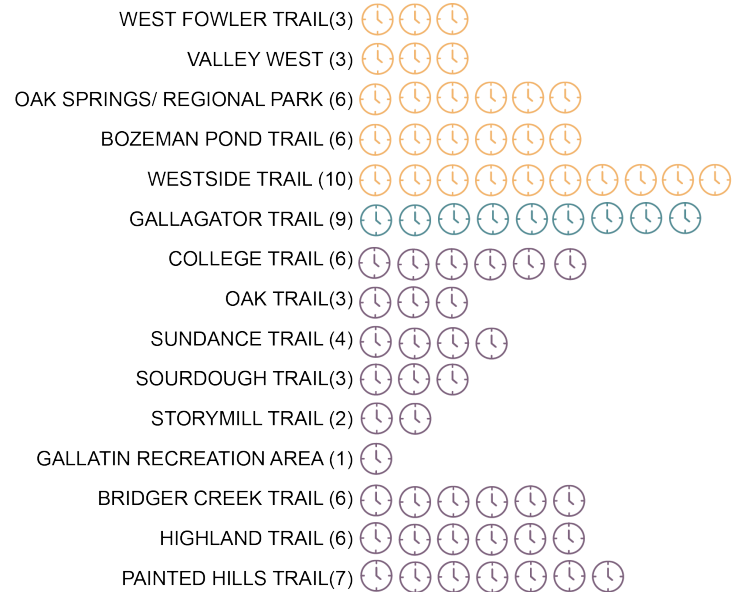
# TRAIL COUNT DATA

The data shows that the Gallagator trail has the highest average per hour usage, with over twice the average number of users as the system as a whole. We can also see that trails are most frequently used by pedestrians, with at least three times as many walkers as bikers on most trails.

Two of the trails on which we gathered the most data are the Gallagator Trail and the Westside trail.

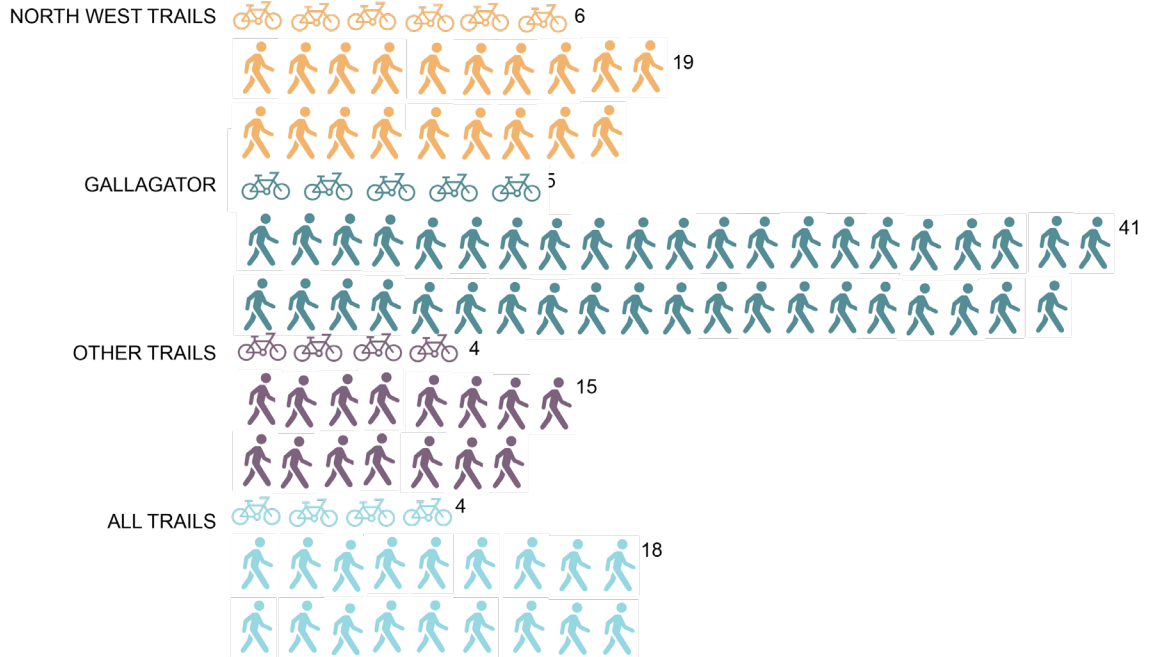
The Gallagator trail has an automatic counter which can be used to validate the manual count data, and vice versa. Because each used different methods, the numbers would not be exactly the same. On average the Gallagator trail counter reports a high of about 1,000 users a day in the summer, and a low of 250 users a day in the winter, including both pedestrians and bikers. The counts from 2019 shows 46 users per hour, which aligns with the counter data showing daily counts of 400 to 600 users per day, or about up to an average of 50 per hour.

# TOTAL HOURS OF TRAIL COUNTING PER TRAIL



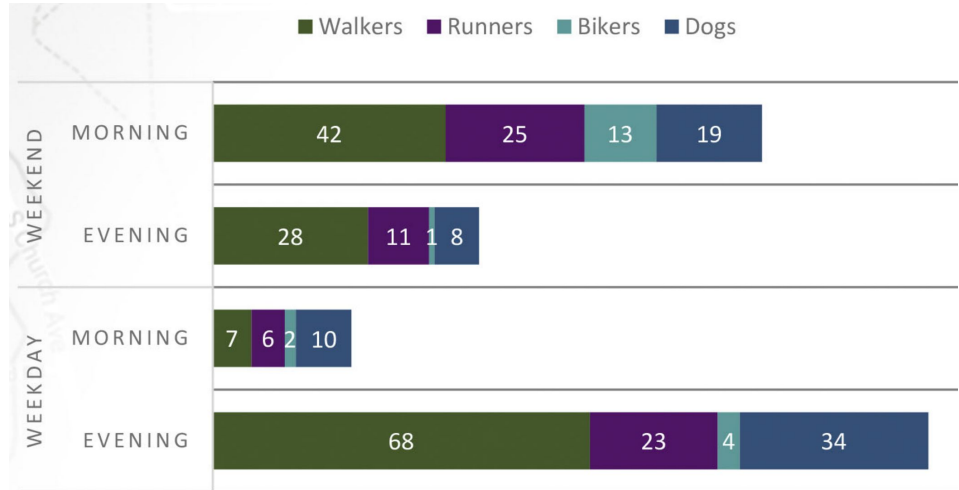
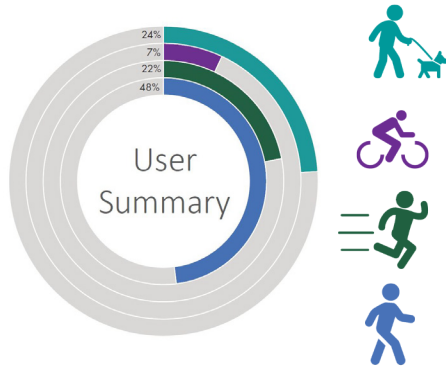


# AVERAGE PEDESTRIANS AND BIKERS AT TRAIL INTERSECTION PER HOUR



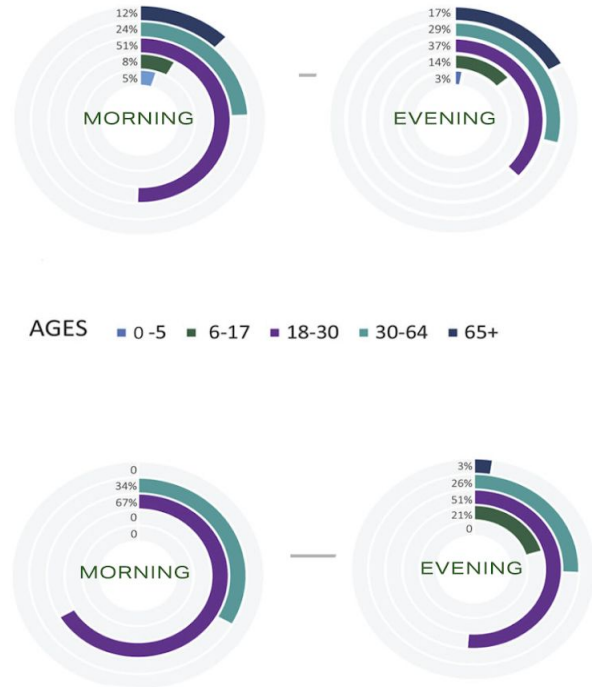
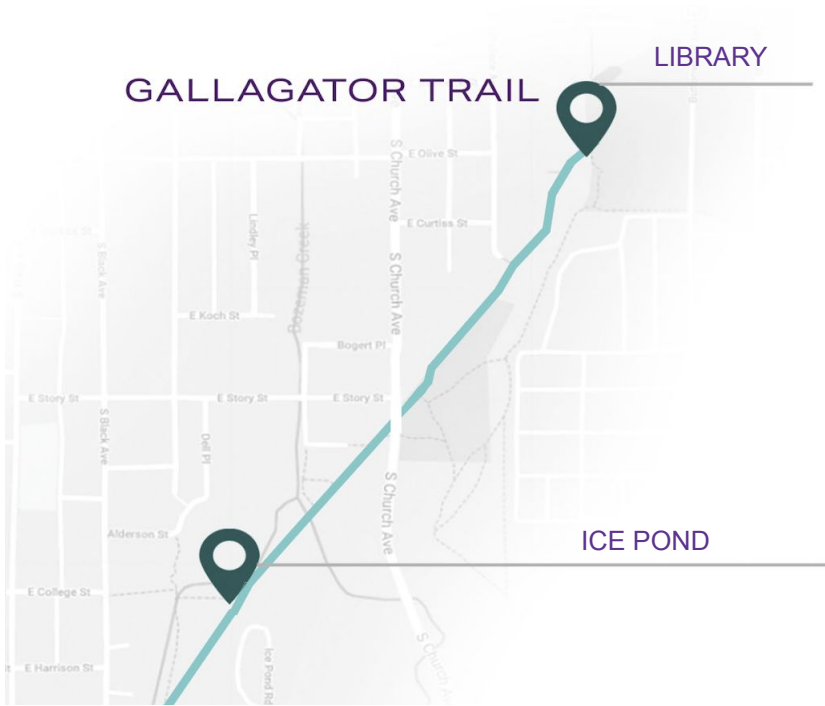
# TRAIL COUNTS ON THE GALLAGATOR

In Spring 2019, eight hours of trail counts on the Gallagator, four hours each at two different locations, show that walkers are the most common users of the Gallagator with frequent use by runners and dog walkers. Bikers accounted for only 7% of recorded users.



By Alex Wolsifer, Eliana Delebahan, Jessica Bone and Kali Peterson

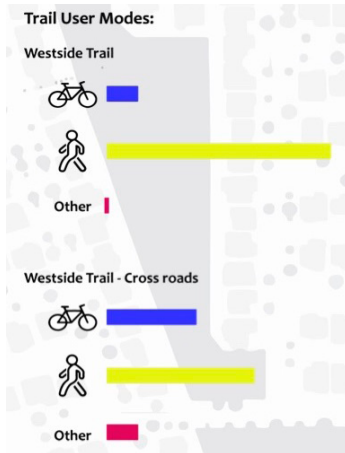
The trail counts on the Gallagator also show that young adults between 18 and 30 years old were the most frequent trail users during all survey time periods. However, counts conducted at two locations show different demographics; children and seniors were present in higher numbers near the library than near the old Ice Pond.



By Alex Wolsifer, Eliana Delebahan, Jessica Bone and Kali Peterson

## COUNTS ON THE WESTSIDE TRAIL

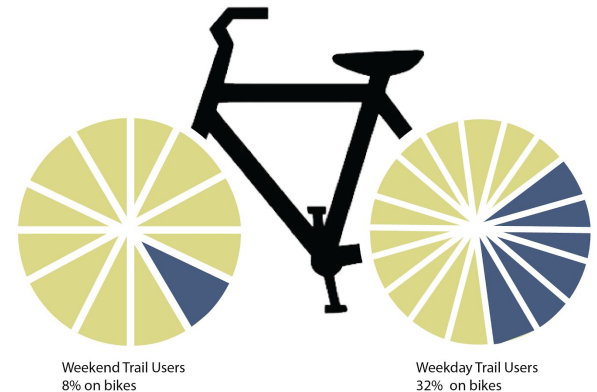
Six hours of trail counts on the Westside Trail showed that while bike use of trails was less common, many bikers were spotted on cross streets near the trails and choose other routes.



By Marissa Garcia, James Albondi, Aiden Cohen, and Adam Franke

## COUNTS ON SUNDANCE SPRINGS

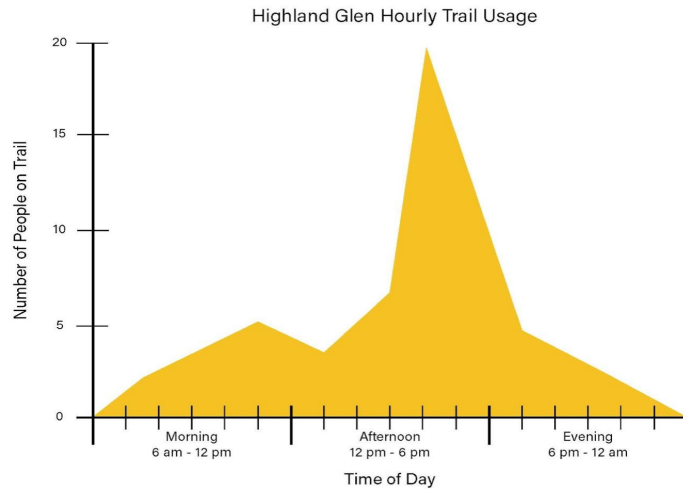
Four hours of trail counts on the Sundance Springs trail in Spring 2019 show that biking, though less common than walking, was more common on weekdays than weekends.



By Larissa Morales and Colton Riebe

## COUNTS ON HIGHLAND GLEN TRAIL

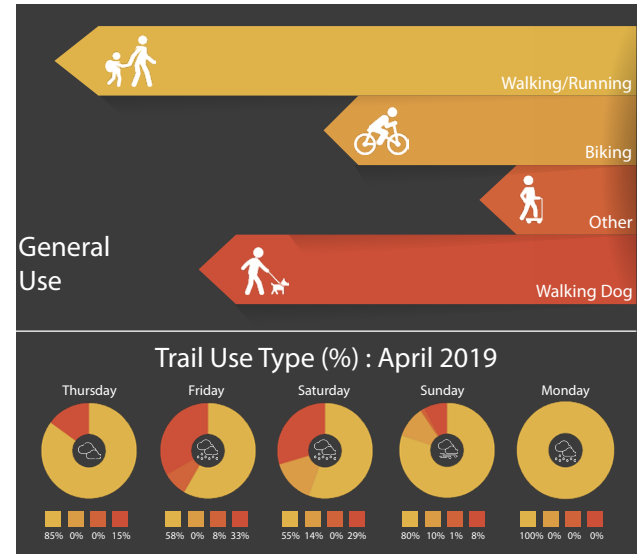
Six hours of trail counts on the Highland Glen trail in Spring 2019 show that use is highest in the late afternoon around 4pm.



