Trail Planning in Bozeman

compiled by Professor Susanne Cowan

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Architecture 452 Research Methods Student Projects

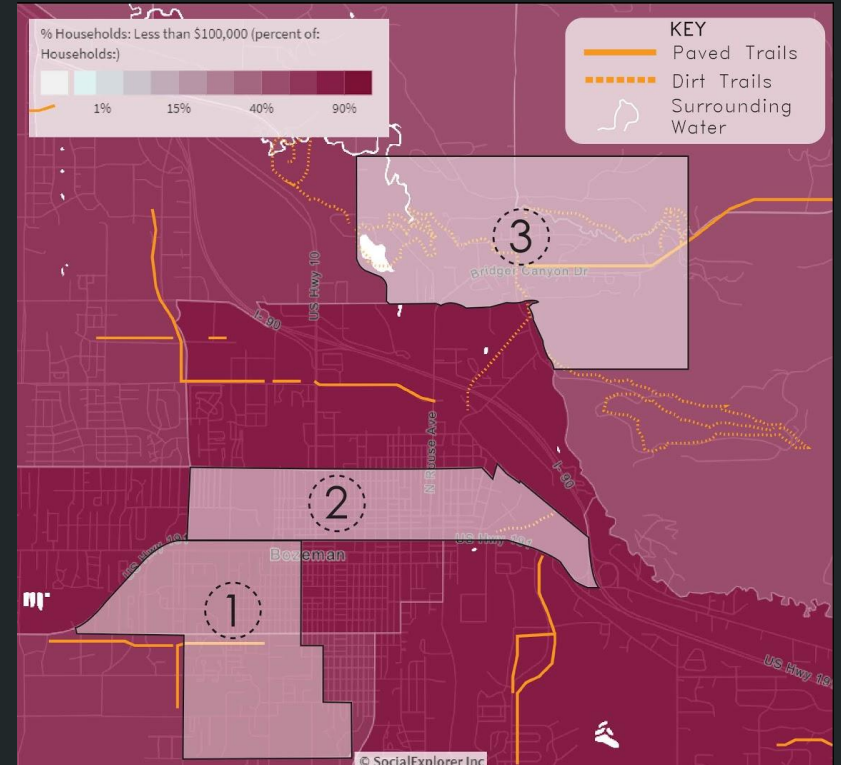compiled by Proessor Susanne Cowan

Main Street to the Mountains

Sydney Nelson, Brayden Scaggs, Ben Kravinsky, Finn Loftesnes, & AJ Ulrich

Abstract

Walkability is key to living a *healthy and sustainable lifestyle*. Much of Bozeman is covered in an excellent trail system that connects integral parts of the city in a safe way for pedestrians. Unfortunately, there are other parts of the city which have trails but they are intermittent and do not connect well to the rest of the community. These *underdeveloped trail systems* all too often are in *lower income areas* of the city. There are many reasons for this including desirability of areas with trails and price to produce trails. When building a trail, it is most easy to *follow waterways* because of existing flood water restrictions. This makes it so that most of the trails in the lower income areas of Bozeman run north to south. These trails become splintered and disconnected making it hard to use the trails to get anywhere. Our proposal is to *find trail opportunities moving East to West in the South West* portion of the city. We expect this to connect these lower income areas of our community to the main pedestrian corridors. Our hope is that this will not significantly increase the cost of living in these areas.
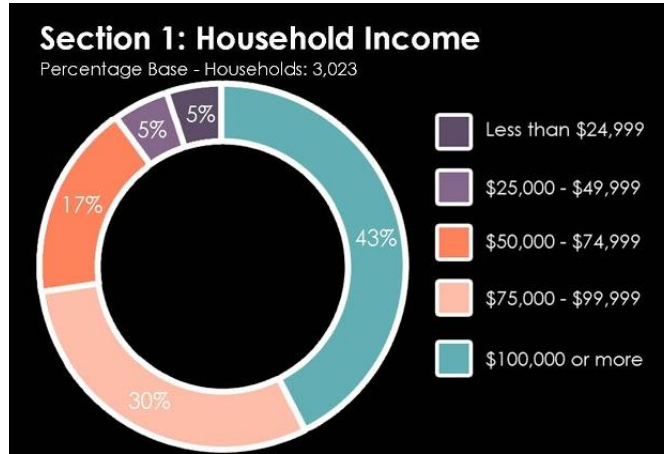
Case Study Sites

These case studies show the relationship between income and useable connected trails. Our area of focus is in zone 1. This area has the lowest socioeconomic levels in Bozeman and also has some of the lowest connected trails in the area. Our goal is to help connect the trails that are in this area with the more robust trail network across the city. It is important to note that there many smaller trails not shown on this map.