By Melissa Worley, Tiffani Finley, Sydney Pfarr

## COUNTS AT BOZEMAN POND

Six hours of trail counts at the Bozeman Pond on April 4-8, 2019 show that while walking and dog walking were the most popular trail uses, biking was more common on the weekends than weekdays.



By Coleman Zauner, Lyndsay Watkins, Cole O'Brian

# SURVEY METHODS

The survey collected data about trail users including their typical trail use patterns, their preferences for improvements, and their demographic data. The survey was one page front and back with 14 content questions and 2 optional demographic questions.

The questions were modeled after pedestrian and bike surveys conducted in Missoula. The questions were edited with assistance from Taylor Lonsdale at the Western Transportation Institute. E.J. Porth at the GVLТ assisted to write a question #14 on the survey. Students were allowed to add their own question for #13 to address specific topics of interest in their trail case study, so question #13 varied.

The survey was delivered by 48 students on 15 trails in April and November of 2019. Students asked every adult on the trail if they would like to participate. Students did not tally how many people present on the trail did not take the survey. Trail users could fill out the survey on their own on a clip board, or have the questions read to them and answer orally. Surveys were tallied using Qualtrix. The survey infographics were created by Larissa Morales.

Before conducting the survey, students completed a CITI training in Human Subjects Research. Dr. Cowan received approval for the research protocols from the Montana State University Institutional Review Board under approval number SC040319-EX.

TRAILS SURVEY

Interviewer Name: \_\_\_\_\_ Weather: Sunny / Cloudy / Snowy / Rainy / Windy

Trail Intersection: \_\_\_\_\_ Temperature: \_\_\_\_\_

Date: \_\_\_\_\_ Shift Start Time: \_\_\_\_\_ Shift End Time: \_\_\_\_\_

I'm a student at Montana State University I am in a class studying how and why people use the trails in town. We will be sharing this information with trail planners. This survey will take 3-5 minutes and the information will be kept anonymous. You may skip any questions that you do not want to answer, and you may stop at any time.

1. What is your home intersection? \_\_\_\_\_ & \_\_\_\_\_

2. How long is your trip in miles and/or minutes? Distance: \_\_\_\_\_ miles and/or Time: \_\_\_\_\_ minutes

3. Where did you start this trip? (Please name intersections or landmarks.) \_\_\_\_\_

4. Where is your destination, or where is the far point of your loop? \_\_\_\_\_

5. What best describes the purpose of this trip? (Check all that apply)

- Commuting to work
- Going to school
- Shopping/Errands
- Exercising
- Dog walking
- Enjoying Nature
- Other \_\_\_\_\_

6. In the past 30 days, about how often have you used this trail?

- 0 - 1 time
- 2 - 5 times
- 6 - 10 times
- 11 or more times

7. In what season do you use this trail? (Check all that apply)

- Summer
- Fall
- Winter
- Spring

8. Today, did you come with or intentionally meet up with any other people.  Yes  No  
If yes, what is the: Total Number of people in your group? \_\_\_\_\_ Number of children in your group? \_\_\_\_\_

9. What form of transportation are you using now?

- Walking
- Skis
- Skateboard
- Bike
- Dirt Bike
- Electric Scooter
- Other \_\_\_\_\_

10. Did you use another form of transportation for part of this trip or to arrive at the trailhead?  Yes  No  
If Yes, what kind? (Please check all that apply.)

- Car
- Bike
- Bus
- Another mode: \_\_\_\_\_

11. Why are you using this trail as opposed to another path? (Please check all that apply.)

- Most convenient or direct
- Lower traffic volumes
- Connection to other trails
- Scenic qualities
- Surface qualities (paved versus unpaved)
- Universally accessible (for wheel chairs, strollers, etc.)
- Amenities: If so, which ones: \_\_\_\_\_

12. What would you like to see improved along this trail? (Please check all that apply.)

- Longer or more connected path
- Wider path
- Better surface
- Better maintenance
- Better street crossings
- Better safety
- More shade trees
- More bike parking
- Access to bathrooms
- Universal accessibility (i.e. for wheel chairs, strollers, etc.)
- Other: \_\_\_\_\_

13A.) If you look at trail signage, what information are you looking for? (Please check all that apply.)

- I don't look at trail signage
- "You are Here" Icon
- Maps
- How to connect to other trails
- The distance to points of interest
- Doggie Bags
- Dog Leash Rules
- Who to call to report maintenance issues
- Information about Park Amenities
- Other: \_\_\_\_\_

13B.) How do you choose your trail routes? (Please check all that apply.)

- Usual Route
- Online/App
- Physical maps
- Trail signs
- Word of Mouth
- Random wandering
- Other \_\_\_\_\_

14. What group or agency do you think is most responsible for trail building and maintenance in Bozeman?  
\_\_\_\_\_

15. Optional Question: What is your age? \_\_\_\_\_

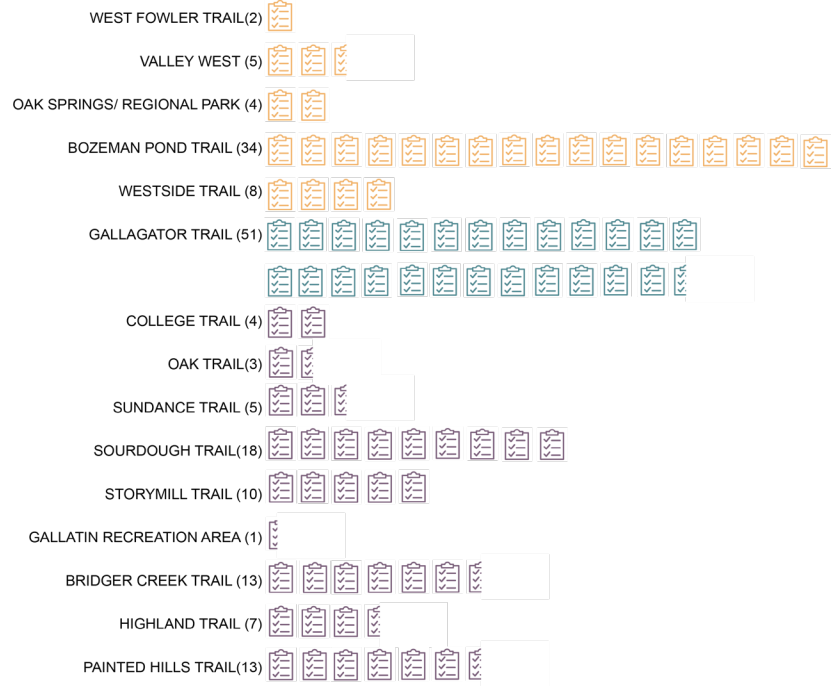
16. Optional Question: What is your gender?


- Male
- Female
- Other or Non-Binary
- I prefer not to say

# SURVEY RESULTS

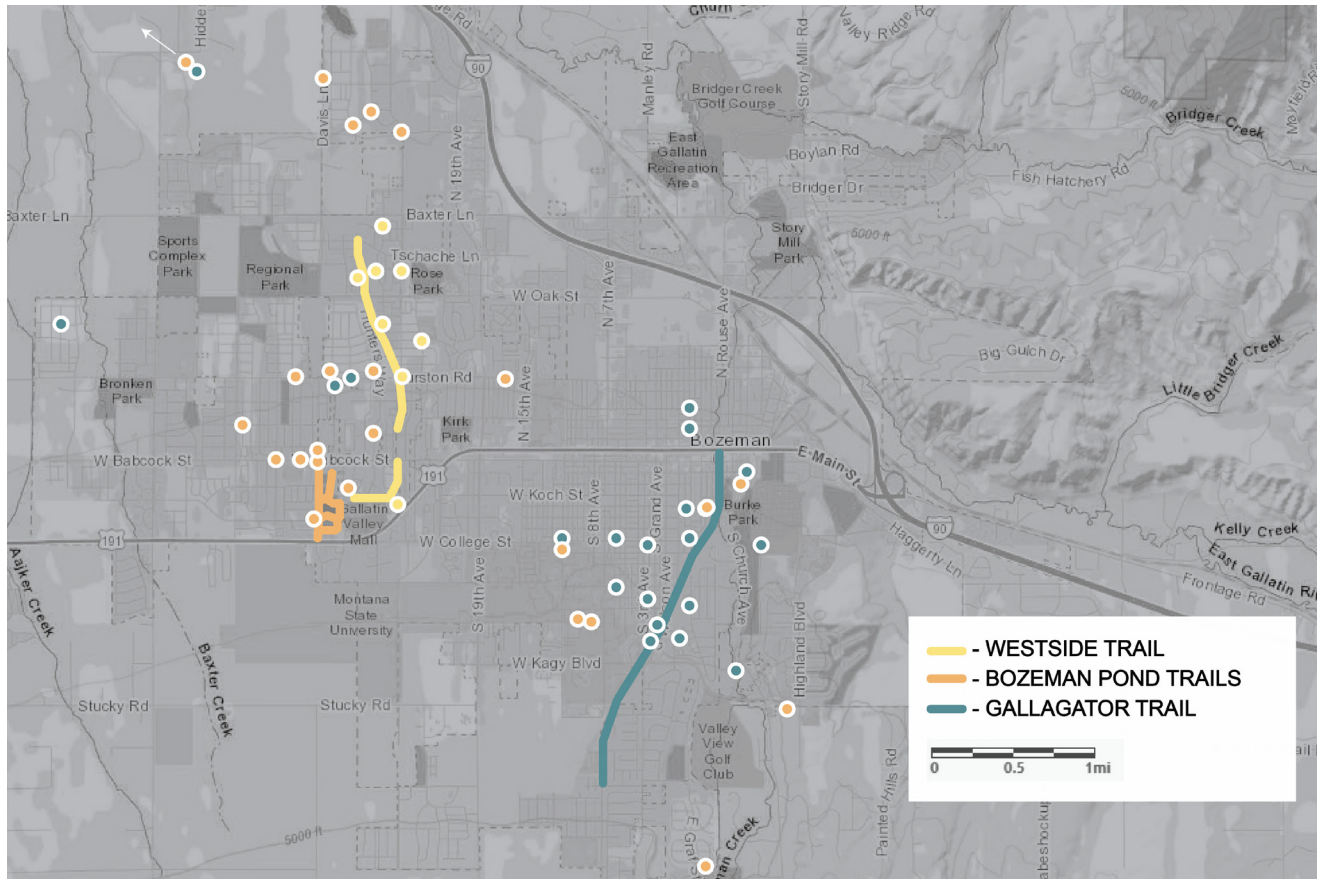
Students spent 85 hours on the trails and collected 175 surveys. 124 surveys were collected in Spring 2019, and 51 in Fall 2019. While these surveys were taken on a variety of different trails, students received the most survey responses at the Bozeman Pond and at the Gallagator.

Looking at a map of where trail users lived, we can see that for the Gallagator, Westside Trail, and the Bozeman Pond, most users lived within walking distance of the trail. However, we do see some Northwest residents using the Gallagator, and some South Bozeman and Belgrade residents using Bozeman Pond. The Westside trail is more predominantly used by neighbors rather than by the city as a whole.



 = 2 Surveys





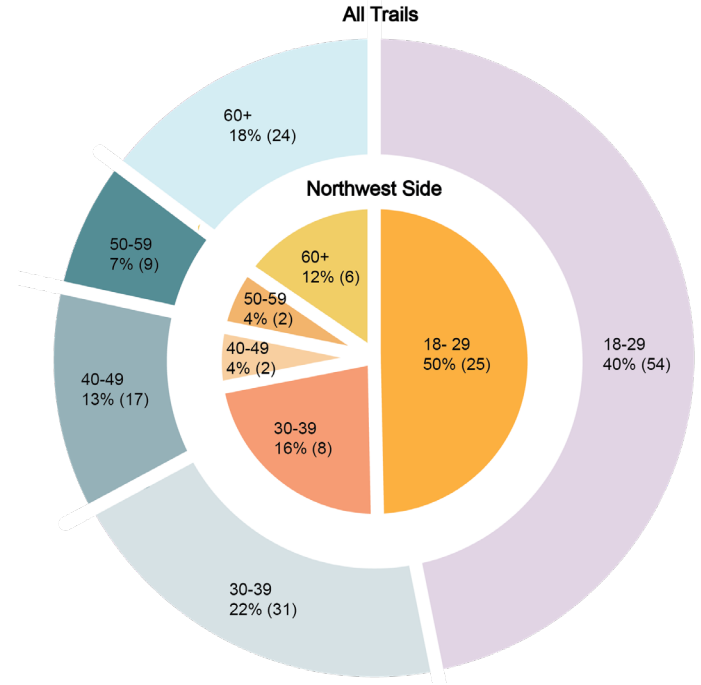
# DEMOGRAPHICS

The survey included demographic questions to ensure that the survey was relatively representative. The comparison of age groups to the general population shows a good representation of different age demographics.

Because survey participation was self-selected, and the sample size was small, these numbers do not necessarily represent the percentage of people using trails in each age demographic. Rather this data helps to clarify who is answering the survey questions.

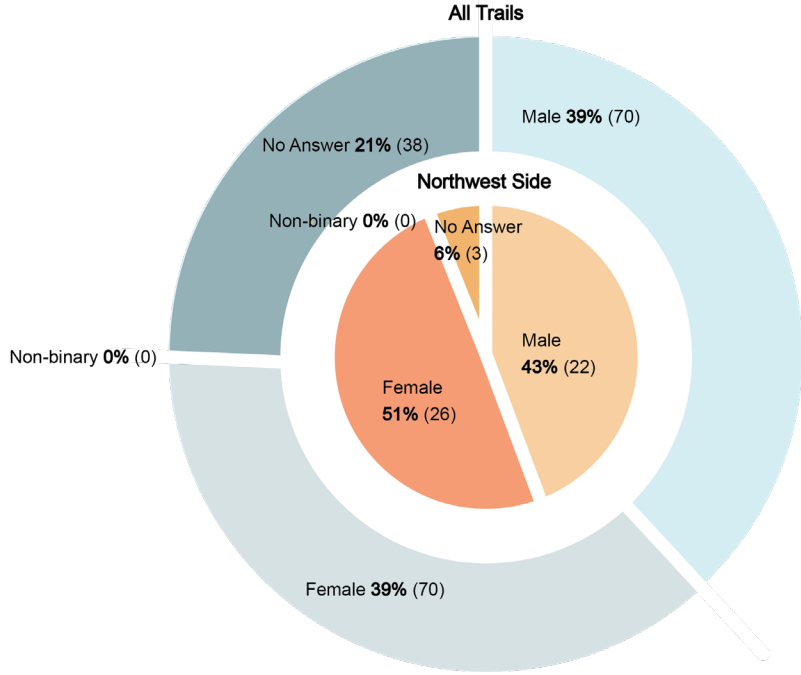
Note that the age question was optional and a large number of survey participants, 26%, chose not to disclose their age, creating a larger margin for error in this question.