Income and Trail Access

Case Study Site #1

Section 1: Household Income
Percentage Base - Households: 3,023

- 5% Less than $24,999
- 5% $25,000 - $49,999
- 17% $50,000 - $74,999
- 30% $75,000 - $99,999
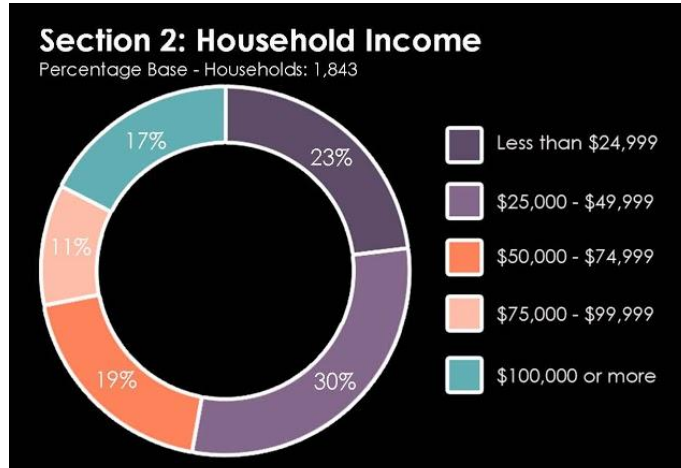- 43% $100,000 or more

S. 19th Ave

W. College St.

Income Evaluation: This location shows that **73%** of household incomes are **over $75,000**.

Site Selection Reason: This area includes the south side of Main Street, which is the historic district, Montana State University, and various businesses.

Case Study Sites #2

Section 2: Household Income
Percentage Base - Households: 1,843

- 17%
- 23%
- 11%
- 19%
- 30%

Less than $24,999
$25,000 - $49,999
$50,000 - $74,999
$75,000 - $99,999
$100,000 or more

US Highway 191

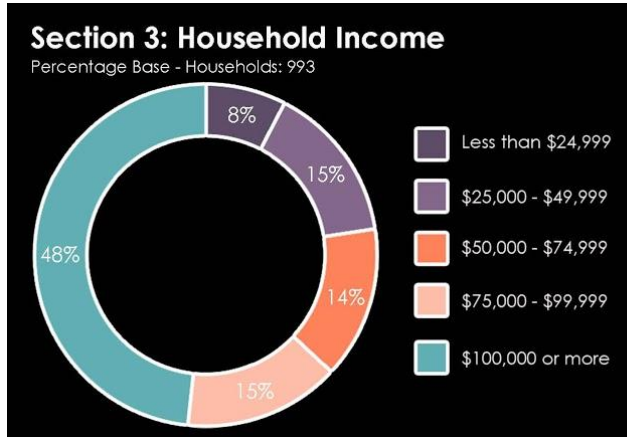Income Evaluation: This location shows that **47%** of household incomes are **over $50,000**.

Site Selection Reason: This area includes a small strip north of Main Street. Most of this region is housing throughout the site and some business right along Main street.

Case Study Site #3

Section 3: Household Income
Percentage Base - Households: 993

8%	
15%	
48%	
14%	
15%	

Less than $24,999
$25,000 - $49,999
$50,000 - $74,999
$75,000 - $99,999
$100,000 or more

Bridger Dr.

Income Evaluation: This location shows that **48%** of household incomes are **over $100,000**.

Site Selection Reason: This area includes the northern part of Bozeman towards the Bridger Mountains. There is mostly residential housing and lots of vacant land.

Case Study Comparison

These 3 areas within Bozeman show different household income in different parts of the city when correlated with the previous trail maps we can start to see connection between income and trail connectivity. These graphs show that there are high income households throughout Bozeman.

Case Study #1 shows that one of the main housing areas in Bozeman still has a high average for household income.

Case Study #2, which is just north of Case Study #1, shows there is a slightly lower household income.

Case Study #3 is going towards Bridger Dr. where there is more land and larger houses. It is expected that the household income of this area would be the highest.

Trail Location Selection

This area within *case study site #1* provides the opportunity to connect the low-income housing along Huffine Lane using added trails to the parks highlighted in green. There are also several amenities within walking distance that can become accessible with these trails.

Planning Projects
- Proposed
  - Application Received
  - On Hold
  - Initial Review
- In Review
  - Public Notice
  - Final Review

Trails
- Trails
  - Paved Paths
  - Gravel Paths
- Proposed Shared Use Paths (PROST)
- Proposed Trails (PROST)
- **Parks**
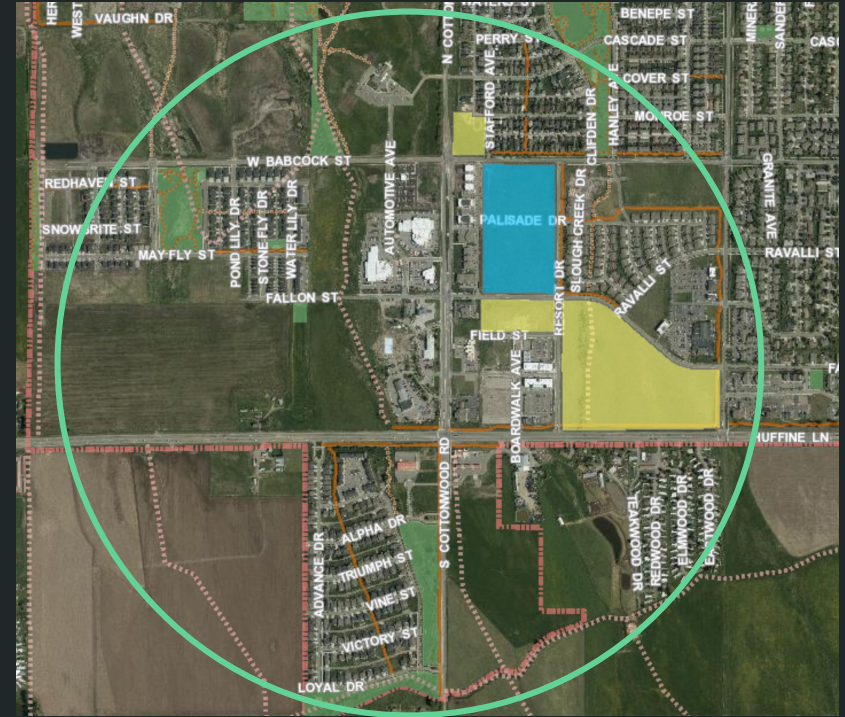
Trail Location Selection

- Trails within city limit, are implemented with help from The Parks, Recreation and Trails Planning Board (Whom have the final say in trail placement).

- In Bozeman there are little "pockets" of county land, where trails are not required.

- Trails are placed where they are because developers were interested in them. This could be because of a lack of space.

- There is a profound need for the implementation of trails running East - West.
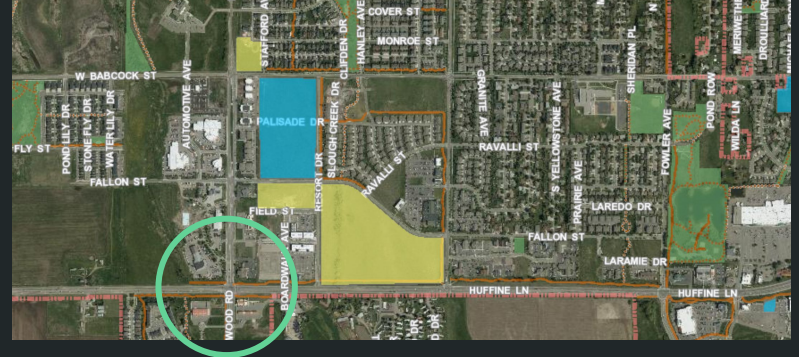
Financing for Trail Implementation

PREVIOUS FUNDING

- Federal and State grants
  - Used for streets and crosswalks within the city of Bozeman

- Recreation trails grant

- Trails and open trails parks bond
  - Approved by residents of Bozeman
  - Received the 14 million bond in 2010
    - Funded story mill, The M, Bogart Park, Bozeman pond, ect
  - Asking for $150,000 for wayfinding
    - Used within the city, and off streets

https://gvlt.org/bozeman-trails-open-space-parks-bond-project-updates/

Financing for Trail Implementation

FUTURE FUNDING OPTIONS

- Federal and State grants

- Recreational trails grant

- *Trails and open trails parks bond*

- Donations

https://gvlt.org/bozeman-trails-open-space-parks-bond-project-updates/

Final Solution

- The southwestern portion of the city is the area that we selected as low or middle income
- Much of the trails in this area run north to south along the waterways
- The only east west trail runs along Huffine a major highway
- We have identified 2 possible new trails that run along old irrigation ditches (red) that would help to connect the south western neighborhoods to campus and downtown.

LOW AND MIDDLE INCOME AREA

Conclusion

This solution connects the residence in the lower income areas of our community to the main pedestrian corridors of Bozeman.

Our trail solution promotes a *walkable*, *healthy*, and *sustainable lifestyle* for the low income area we selected. By further developing the *underdeveloped trail systems*, and *running the trails in the East to West in the South West* portion of the city, this same idea can be achieved in other areas throughout Bozeman by using the same methods.