## HOW OLD ARE YOU?



43 responses on 50 surveys on the Northwest trails  
137 responses on 175 surveys on All Trails

# WHAT GENDER DO YOU IDENTIFY AS?



The survey included a question on gender to ensure that the survey sample was relatively representative.

Men and women participated equally in the survey overall, but on the Northwest trails, women had higher participation. This survey slightly over-represents women in relationship to Bozeman's overall population.

Some participants chose not to disclose their gender, often because they were a couple taking the survey together. Sometimes a couple put two answers. Though the survey provided a non-binary gender option, no participants chose this answer.

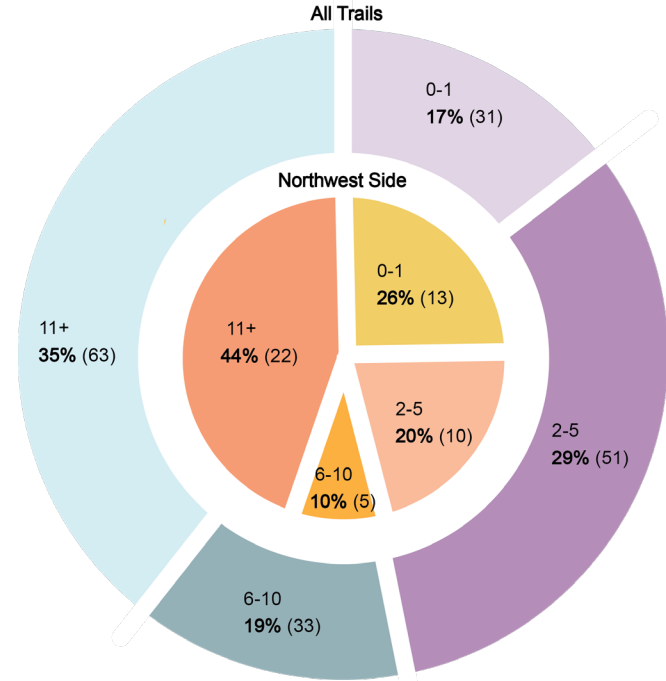
48 responses on 50 surveys on the Northwest trails  
140 responses on 175 Surveys on All Trails

# TRAIL USAGE

One question we asked was how often people used that trail. Habitual trail use was common on most trails.

Both on the Northwest trails and on all the trails generally, respondents report using trails frequently with over half using the same trail six or more times in the past thirty days. Over one third of respondents used the same trail eleven or more times in the past thirty days.

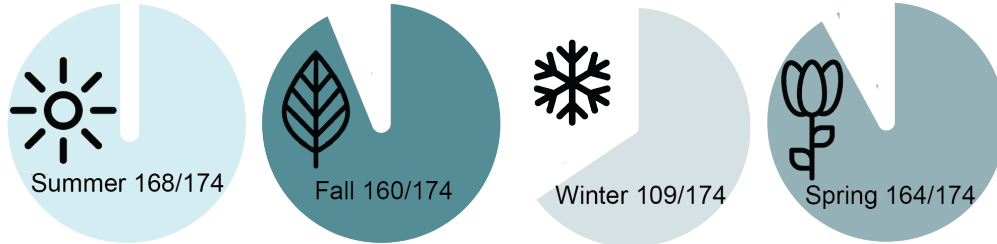
## IN THE PAST 30 DAYS, HOW OFTEN HAVE YOU USED THIS TRAIL?



50 responses on 50 surveys on Northwest trails.  
187 responses on 175 surveys on All Trails.

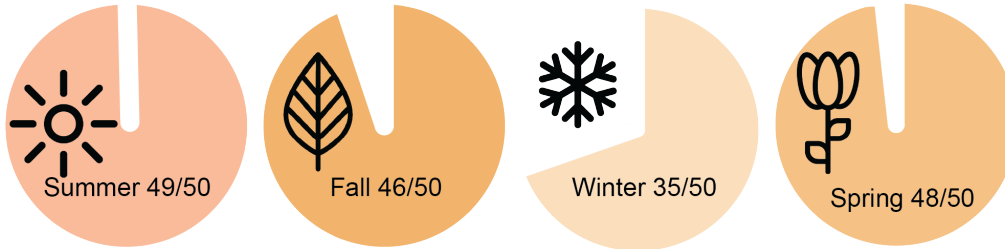
## IN WHAT SEASON DO YOU USE THIS TRAIL?

### ALL TRAILS



174 responses on 175 surveys on All trails

### NORTHWEST TRAILS



50 responses on 50 surveys on Northwest trails

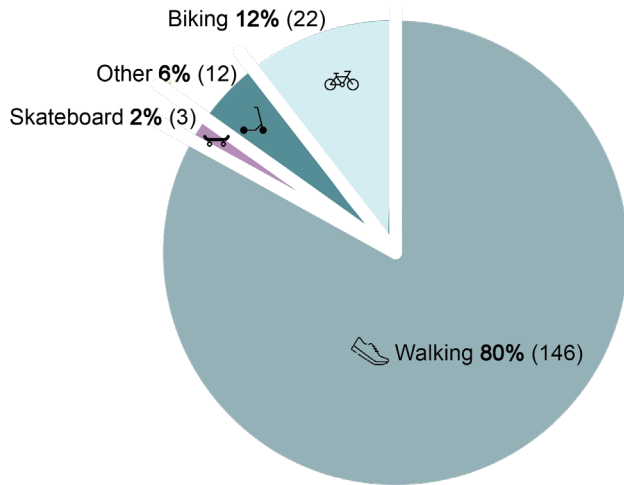
This survey shows year round use of the trails. Although none of the surveys were taken in the summer, 97% of respondents reported using the trail in the summer. While trail use decreased to 63% in the winter, usage remained over 90% in the fall and spring.

Trail usage may be more seasonal than this survey suggests. The fact that the surveys were taken in fall and spring may mean there are additional “fair weather” summer users who did not respond to this survey.

# WHAT FORM OF TRANSPORTATION ARE YOU USING NOW?

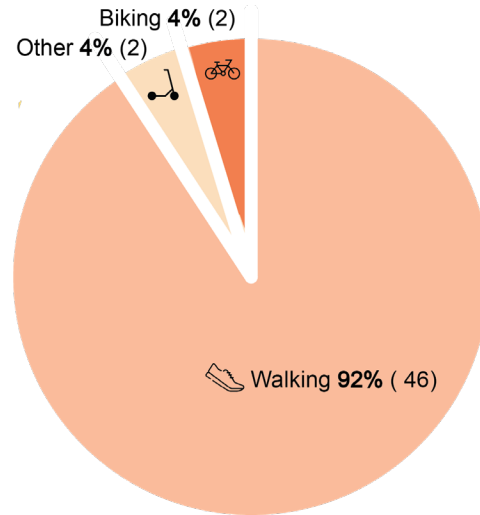
Most of the users who responded to the survey were pedestrians. Only 12% of respondents were bikers and 8% used other transportation like skateboards, scooters, or strollers. Biking was even less common on the Northwest trails. This is not an indicator that only 12% of users are bikers. Trail counts indicated that around 18% of users were on bikes. Bikers were less likely to stop to take the survey.

### ALL TRAILS



183 responses on 175 surveys.

### NORTHWEST TRAILS



50 responses on 50 surveys.

# DID YOU COME WITH OR INTENTIONALLY MEET UP WITH OTHER PEOPLE?

## ALL TRAILS



174 responses on 175 surveys on All Trails

## NORTHWEST TRAILS

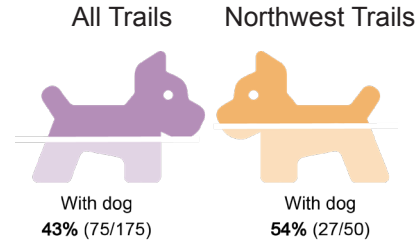


50 responses on 50 surveys on Northwest trails

Most of the users who responded to the survey were alone, with less than one third intentionally meeting someone at the trail the day of the survey.

Intentional meetups on trails were less common on the Northwest trails than in other areas, with 20% of survey respondents reporting that they had planned to meet someone at the trail.

Many trail users were accompanied by a dog, with 43% reporting they came with the explicit purpose of dog walking. This was 11% more common on the Northwest trails than trails in general.

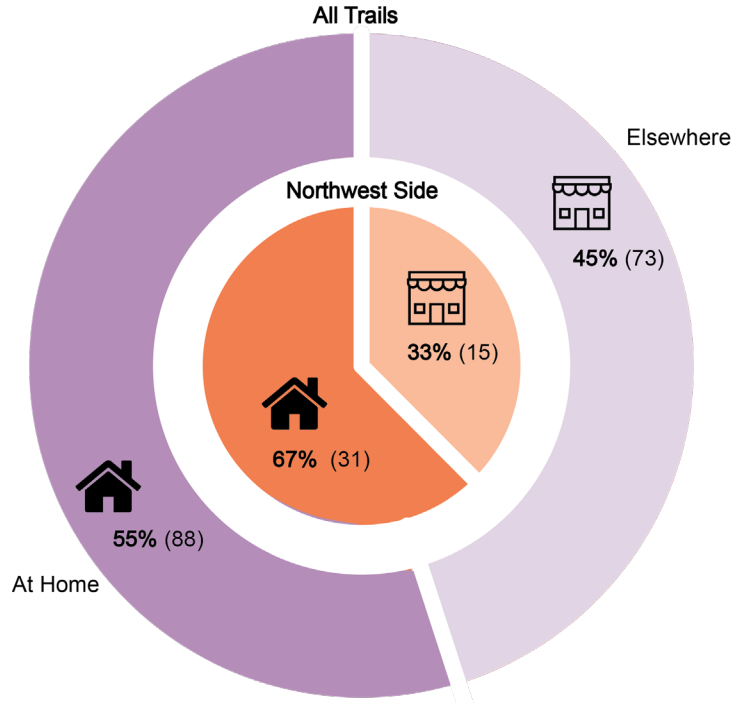


# TRAIL ACCESS

A slight majority of the trail users started their trips from home. However, a significant number started their trip elsewhere, from another location like MSU, the hospital, the mall, or a park.

Starting the trip from home was particularly prevalent on the Northwest trails where 67% came directly from their home.

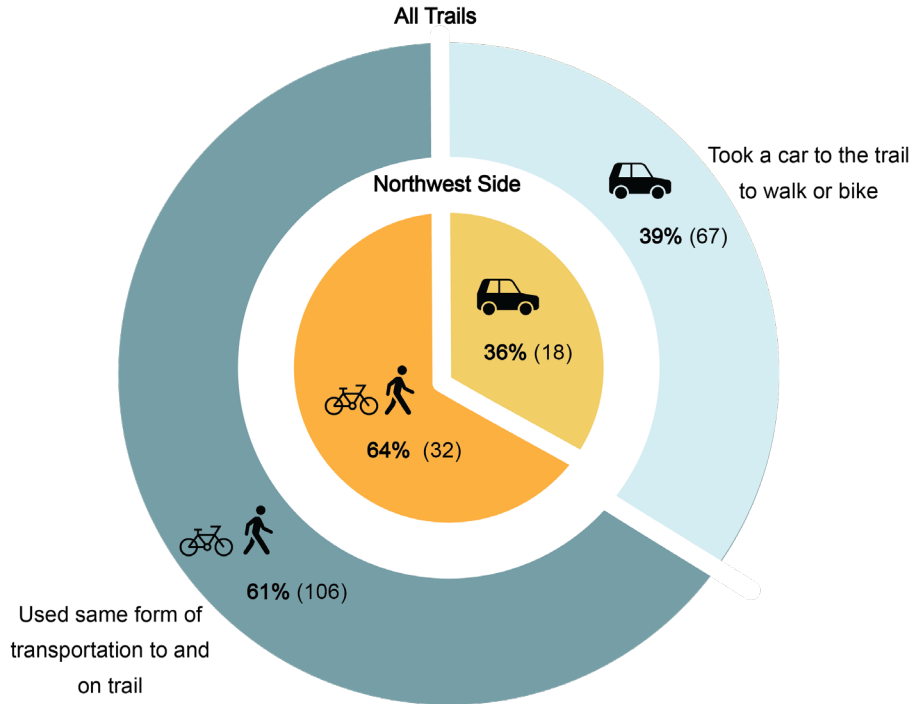
## WHERE DID YOU START THIS TRIP?



46 responses on 50 surveys on Northwest trails.  
161 responses on 175 surveys on All Trails.



# HOW DID YOU ARRIVE AT THE TRAILHEAD?



50 responses on 50 surveys on Northwest trails.  
173 responses on 175 surveys on All Trails.

Most of the trail users walked to the trail, indicating they used trails near to their homes or other activities.

Over one third of trail users drove to the trail, indicating that even neighborhood trails in residential areas are used as destination trails.

There was little to no difference in the use of cars to get to the Northwest trails versus the system more generally. The Northwest trails include the Bozeman Pond, which was a destination for non-neighborhood users.

# PURPOSE OF TRIP

Most of the trail users described the purpose of their trip as exercising, dog walking, and/or enjoying nature. Respondents could choose multiple answers. Only 14% of respondents reported using trails for functional transportation routes to commute, go to school, or shop or do errands.

## WHAT BEST DESCRIBES THE PURPOSE OF THIS TRIP?

### ALL TRAILS

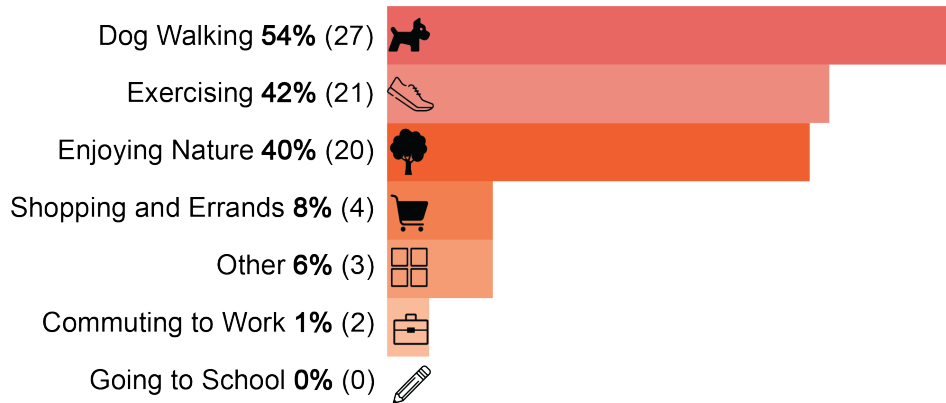


255 responses on 175 surveys on All Trails.

On the Northwest trails answers were similar to on the trails as a whole, with a higher prevalence of dog walking. Use of trails for commuting, going to school, and shopping and errands remained low.