Great American Rail Trail

Ian Tanninen, Korry Broderick,
Keith Engstrom, Braden Heidbrink,
Colton Crum

How can Bozeman utilize local community trails to create an alternate route for the National Rail Trail which also improves local economy and trail user experience?

Use and Connectivity Issues

- Separating vehicle traffic from pedestrian/bicycling traffic would create safer travelling routes.
- Destination Routes to help reconnect important aspects and locations of Bozeman.
- Taking into consideration user demographics in accordance to trail types to provide a variety for all user types.
- Trail qualities impact effective use thus should be considered based on location and usability year round.
- Residential trail access provides community to community access along with community to goods access.
- Alternate routes for Rail Trail will allow for a variable of experiences to take place among user groups.

Site Location

The site was selected because of its proximity to existing trail infrastructure (Cattail trail) as well as the potential for development on the site. The potential trail could act as an alternative route for the rail-trail while further expanding the trail system in Bozeman's north-west neighborhood. New trail conditions will suite pedestrian and bicycle traffic.

Pedestrian Traffic

This heat map shows the density of pedestrian traffic is located in the residential areas where trail users mainly consist of people exercising, walking dogs and walking to parks for recreation and entertainment. It can show that the trail quality is more suited for pedestrian traffic over cyclists. These residential trails have potential to connect to other main pedestrian trails.

Strava.com/heatmap
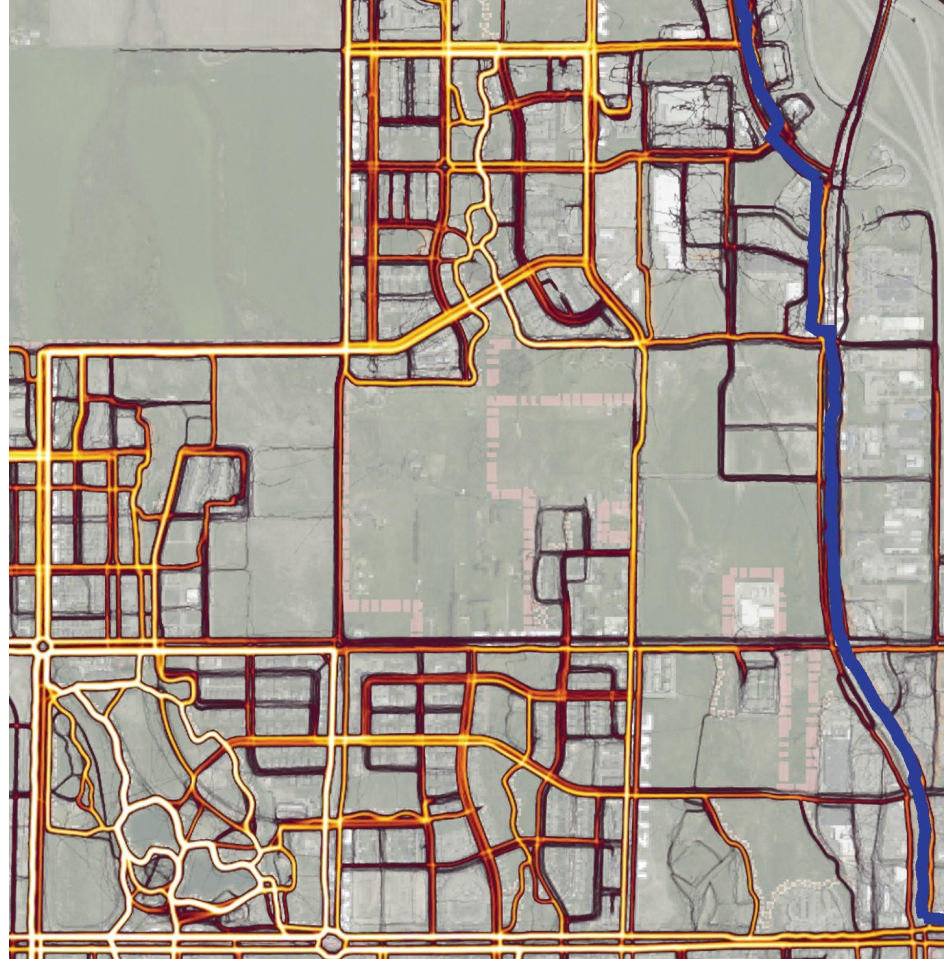
Bike Traffic

This heat map shows the density of bike traffic surrounding our site. The cyclist consist of commuters, recreational biking, and tourist bikers. The cyclist mainly remain on the roads near vehicle traffic. The roads which include a bike lane have a higher density which shows cyclist desire an efficient and safe way of travel.