## WHAT BEST DESCRIBES THE PURPOSE OF THIS TRIP?

### NORTHWEST TRAILS



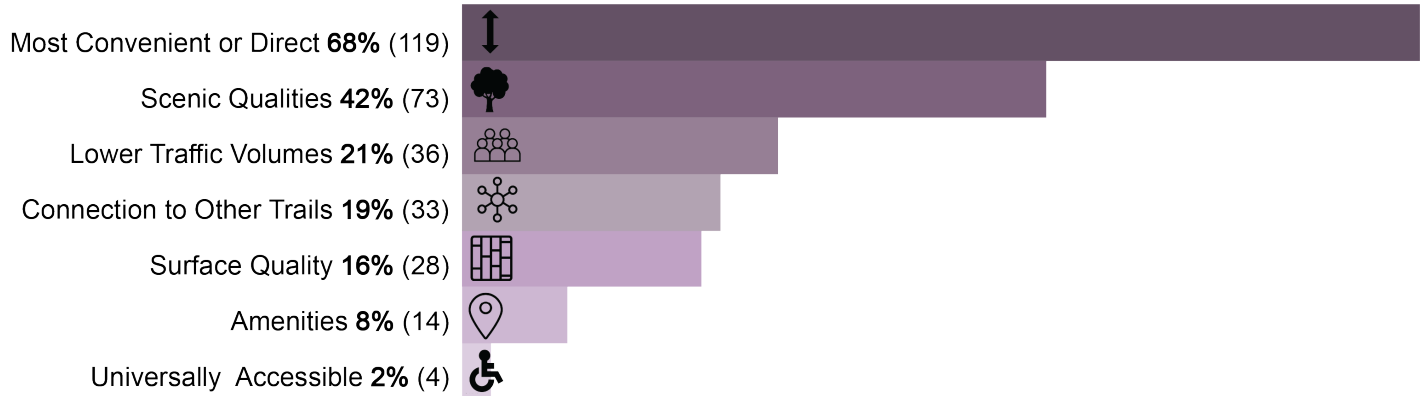
76 responses on 50 surveys on Northwest Trails.

# TRAIL CHOICE

When asked why they chose this trail for their path versus other routes, over two thirds of respondents reported that this trail was the most direct. But convenience was not the only factor. 42% of respondents reported that they chose the trail for its scenic properties. Lower traffic volumes and connections to other trails were also important draws.

## WHY ARE YOU USING THIS TRAIL AS OPPOSED TO OTHER PATHS?

### ALL TRAILS

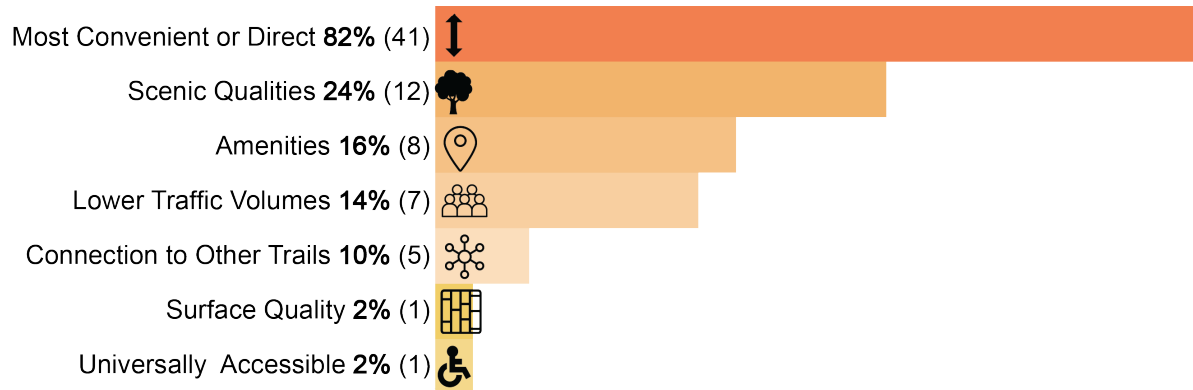


307 responses on 175 surveys on All Trails.

On the Northwest trails, answers were similar but with an even greater emphasis on convenience, with 82% of respondents indicating that they chose the path because it was direct. Scenic qualities had significantly less impact on the choice of Northwest trails, with only 24% indicating that it was a factor in their route decision.

## WHY ARE YOU USING THIS TRAIL AS OPPOSED TO OTHER PATHS?

### NORTHWEST TRAILS

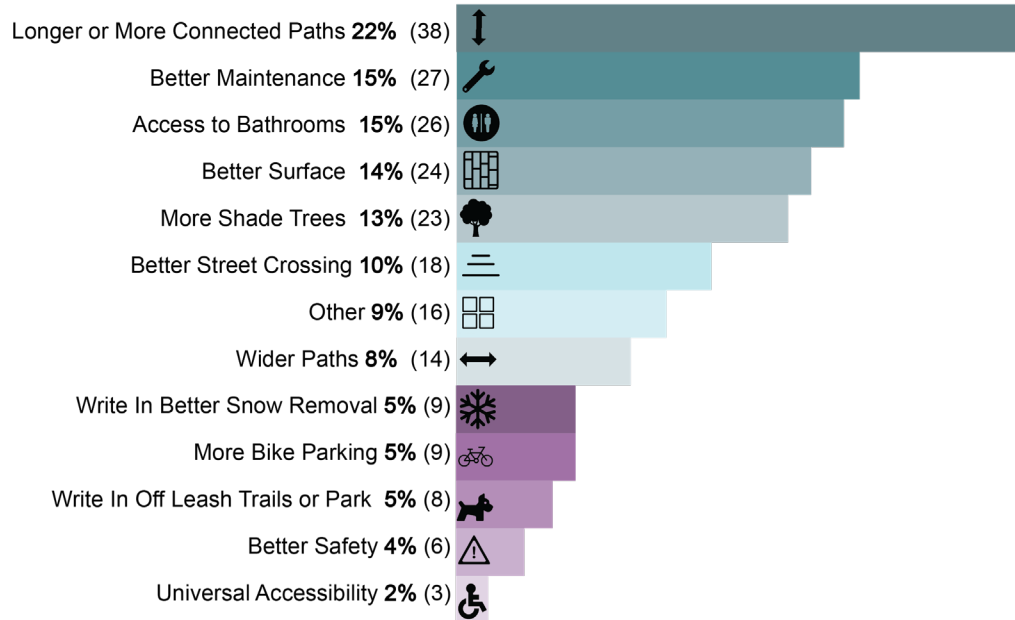


75 responses on 50 surveys on Northwest Trails.

# TRAIL IMPROVEMENTS

WHAT WOULD YOU LIKE TO SEE IMPROVED ALONG THIS TRAIL?

## ALL TRAILS

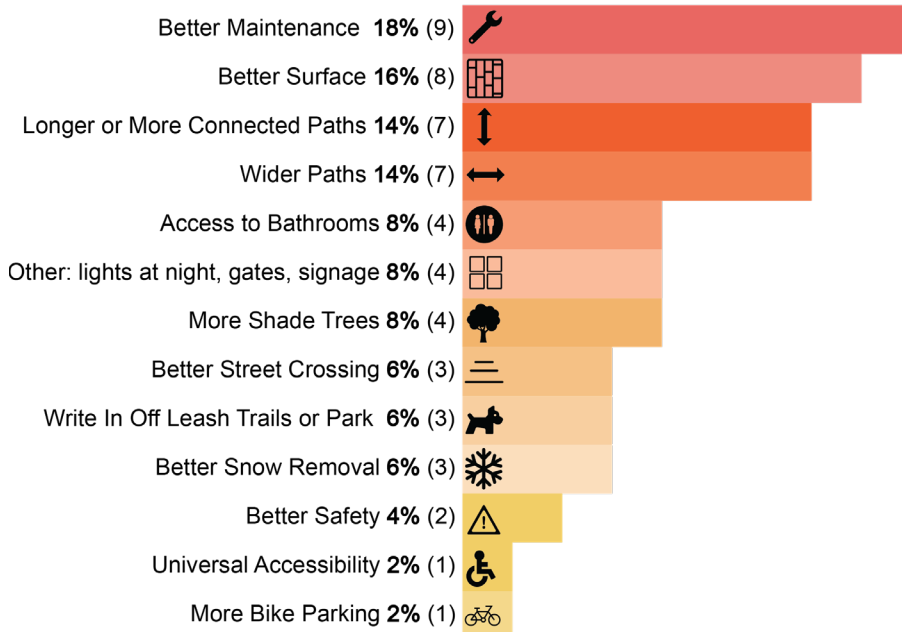


221 responses on 175 surveys on All Trails.

# WHAT WOULD YOU LIKE TO SEE IMPROVED ALONG THIS TRAIL?



## NORTHWEST TRAILS



When asked what improvements they would like to see, trail users' top three priorities were longer or more connected paths, better maintenance, and better surfaces.

More shade trees, access to bathrooms, and better street crossings also received significant support from at least 10% of respondents on the system as a whole. Wider paths received support particularly from Northwest trail users.

Popular write in responses requested off-leash dog areas and snow removal.

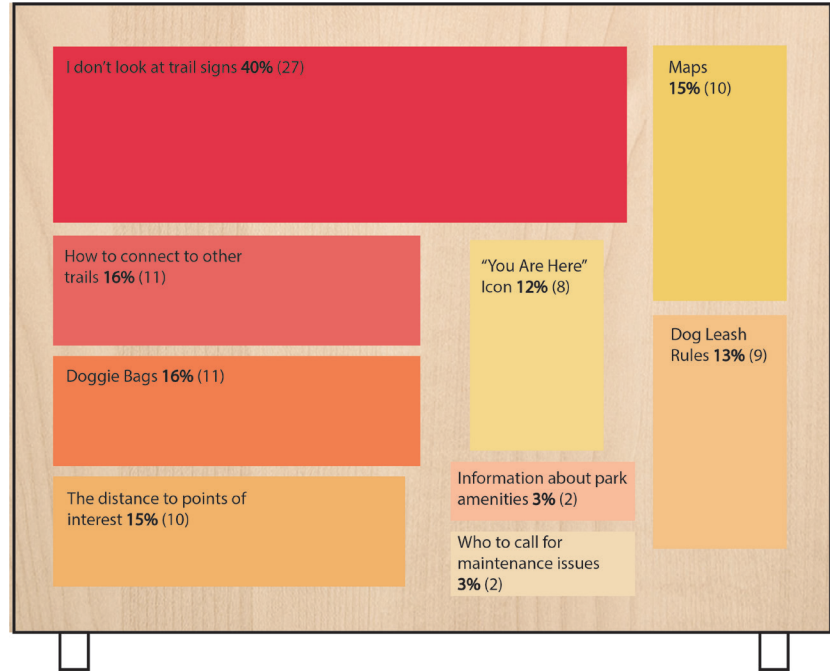
78 responses on 68 surveys on Northwest Trails.

# WAYFINDING

While 40% of trail users did not use trail signage. Those who did looked for maps, points of interest, and how to get to other trails with about equal frequency. The least used information was about park amenities and who to call for maintenance. This data may indicate that more maps and connection information would be useful on signage.

When choosing trails, physical maps were the least frequently used source of information. Most trail users chose their usual route or wander randomly. When using maps, online apps are used often. This indicates that developing online trail maps or working with popular apps may be more useful than printed maps or digital maps not connected to commonly-used apps.

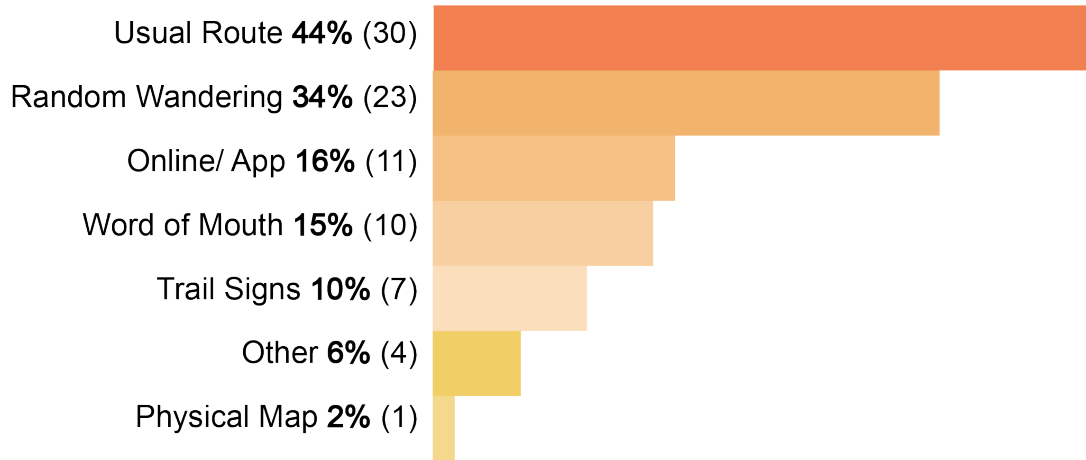
## IF YOU LOOK AT TRAIL SIGNAGE WHAT INFORMATION ARE YOU LOOKING FOR?



90 responses on 51 surveys conducted Fall 2019



## HOW DO YOU CHOOSE YOUR TRAIL ROUTES?

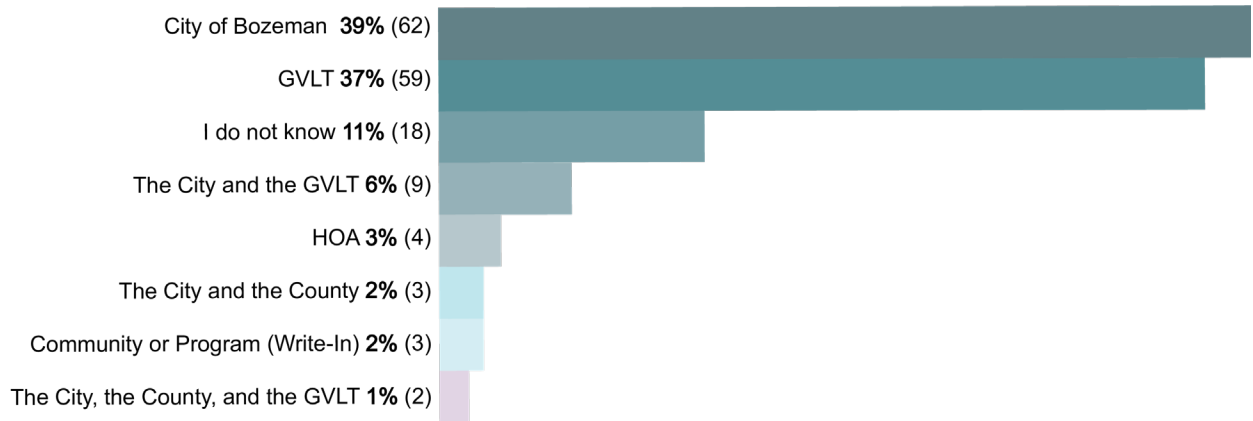


86 responses on 51 surveys conducted in Fall 2019

# PUBLIC AWARENESS OF TRAIL STEWARDS

WHAT GROUP OR AGENCY DO YOU THINK IS MOST RESPONSIBLE FOR TRAIL BUILDING AND MAINTENANCE IN BOZEMAN?