Strava.com/heatmap
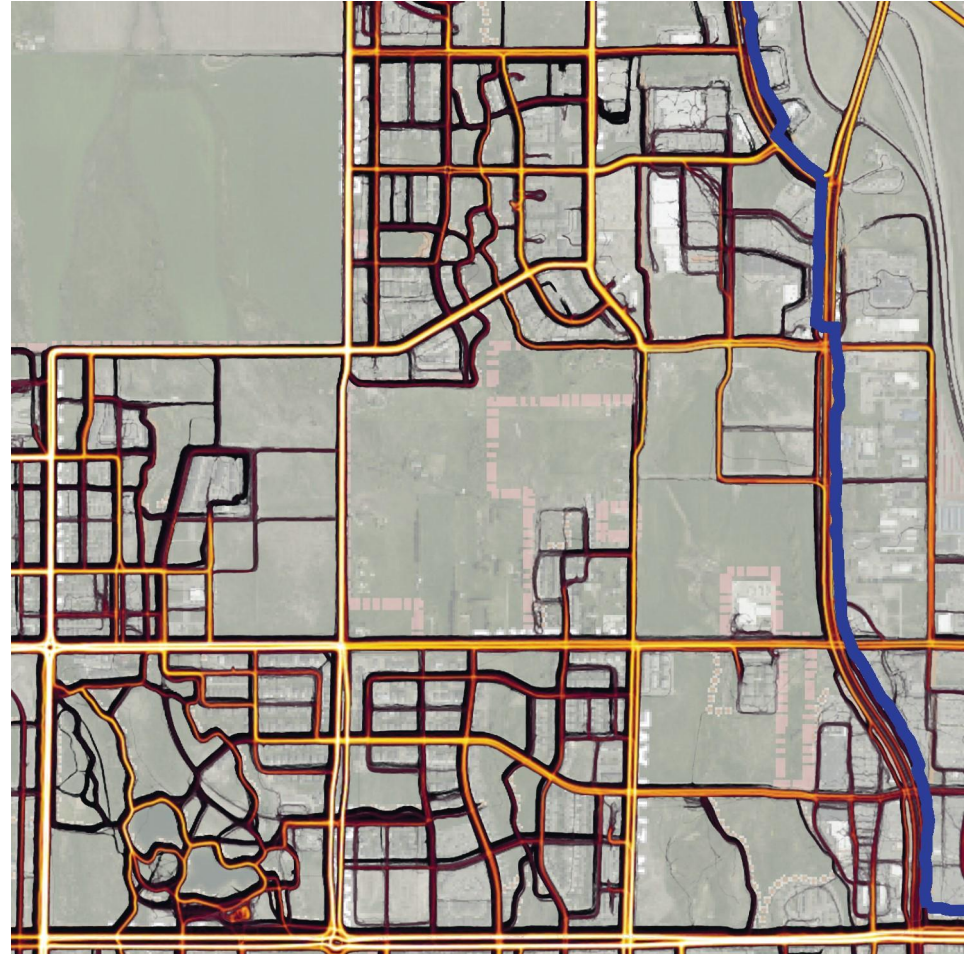
Trail Data-Purpose of Trail Use

The survey shows the four main categories of trail user types. The trail use group size comparison provides a sample to understand how trails should be built to accommodate the most amount of people.