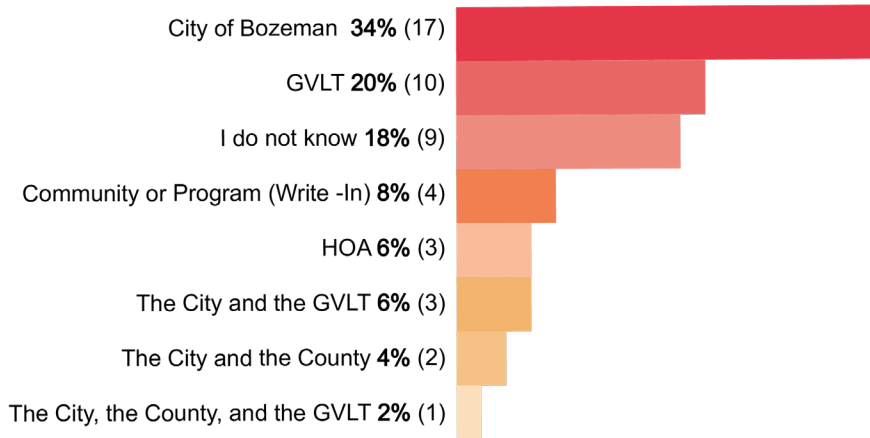
## ALL TRAILS



159 responses on 175 surveys on All Trails. This question did not provide multiple choices, only write in responses.

Most of Bozeman residents know who maintains the trails with only 11% of users self reporting that they “don’t know” which agency is most responsible for trail building and trail maintenance. Another 9% didn’t respond. This data shows that the City and the GVLТ have effective marketing about their role in trail stewardship.

## NORTHWEST TRAILS



47 responses on 50 surveys on Northwest Trails. This question did not provide multiple choices, only write in responses.

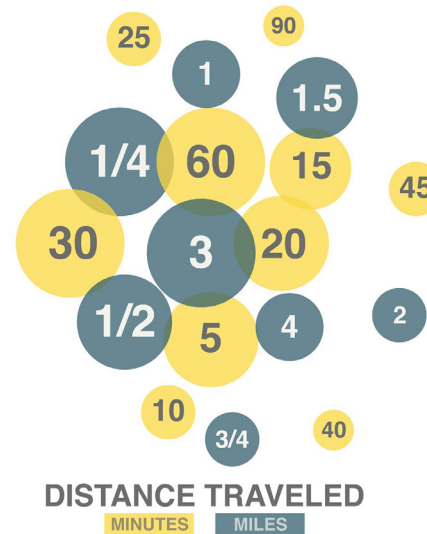
# ADDITIONAL SURVEY DATA

The survey data presented thus far is pulled from the entire set of 175 surveys by Dr. Cowan and her assistant Larissa Morales.

The students also developed infographics for the surveys they conducted on specific trail routes. They also added their own questions. The graphics in this section use small data sets and are less representative and precise in their use of survey techniques. Nonetheless this data adds useful information from the survey, such as site specific responses and new thematic content.

## DISTANCE TRAVELED ON TRAILS

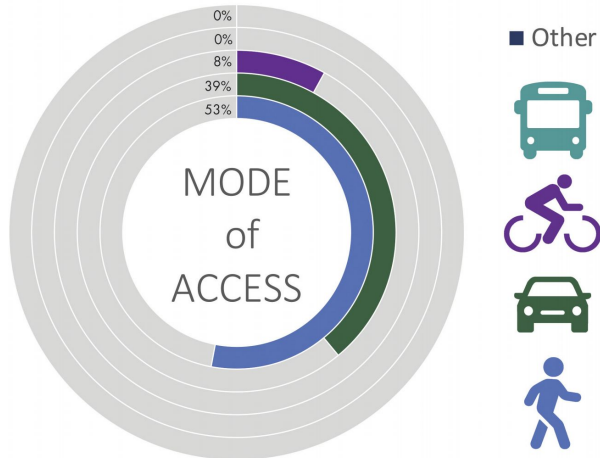
The diagram below shows the length of the total trip of trail users. This data is based on 51 surveys conducted in Fall 2019. Trips lasted from 5 minutes to 90 minutes, and from 1/4 mile to 4 miles.



By Austin Anderson, Brooke Kervi, and Jackson St Clair

## ACCESS TO THE GALLAGATOR

27 surveys conducted on the Gallagator in Spring 2019 show that while most users walked to the trailhead, a significant number, 39% drove to trail and then walked. Only 8% biked to the trail, and all of these users stayed on their bikes.



By Alex Wolsifer, Eliana Delebahan, Jessica Bone and Kali Peterson

## ATTRACTIONS TO BOZEMAN POND

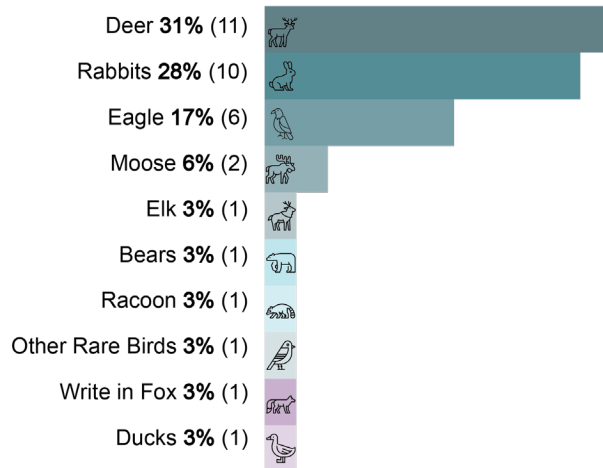
Based on responses during 8 hours of surveying at Bozeman Pond between April 19-23 2019, most users come to the park to run or walk dogs; however 12% also come to use the climbing wall. In this survey, fishing was not a major attraction.



By Coleman Zauner, Lyndsay Watkins, Cole O'Brian

# STUDENT CREATED SURVEY QUESTIONS

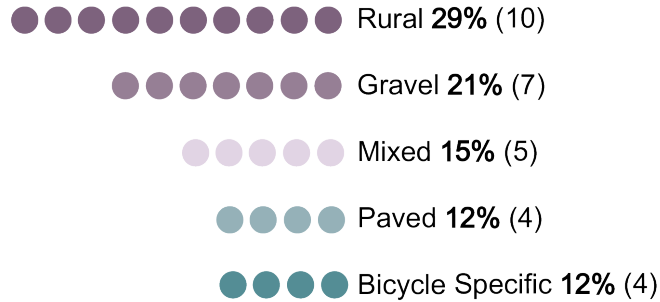
WHAT ANIMALS HAVE YOU SEEN WHILE ON THE TRAIL THIS WEEK?



36 responses on 16 surveys This question was asked on Highland Hills, Bridger Ceek, and Painted Hills.

# WHAT KIND OF TRAILS WOULD YOU LIKE TO SEE THE CITY BUILD?

## PAINTED HILLS



34 responses on 13 surveys. This question was only shown on Painted Hills Surveys.

# PROPOSALS FOR TRAIL IMPROVEMENTS

The data from the surveys can be used to understand both how the trails are being used, and how users would like to see them improved. The students in Dr. Cowan's classes "Arch 452: Architecture Research Methods" and "Arch 525: Participatory Open Space Planning" used their analysis of the trail counts and surveys to propose ways to enhance the trails. Some students were assigned to specific trails, like the Gallagator, the Westside trail, or the Great American Rail trail. Other students chose a topic like Wayfinding, then looked at several trails, or the system as a whole. The designs presented here address perceived problems with the existing trails, or imagine new possibilities for future upgrades or extensions. The recommendations aim to improve the connectivity, accessibility, usability, safety, legibility, and/or aesthetics of the trails.

Some of the designs build on existing ideas suggested by the City of Bozeman or the Gallatin Valley Land Trust; others originated with the students. While some of these projects are realistic, others are intended to be inspirational and may not be practical in the near future. These suggestions can be used by the City of Bozeman and the Gallatin Valley Land Trust in their upcoming grant proposals, strategic planning, or in the future Parks Recreation, Open Space, and Trail (PROST) plan.





By Larissa Morales

# NEW ROUTES

Some students chose to propose new trail routes, or to help the City and the GVLТ to visualize and design routes already in consideration.

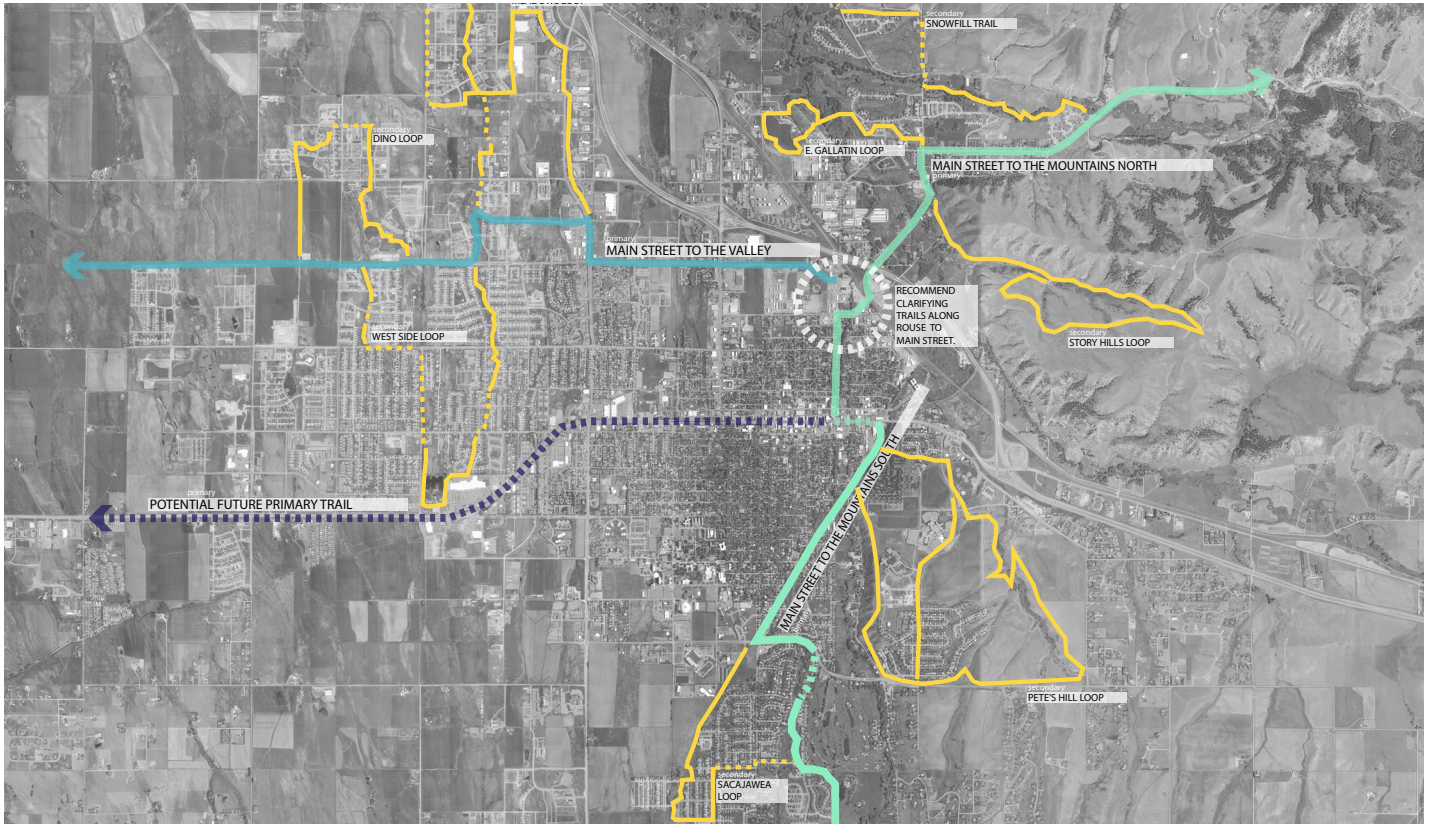
These new routes aimed to connect existing trails, connect all neighborhoods to the mountains, connect neighborhoods to their local schools and parks, or add more east-west connections.



By Cassie Coate, Alex Simensen, Stephanie Weedle, Sage Trantitis

A major focus for these new routes was the Northwest quadrant of Bozeman, where piecemeal growth has created fragmented trails. The proposals aim to help create a more cohesive system of trails in the Northwest.

The new trail proposals on the right not only connect existing trails but create a clear identity for each trail, to help trail users find cohesive pathways for longer exercise routes or to reach specific destinations. The Main Street to the Valley trail would designate an east-west trail from the Northeast neighborhood to the Northwest quadrant. The Dino Loop, Meadows Loop, and Westside Loop create identifiable circuits within neighborhoods, connecting residential areas to the longer cross-town routes.