PURPOSE OF TRAIL USE

Number of People

Exercising	Dog Walking	Enjoying Nature	Commuting /Other
77	60	52	22

Trail Survey Data taken from 2019 Arch 452 & 525
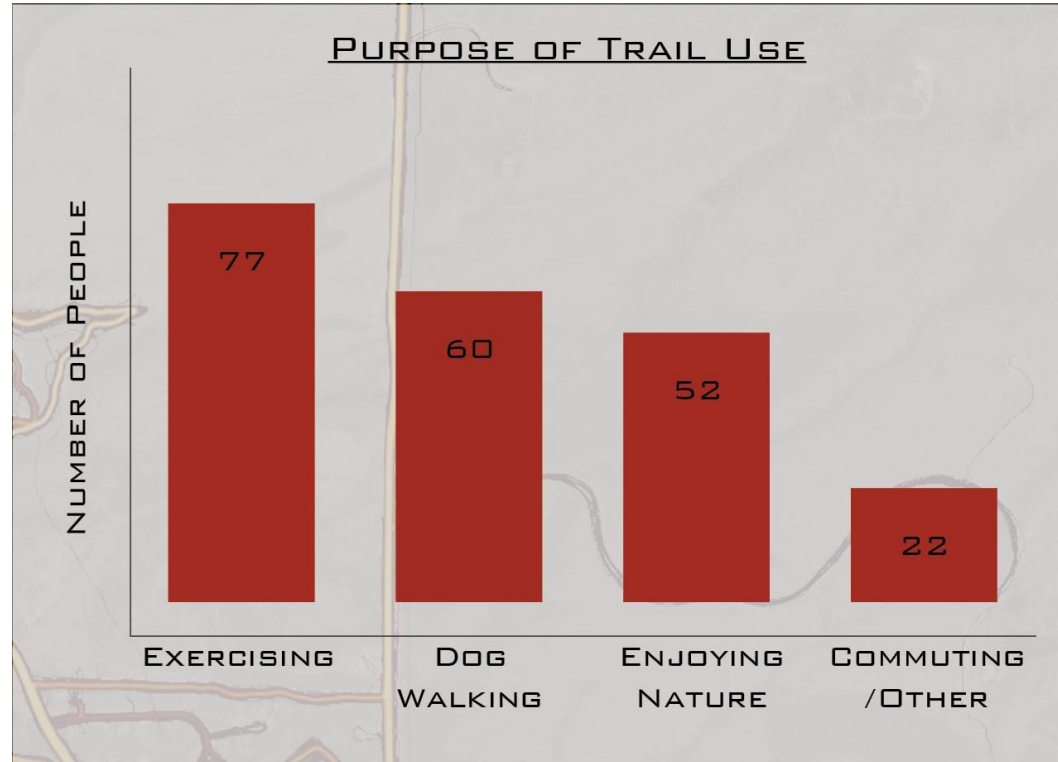
Trail Data-Route Selection

Route selection survey gathers data to see why people chose the paths that they did. In future trail construction new trails added can take into account these groups when selecting their site location and how they fit in a larger trail system.

Trail Survey Data taken from 2019 Arch 452 & 525

REASON FOR TRAIL USE OPPOSED TO OTHER PATH

Number of People

100

61

33

27

MOST DIRECT ROUTE

SCENIC QUALITIES

LOWER TRAFFIC VOLUMES

CONNECTION TO OTHER TRAILS

Trail Data-Improvement Areas

Trail improvement data investigates potential areas to increase user satisfaction. Satisfactory trail conditions create a reciprocity with national trail systems, where both national and local trail users benefit from improvements.

Trail Survey Data taken from 2019 Arch 452 & 525

HOW TRAILS COULD BE IMPROVED

NUMBER OF PEOPLE

| 35 | 32 | 26 | 22 |

CONNECTION TO OTHER TRAILS | OTHER AMENITIES | SURFACE QUALITY / | SAFETY /ACCESS
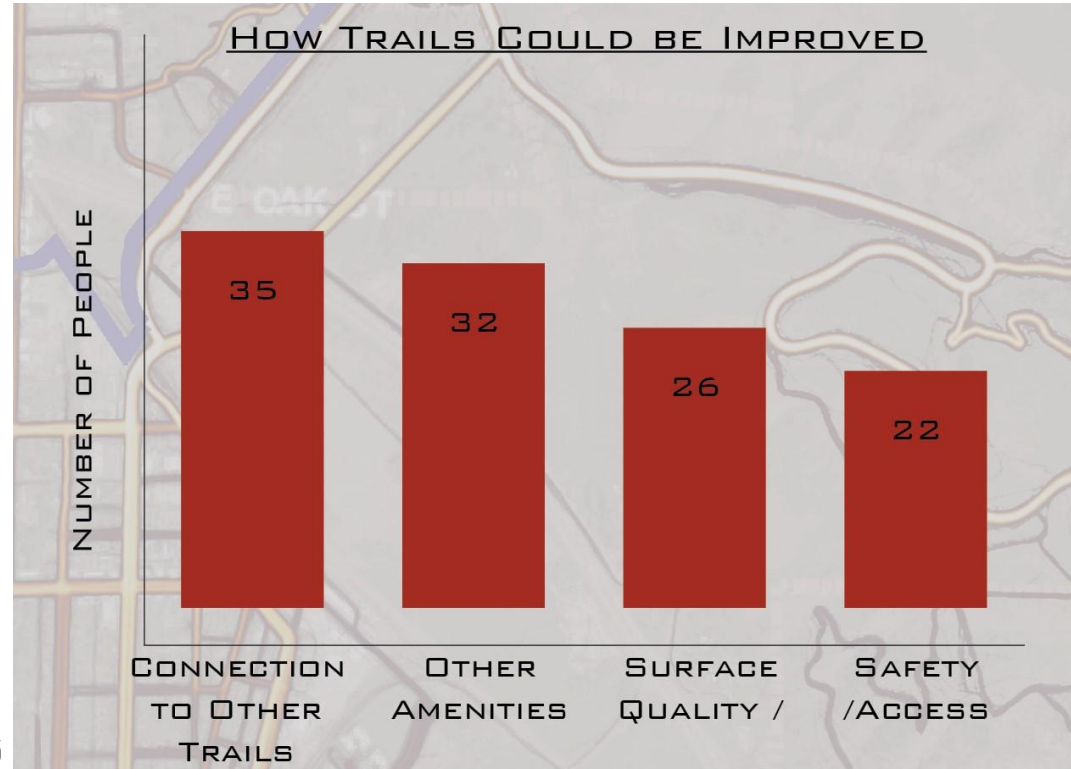
Survey Data Takeaway