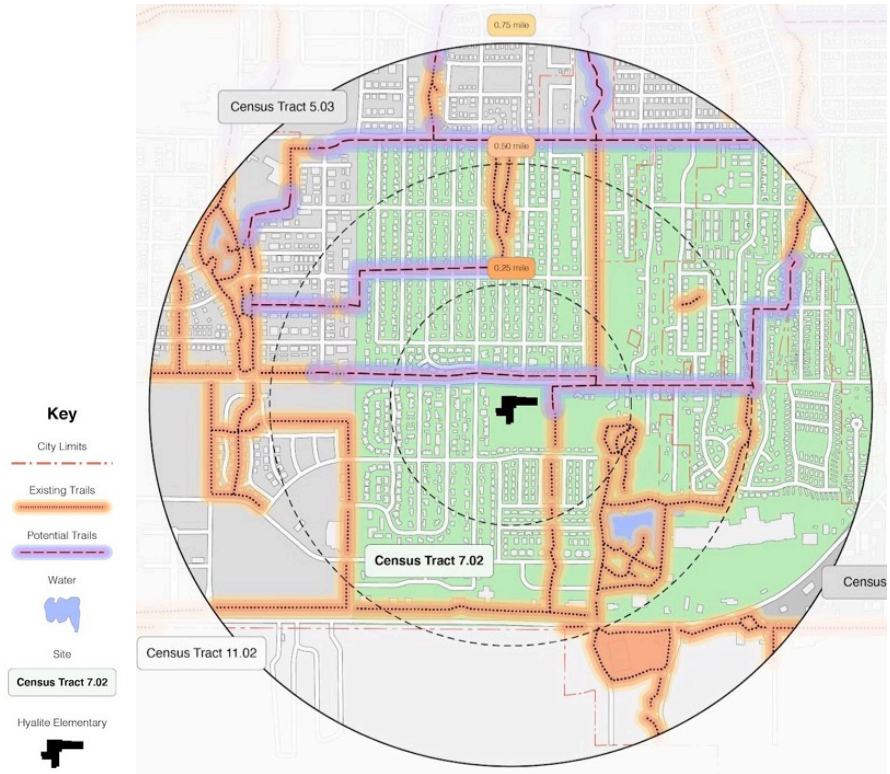


By Austin Anderson, Brooke Kervi, and Jackson St. Clair

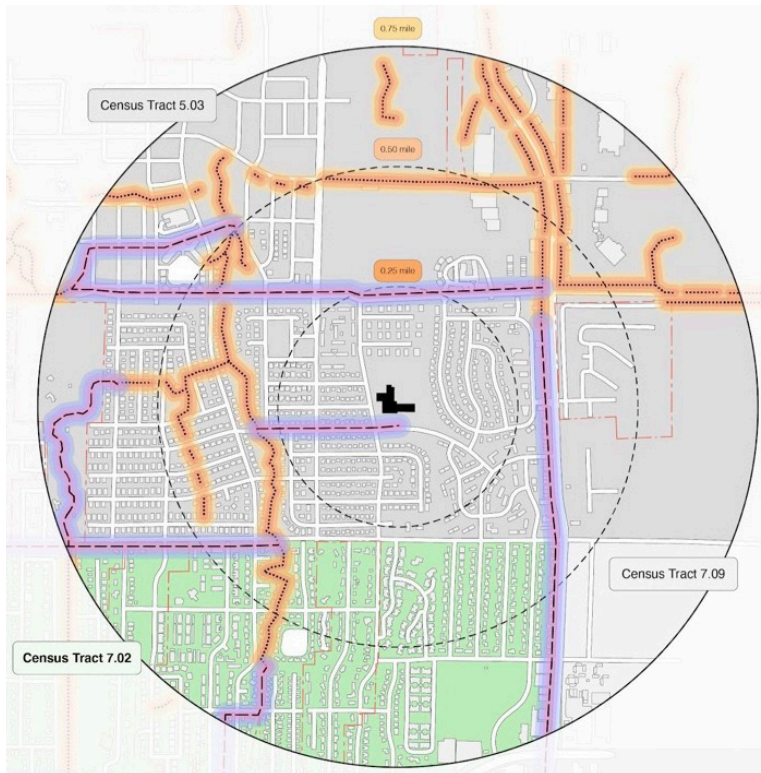
# TRAILS NEAR SCHOOLS

Some students chose to focus on mapping the existing trails around schools, and identifying new trail routes that could connect residents to their local elementary school.

Here a 3/4 mile radius is drawn around Hyalite School to identify the trails within a 15-minute walk. New routes are shown in purple where the addition of pedestrian infrastructure could improve walk-ability around the school.



By Scott Mooney, Grant Doken, and Paul Patterson



This map shows a 3/4 mile radius drawn around Emily Dickinson Elementary School, showing the areas within a 15 minute walk. Adding the trails in purple would provide safer walking and bike routes to school for most of the nearby residents.

Together these two maps show the importance of trails in facilitating sustainable commuting for school age kids.

By Scott Mooney, Grant Doken, and Paul Patterson

# WAY FINDING

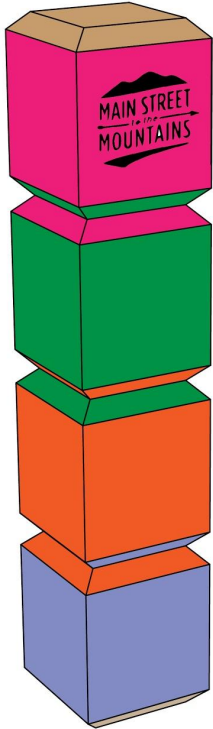
In some areas of Bozeman, especially in the Northwest, trails have gaps, or lack signage. Some local people may not know about all of the trails near them, or may not be certain if a pathway is a public right-away or part of a private yard. Improved frequency and utility of signage can help people to find trail routes more easily.

Several groups of students suggested improvements to the design of the signs. One group of graduate students proposed adding maps to existing signage. These students also modeled what a new brand identity for the Valley to the River trail might look like.

Other students proposed much more colorful signs to make these signs easier to see for people of all ages, including those with impaired vision. Color coding could help to brand trails.



By Whitney Ciofalo, Maddie Miller, and Alexis



By Scott Mooney, Grant Doken,  
and Paul Patterson



Idea By Travis Boyer, Christian Snell,  
Stalone Cruz, and Willie Leidof

A third group of students proposed using smart phones to help users access way-finding information while on the trails. Signs could include a QR code which people could scan with their phones and get connected to real time maps and trail information.

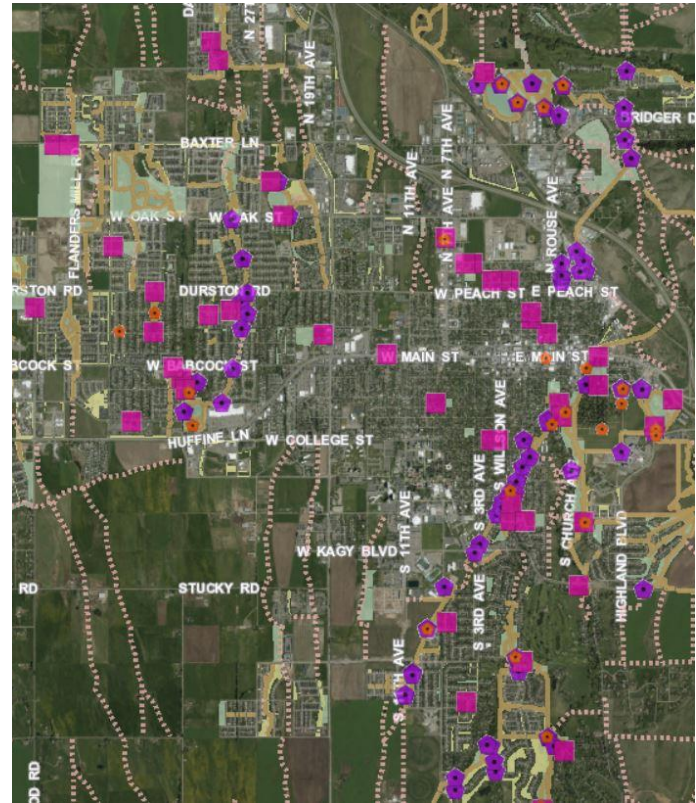
Small strategically placed interactive signs could convey more information for less cost. The codes could connect to the GIS trail map to make it easier to use on a phone. The codes could also engage users in new ways by linking to historical information, temporary digital exhibitions, or point reward systems that could be changed over time.

## EXISTING SIGNAGE LOCATIONS

This map shows the existing signage present on trails within Bozeman. Trails like the Gallagator and the Westside trail have frequent totems marking their pathway and entrances, here shown in purple. Newer trails have less frequent signs with maps. Some parks lack any signage at all, like the Valley West Park and West Winds Park. Linear multi-use trails like College/Huffine and Oak also lack signage.

The following student projects propose additional signage to improve wayfinding along the trails. They propose a hierarchy of different types of signs, where those signs should be located, and where they should start to highlight destinations.

Considering that the cost of these signs and budgetary restrictions may limit the number of signs, these proposals can start to highlight priorities for new sign locations.

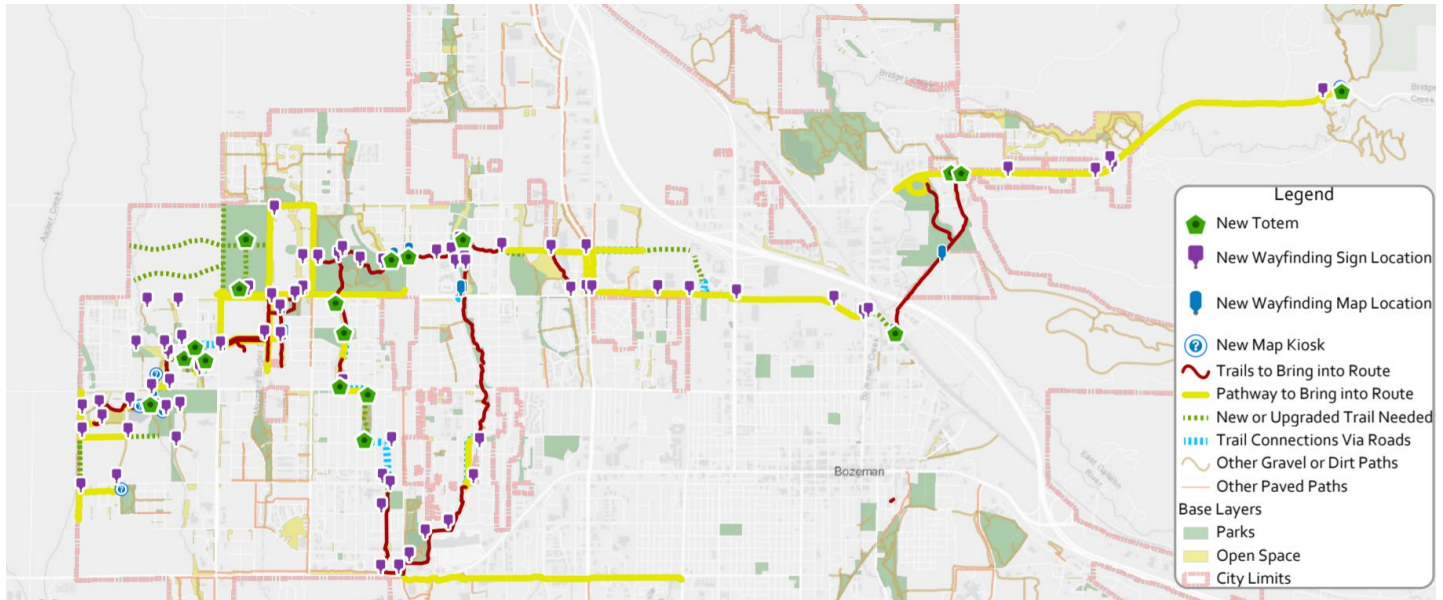


GIS map provided by the City of Bozeman



# NEW TOTEM AND SIGN LOCATIONS

One group mapped potential signage options across the east west trail from the M to the Northwest. Here a combination of totems, maps, and signs would help people to find their way along existing and new trails.



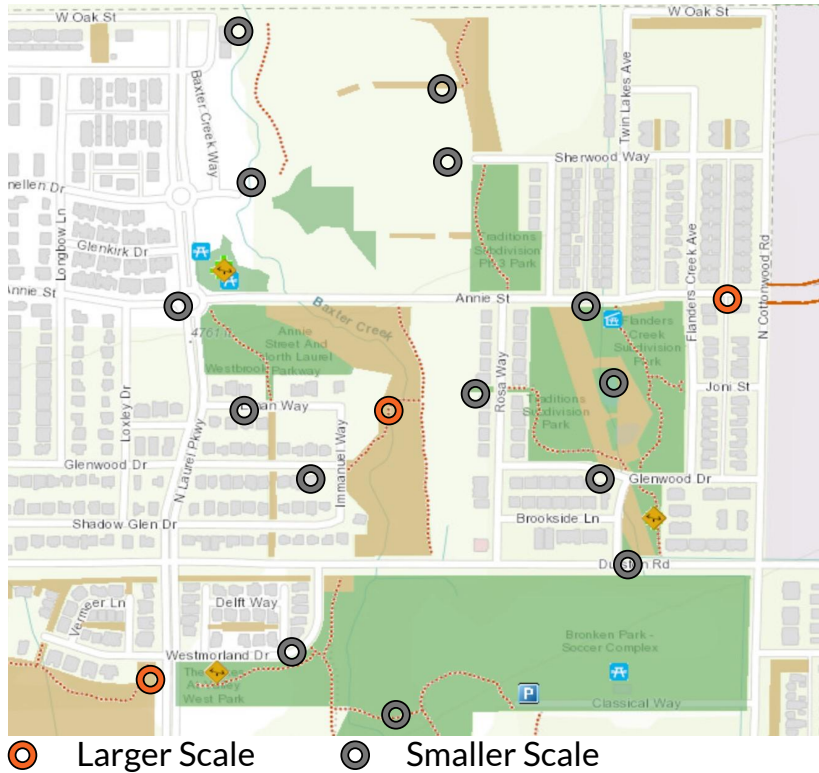
By Cassie Coate, Alex Simensen, Stephanie Weddle, and Sage Triantis

One group proposed locations for new signs in two Northwest quadrant parks, at Valley West and Valley Unit. Here signs at park entrances and major trail intersections help park users to connect to the trail system. The students also hoped that the under-used Valley Unit park might attract more visitors if marked as part of the trail system.

Given the number of signs needed at these parks, the City and GVLТ may choose to use smaller, more affordable signs rather than expensive totems or map kiosks. Students suggested that signs include distances to landmarks.



By Heather Stevenson, Kameron Conklin, and Lindsey Teply



A third group proposed new signage for the Flanders Creek and Baxter Creek areas in Northwest Bozeman.

They proposed two different types of signs.

The larger signs occur at points of greater trail deviation, where choices to turn may lead users off the trail system. The larger signs notify users of larger scale trail fragments.

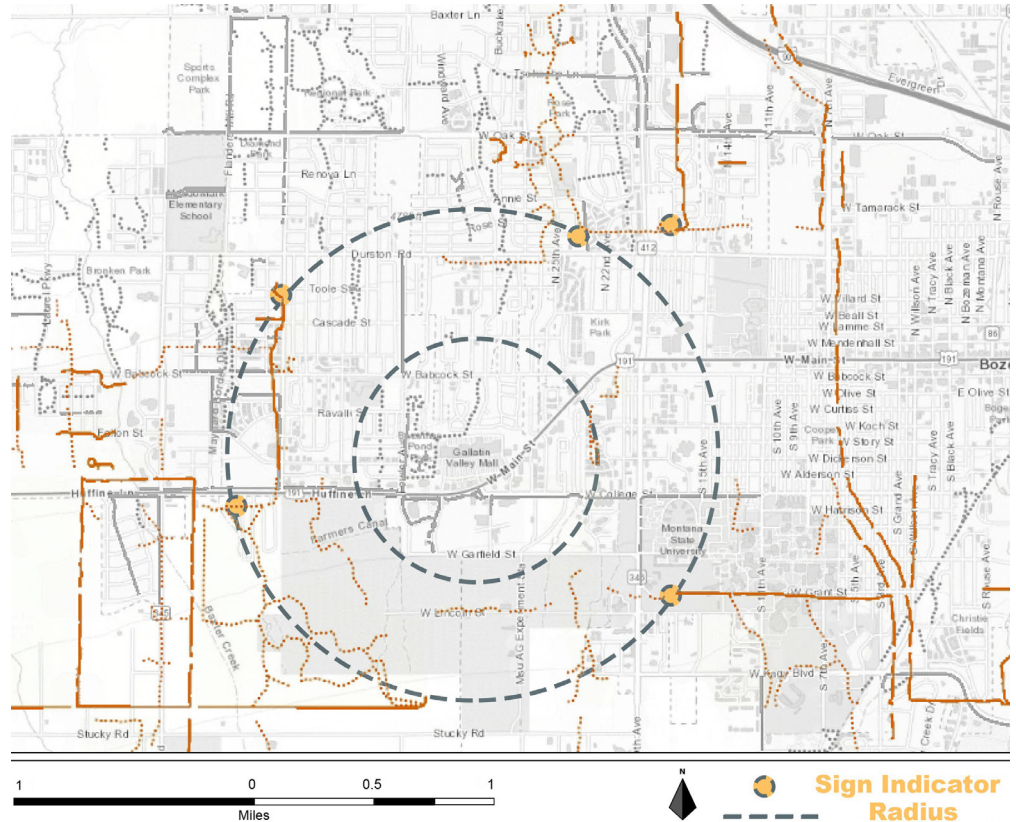
The smaller signs are simple yet precise location markers which occur at the entry points to trails or at small intersections within a trail or park. They include only information the user would need immediately at that location, such as directions to upcoming areas of interest.