- Trail Use-The largest group of users are participating on trails as a means of exercise and enjoyment as opposed to using the trail as a means of circulation throughout a community.
    - Trail Site selected for exercise/enjoyment users.
- Route Selection-Majority users chose route based on destination and scenic qualities.
    - Trail Site selected for destinations and views
- Trail Improvement-The majority of users wanted trails to have better connectivity within the trail system
    - Trail Site selected for better connectivity

Proposed Solution

The proposed route provides a safer alternative route to the existing rail trail. By separating pedestrians and vehicle traffic, this will allow for a greater connectivity to be achieved in the local trail infrastructure. This will result in a greater overall reach of the rail trail system in Bozeman. The site selection improves the local economy and user experience by satisfying the major takeaways from our survey data.

PROPOSED ALTERNATE ROUTE
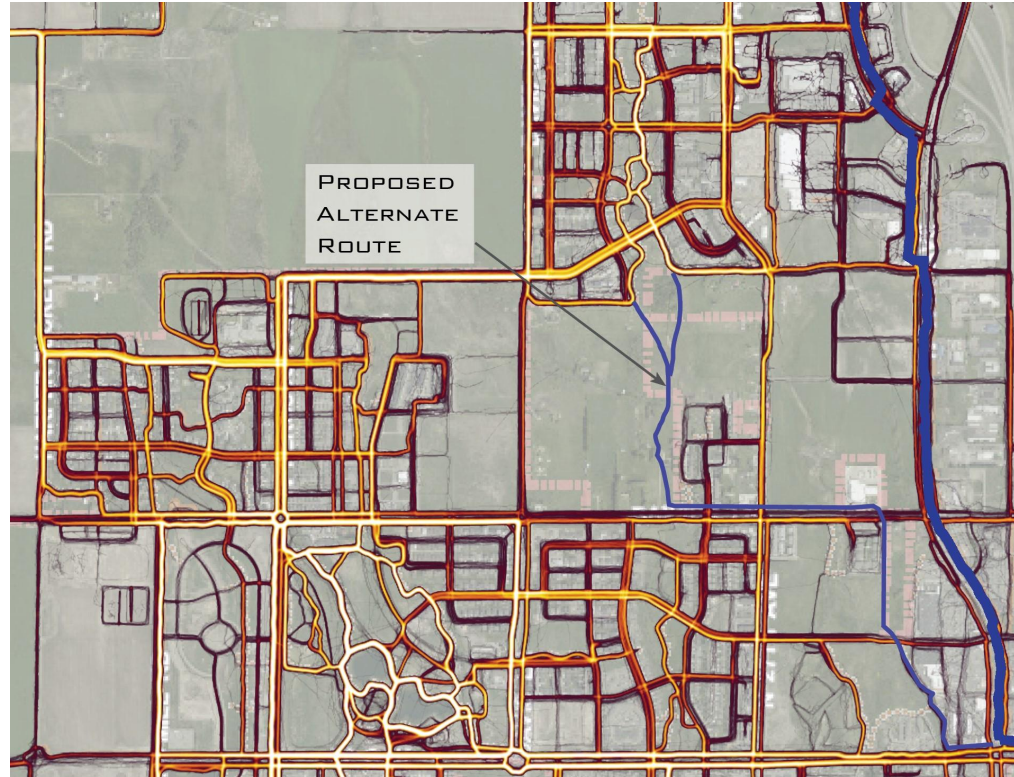
Strava.com/heatmap

Sources

- Strava (strava.com/heatmap)
- Gallatin Valley Land Trust (gvlt.org)
- Trail Survey Data taken from 2019 Arch 452 & 525
- The Great American Rail Trail (railstotrails.org/greatamericanrailtrail)
- Kevin Belanger from Rails to Trail
- Matt Marcinek from GVLT