By Cassie Coate, Alex Simensen, Stephanie Weddle, and Sage

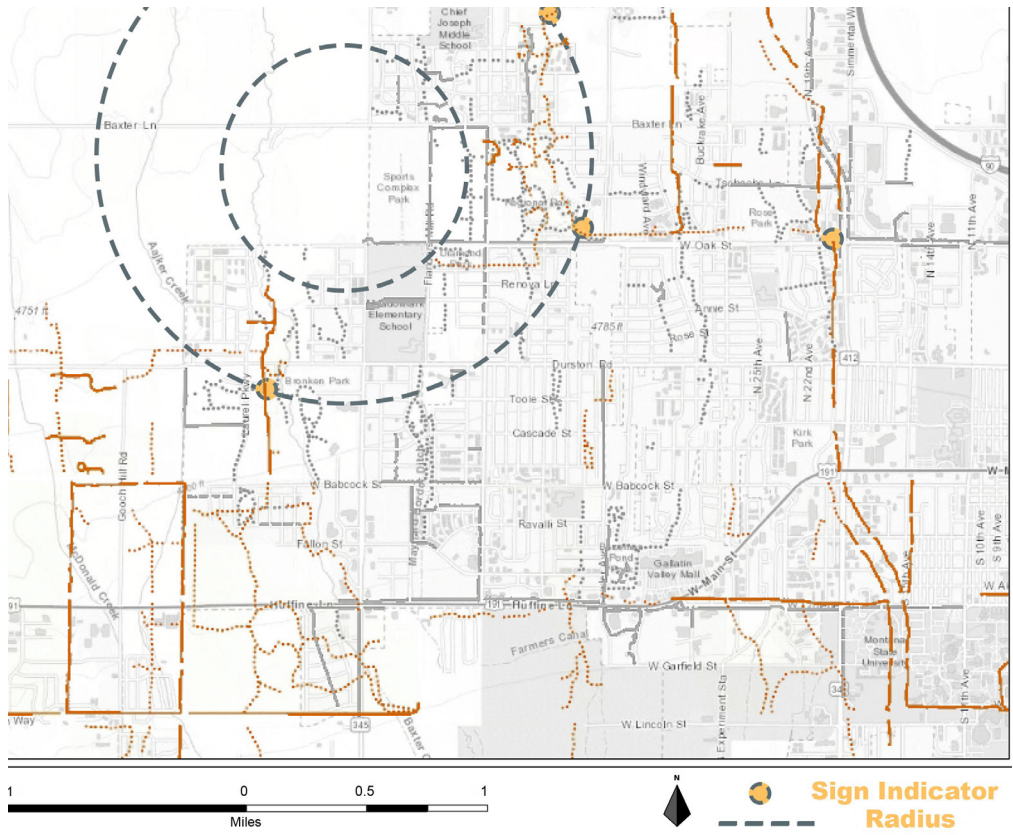
Besides locating signs, students also considered policies for marking destinations and distances to landmarks on trail signage.

One graduate student proposed that trail signs denoting the distance to specific parks or destinations should begin around 1 mile radius from the location, or a 20 minute walk. Using this guidelines she chose locations for trail signs which would direct trail users to specific parks.

On this page she designated four locations 1 mile from Bozeman Pond where trail markers could be located to direct trail users to that location.



By Britney Sulzen



The map on this page shows the proposed location of three signs located one mile from the Bozeman Sports Park.

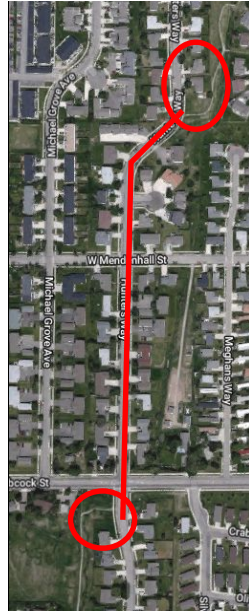
Additional signs with directions and distances to these parks could be placed along the trail on the appropriate trail signs within that 1 mile radius.

Other landmarks that could be treated in a similar way, including schools and public buildings like the library.

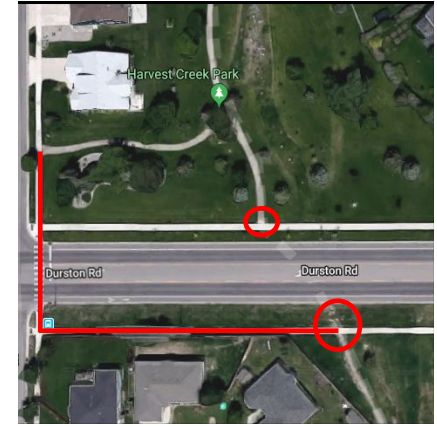
By Britney Sulzen

# SAFETY AND CONNECTIVITY AT STREET CROSSINGS

The Westside Trail has many gaps that make safe continuous trail use difficult. One group of students identified the major intersections and made suggestions about how to improve those street crossings.

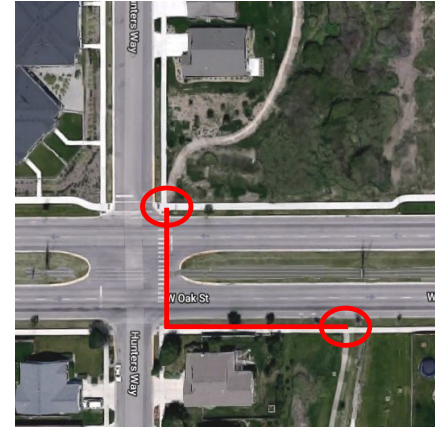


The Westside trail has a 1/4 mile, 5 minute gap between Babcock and Mendenhall which could be addressed with a bike boulevard sign and trail signs to help users find the trail connection. The section crossing Villard could use a cross walk and/or pedestrian crossing yield signs.



By Marissa Garcia, James Albondi, Aiden Cohen, Adam Franke using Google Maps

The trail crossing at Durston could use a cross walk, or signage directing pedestrians to the nearby intersection which already has a cross walk. At Rose a trail segment could be added or redirected to the north and/or southside to connect the trail directly across the street, and a cross walk and pedestrian crossing yield sign could be added. At Annie the trail connects to the intersection nicely, so a cross walk could be added at the intersection, perhaps with a stop sign or yield sign. Finally at Oak street, the trail could be turned slightly and a trail sign added to direct users toward the west of the intersection at Hunter's Way, where a cross walk already exists. Together these modifications would increase the clarity of wayfinding on the trail, and increase safety for pedestrians and bikers when crossing car traffic.



By Marissa Garcia, James Albondi, Aiden Cohen, Adam Franke using Google Maps

# NEW AMENITIES

Some students chose to augment existing trails by adding new amenities.

Some of these student projects addressed needs identified in the survey such as safety, shade trees and bathrooms.

Other students developed proposals based on the specific needs of the case study trail they studied. This includes a campground for the Great American Rail Trail, a pier for the Bozeman Pond, and flood mitigation on the Bridger Creek Trail.

Some of these proposals are realistic and budget conscious, while others are aspirational, meant to inspire new ways of thinking about the trails.



A frequented Bozeman amenity, The Gallagator Climbing Boulder

Photo by: Larissa Morales





## LIGHTING

One new amenity that several students proposed for trails was additional lighting for way-finding and improved safety at night time.

One group of students proposed typical landscape lights, such as low lantern fixtures for the Story Mill trail. Another group proposed overhead street lights or lampposts for the College/Huffine trail.



But since the costs for this type of infrastructure can be high, one student proposed painting trails with glow in the dark paint. This could be useful for multi-use trails like College/Huffine trail, or Oak trail.

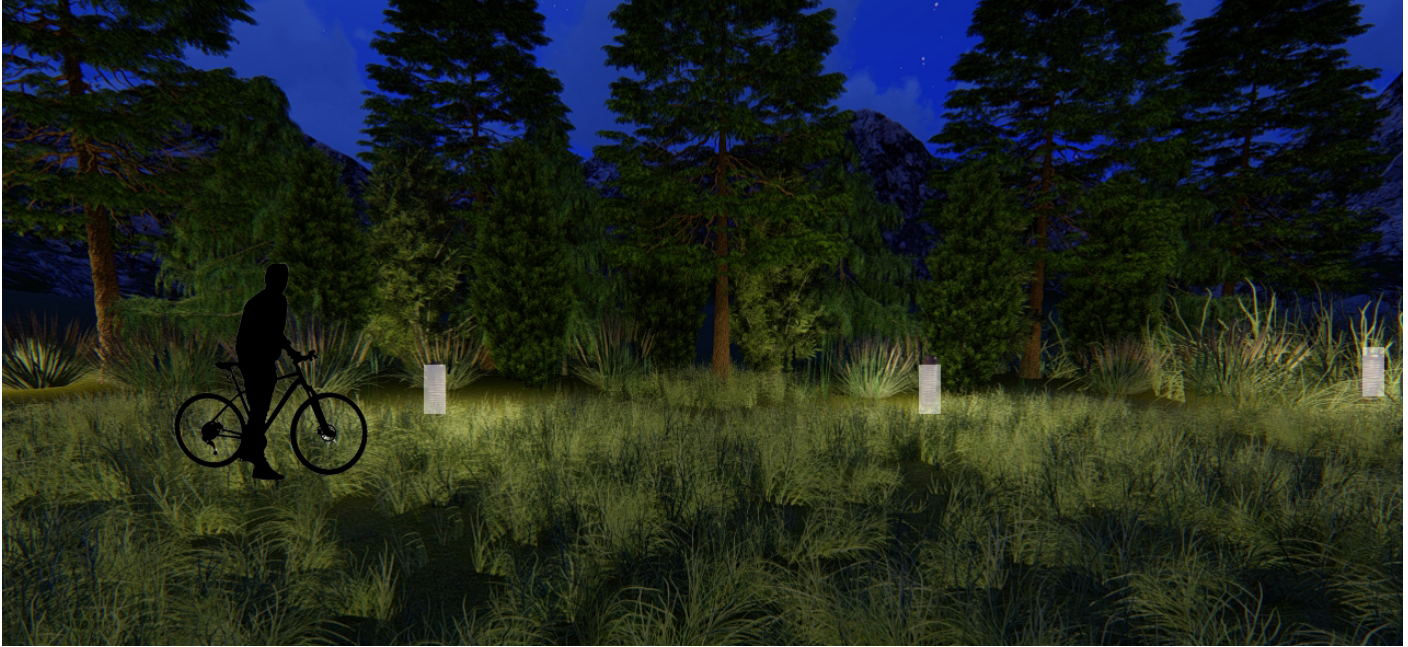
Considering Montana's long winters, many trails, like the Westside trail, are not consistently shoveled. Many others are unpaved. Another affordable option for marking trails at night is glow-in-the-dark vertical trail markers as seen on the next page.

One student proposed adding affordable glow-in-the-dark paint to help to mark trails at night. In order to make the markers visible they will be located every 20 feet, and will be 3 feet high, above the winter snow line. This illustration shows the light reflecting off the snow in the winter.



By Larissa Morales

This image shows a sample of what the markers could look like, as seen in the summer. The path markers could also be made in different colors to designate different trails and could be designed by local artists to achieve different visual effects of light.



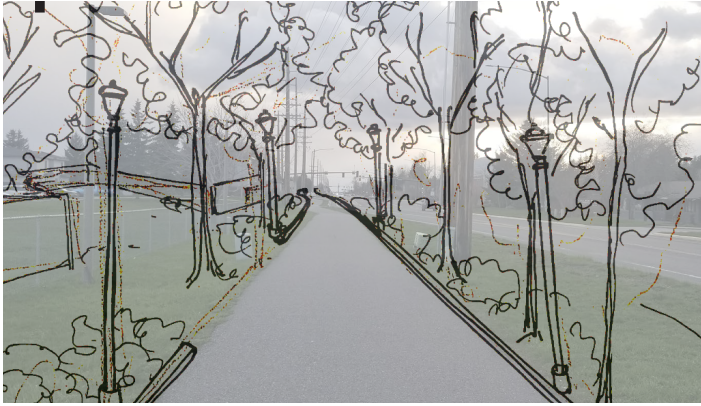
By Larissa Morales

## FURNISHINGS

Along the College Avenue trail, students proposed planting trees to provide more protection between cars and the multi-use pathway. This would make the pathway feel more safe, and attract more pedestrian traffic, encouraging commuters to use sustainable means to get to campus. The students also proposed new lighting, signage, and adult exercise equipment to add amenities for students and neighbors along this linear trail.



By Rutuja Joshi and Saurabh Tulsankar

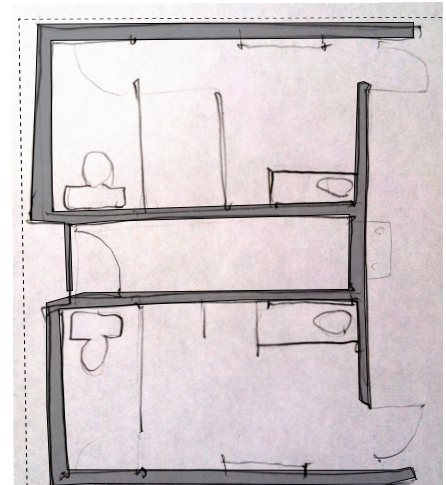


By Rutuja Joshi and Saurabh Tulsankar



# BATHROOM

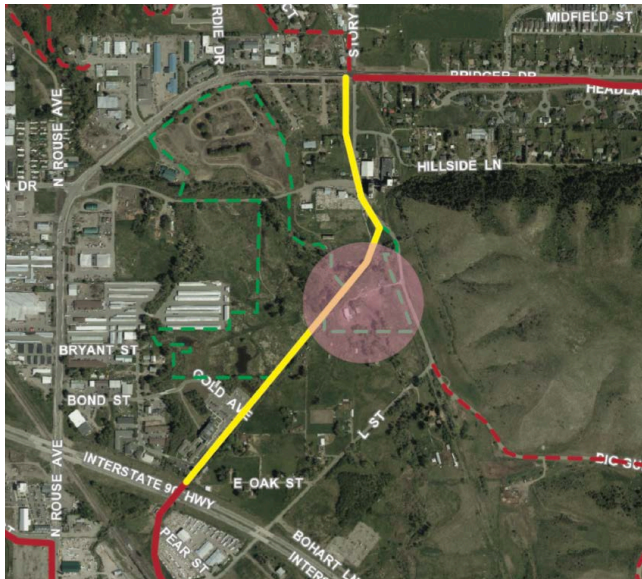
One group proposed to add a bathroom to one of Bozeman's most popular trails, the Gallagator. They proposed two possible locations, the first is in Langhor Park near the community garden. This areas is far from a public restroom. The second proposal is in the parking lot at the base of Peets Hill. There is a public bathroom at the top of the Burke's Hill trail over a mile away. However, near downtown trail users only have access to the library bathroom, which is not open on Sundays or after hours. A new bathroom at either location would increase accessibility of this popular trail and facilitate longer use of the trail system.



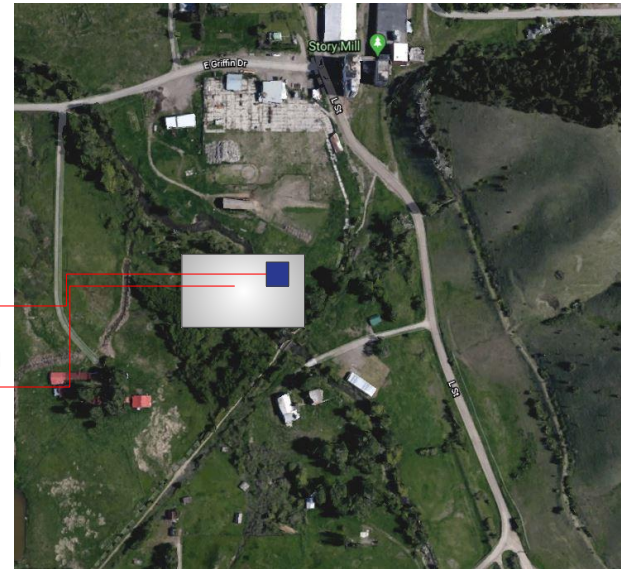
By Sam Bjorkland and Mathew Thome

# CAMPGROUND

Along the Story Mill trail, students suggested adding a campground with a bathroom as an amenity for the new Great American Rail Trail. This project would aim to utilize the tourist traffic from the rail trail to bring economic development to Bozeman, making the town a destination on the route, rather than just a locale to pass through.



- Great American Rail Trail
- - - Existing trails
- Proposed site
- Survey trail

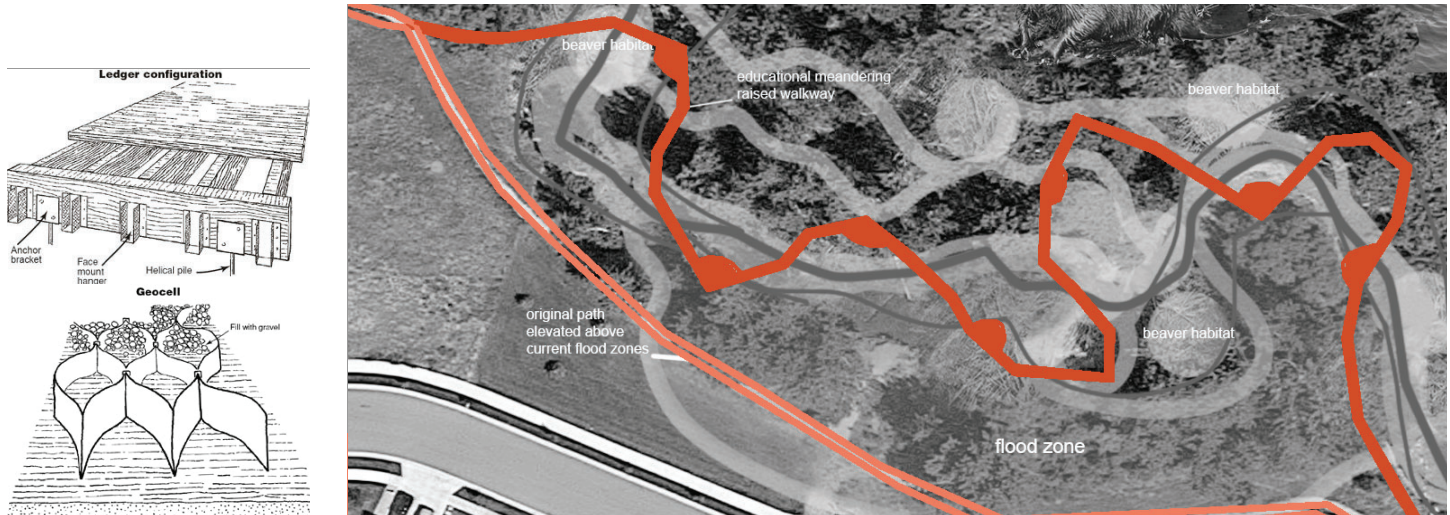


- Toilet
- Campground

By Sina Seyedian, Sam Stretch, Riley Wanzek, and Hannah Riley

# CREEKSIDE BOARDWALK

To address flooding, erosion, and beaver damage, one group of students proposed interventions to the Bridger Creek Trail. This project included the use of technology like geocells and helical piles to stabilize the creek bed. They also proposed a raised walkway, above the flood plane, which allowed for views of the creek and of the beaver habitats along the trail.



By Connor Christian, Jonathan Contreras, and Austin Traxler





By Connor Christian, Jonathan Contreras, and Austin Traxler

## DOCK

One group of students proposed to enhance the Bozeman Pond trail by creating a dock that would bridge across the pond. This would allow for more direct circulation from the existing dock towards east entrance, creating a short cut connecting to the Westside trail.



By Coleman Zauner, Lyndsay Watkins, Cole O'Brien



The dock would allow users to get into the heart of the park, away from the noise of street traffic and parking lots.

It could also be a tool for improved fishing, and an amenity and play area for swimmers.

The fanciful shape of the dock is inspired by precedents like the Infinitive Bridge and the Kastrup Sea Bath, both in Denmark.

By Coleman Zauner, Lyndsay Watkins, Cole O'Brien

# REVISED DATA COLLECTION TOOLS

After completing data collection, students gave feedback on how the trail count sheet and survey designs impacted their ability to collect data.

## TRAIL COUNT PROBLEMS

We noticed that the trail count form's design, originally meant to collect data on bike commuters on streets, was not the most effective way to count trail users. The sheet only collects data on where pedestrians and bikers enter an intersection; it does not collect data on where they go after crossing the intersection. When this tool was used at an intersection of a trail and a street, we did not get an accurate count of all trail users, such as someone turning from a street onto a trail.

Surveyor Name:

Trail Name:

Temperature (F):

Directions: Tally every person that goes *into* the intersection for each 15 min. block. Please total the tallies in the box provided after each 15 minute block is completed.

Date and Times:

Intersection:

Weather: Sunny Cloudy Raining Snowing

O = Other (skateboard, scooter, etc.) If it is a 3 way intersection cross out the side not present.

The form consists of six identical 15-minute data collection sheets arranged in a 2x3 grid. Each sheet is for a specific 15-minute interval: 0:00 – 0:15, 0:15 – 0:30, 0:30 – 0:45, and 0:45 – 1:00. Each sheet depicts a cross-section of a trail and road intersection. Arrows indicate the direction of travel for users. For each direction, there are three boxes for counting users: one with a bicycle icon, one with a pedestrian icon, and one with a circle containing the letter 'O' (representing 'Other' users like skateboarders or scooters). A 'TOTALS' box is provided for each direction. A central north arrow is shared by all sheets. Labels include 'Trail or Road Name:' and 'TOTALS'.

Surveyor's Name: \_\_\_\_\_ Trail Name: \_\_\_\_\_

Date: \_\_\_\_\_ Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Trail Location (trail Intersection or sign number): \_\_\_\_\_

Temperature: \_\_\_\_\_ Weather Conditions: Sunny Cloudy Raining Snowing

For precisely one hour, tally the number of people on the trail in each category.

**Pedestrians** (the number of people walking, running, walking dogs, pushing strollers, cross country skiing, snow shoeing, or other self-propelled transport without wheels etc.)



**Bikers** (the number of people biking on pedal bikes including road, dirt, or electric assist bikes)



**Other** (the number of people riding skateboards, scooters, in strollers, or motorized transport.)



## REVISED TRAIL COUNT FORM

For that reason, we have redesigned the trail count sheet to document all trail users.

The new count sheet will be simpler with a tally sheet for each pedestrian and biker who passes the counter on the trail. Since several students were confused how to mark certain types of users, like women with strollers, this form has clear directions for how to classify different user types. This will provide more accurate trail use data.

This form removes the 15 minute increments which required extra precision from the trail counters. Instead counts will be gathered only by hour increments.

# REVISED SURVEY FORM

While the survey was successful, some minor edits could improve the clarity of responses and the increase the comfort for respondents.

Some simplifications have been made to the surveyor data box which indicates when and where the survey was administered. We noticed some respondents filled out their own name here or surveyors forgot to fill out this information.

In order to better understand where respondents started and ended their trips, a multiple choice has been added to the new question 1 for home, work, shop, or other. We noticed several respondents wrote in "home," but not where home was located. Using landmarks and intersections to note trip start and end locations led to many unclear responses, and data that was difficult to process in infographics. This new check box will create clearer generalizable data while still allowing specificity.

For Surveyor Use Only: Trail Intersection: \_\_\_\_\_

Date: \_\_\_\_\_ Shift Start Time: \_\_\_\_\_ Shift End Time: \_\_\_\_\_

## BOZEMAN TRAILS SURVEY

This survey by Montana State University aims to learn more about how and why people use the trails in town. We will be sharing this information with trail planners. This will take 3-5 minutes and the information will be kept anonymous. You may skip any questions that you do not want to answer, and may stop the survey at any time.

1. Where did you start this trip?  Home  Work  Shop  Other \_\_\_\_\_

(Please name an intersection or landmark near the start of your trip.) \_\_\_\_\_

2. Where is your destination, or where is the far point of your loop? \_\_\_\_\_

3. How long is your trip in miles and/or minutes? Distance: \_\_\_\_\_ miles and/or Time: \_\_\_\_\_ minutes

4. What best describes the purpose of this trip? (Check all that apply)

- Commuting to work
- Going to school
- Shopping/Errands
- Exercising
- Dog walking
- Enjoying Nature
- Other \_\_\_\_\_

5. In the past 30 days, about how often have you used this trail?

- 0 - 1 time
- 2 - 5 times
- 6 -10 times
- 11 or more times

6. In what season do you use this trail? (Check all that apply)

- Summer
- Fall
- Winter
- Spring

7. Today, did you come with or intentionally meet up with any other people.  Yes  No

If yes, what is the: Total Number of people in your group? \_\_\_\_\_ Number of children in your group? \_\_\_\_\_

8. What form of transportation are you using now?

- Walking
- Skis
- Skateboard
- Bike
- Dirt Bike
- Electric Scooter
- Other \_\_\_\_\_

9. Did you use another form of transportation for part of this trip or to arrive at the trailhead?  Yes  No

If Yes, what kind? (Please check all that apply.)

- Car
- Bike
- Bus
- Another mode: \_\_\_\_\_

10. Why are you using this trail as opposed to another path? (Please check all that apply.)
- Most convenient or direct
  - Lower traffic volumes
  - Connection to other trails
  - Scenic qualities
  - Surface qualities (paved versus unpaved)
  - Universally accessible (for wheel chairs, strollers, etc.)
  - Amenities: If so, which ones: \_\_\_\_\_
11. What would you like to see improved along this trail? (Please check all that apply.)
- Longer or more connected path
  - Wider path
  - Better surface
  - Better maintenance
  - Better street crossings
  - Better safety
  - More shade trees
  - More bike parking
  - Access to bathrooms
  - Universal accessibility (i.e. for wheel chairs, strollers, etc.)
  - Other: \_\_\_\_\_
12. If you look at trail signage, what information are you looking for? (Please check all that apply.)
- Maps
  - "You are here" icon
  - How to connect to other trails
  - The distance to points of interest
  - Information about park amenities
  - Dog leach rules
  - Who to call to report maintenance issues
  - Other: \_\_\_\_\_
  - I don't look at trail signage
13. How do you choose your trail routes? (Please check all that apply)
- Physical Maps
  - GVL's online GIS map
  - Other Online source or Ap
  - Trail Signs
  - Word of Mouth
  - Random Wandering
  - Usual route
  - Other: \_\_\_\_\_
14. What group or agency do you think is most responsible for trail building and maintenance in Bozeman?
- \_\_\_\_\_
15. What is your home intersection? \_\_\_\_\_ & \_\_\_\_\_
16. What is your age? \_\_\_\_\_
17. What is your gender?
- Male
  - Female
  - Other or Non-Binary

We also moved the old question 1 to the end of the survey now the new question 15. This was because students reported that respondents were sometimes taken aback that the first question on the survey was their home intersection. People seemed concerned about their privacy and were curious why we needed to know this information. We did not ask for addresses because we wanted to keep the survey anonymous. However we did collect home intersection information because we hoped to compare the respondents neighborhood location to the trail location, and the start and end points of their trips. In order to help respondents feel more comfortable with this personal question, it has been moved to the end of the survey with the demographic information like age and gender.

The revised survey questions are similar enough to the old survey that the responses could be combined in the same report, allowing comparisons over time, or a larger sample size.

# NEXT STEPS

This trail count and survey data can be used by the City and the GVLT to develop proposals for improvements and expansions to the trails in Bozeman. When the next PROST plan is developed, this data can be useful for understanding how trails are being used, and how they can be enhanced. Currently the data shows that longer more connected trails remain a priority for users as the City and the GVLT pursue trail development.

This data from 2019 provides a starting point for understanding trail use. It would be useful to collect additional data in the summers and to increase the sample size to refine the results, especially to understand use patterns and user preferences on specific individual trails. On trails that are being considered for redesign or interventions, it may also be useful to conduct additional community engagement activities like interviews, design workshops, or focus groups. This outreach could be focused on neighbors, key user groups like bike and running clubs, or all city residents.

While this report concludes the School of Architecture Outreach and Engagement Seed Grant, Dr. Cowan can still include data gathering, analysis, and design activities in her future classes. Areas for further research include the use of bikes on trails for commuting, trail use for errands, equity in trail access across various neighborhoods, comparing trail maintenance on trails managed by HOAs versus by the city, and the impact of trails and parks on house prices. Bozeman already has a strong network of trails and open spaces to allow residents access from “Main Street to the Mountains.” This research helps the City and the GVLT to continue to expand and improve that access to ensure Bozeman residents have sustainable means of transportation and recreation in the future.







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