The Great American Rail Trail

H. Riley, S. Seyedian, S Stretch, R. Wanzek - 05.08.2020

Overview

What role does Bozeman play in the national Rail-Trail system? How can implementing a Rail-to-Trail addition to the existing Bozeman/Gallatin Valley Trail system promote sustainable and healthy lifestyles for the residents and tourist of the area? Furthermore, Bozeman has great potential to economically thrive as a major destination along the national Rail-Trail system.

ejb
oct 04

% of Bicycle Commuters Per Census Block

Existing Trail System
Proposed Rails-to-Trails

% Bicycle Commuters Per Census Block

1%   15%   40%   90%
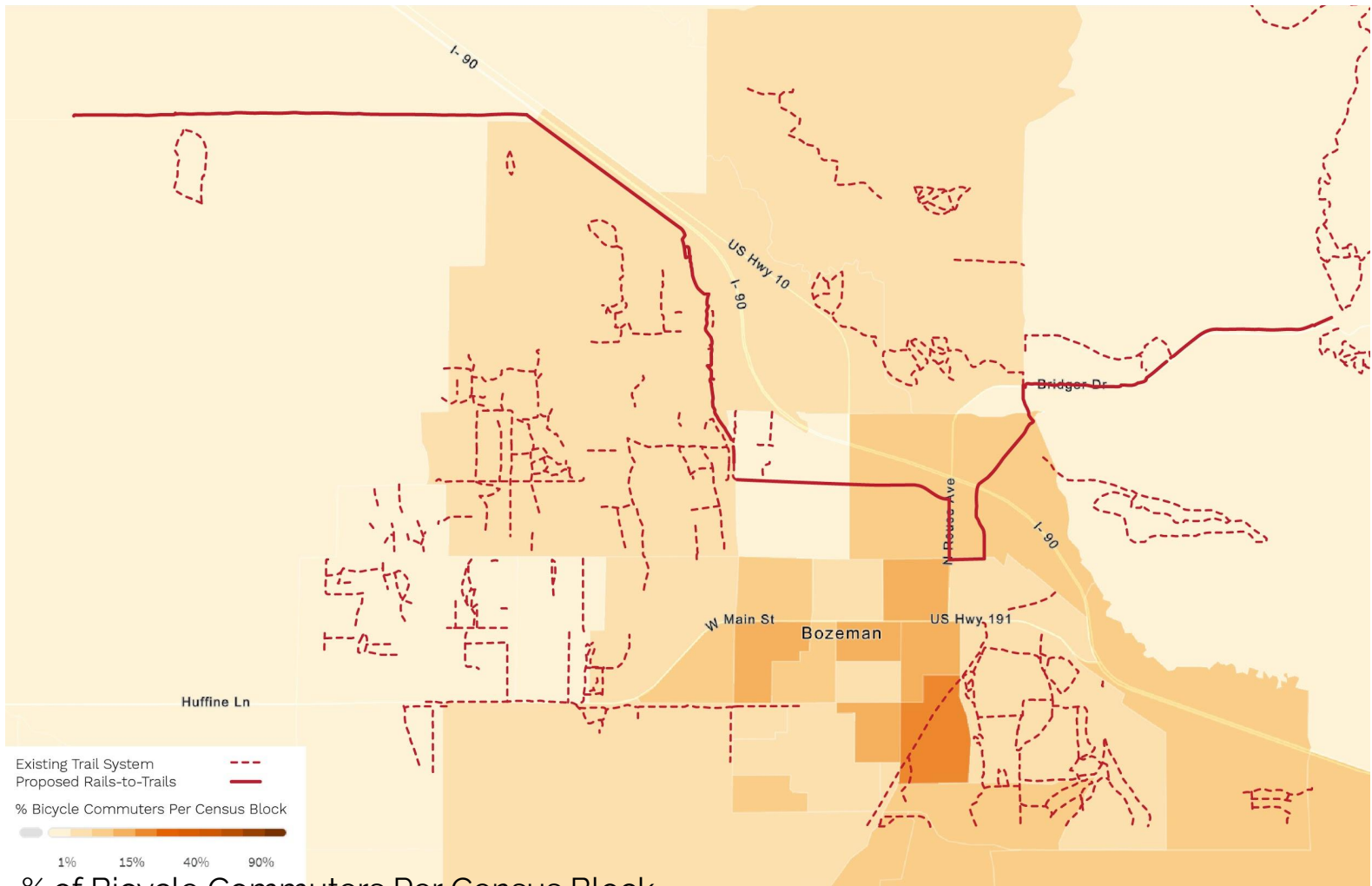
There is plenty of room for growth around the proposed site which gives opportunity for expansion of amenities needed for economic growth
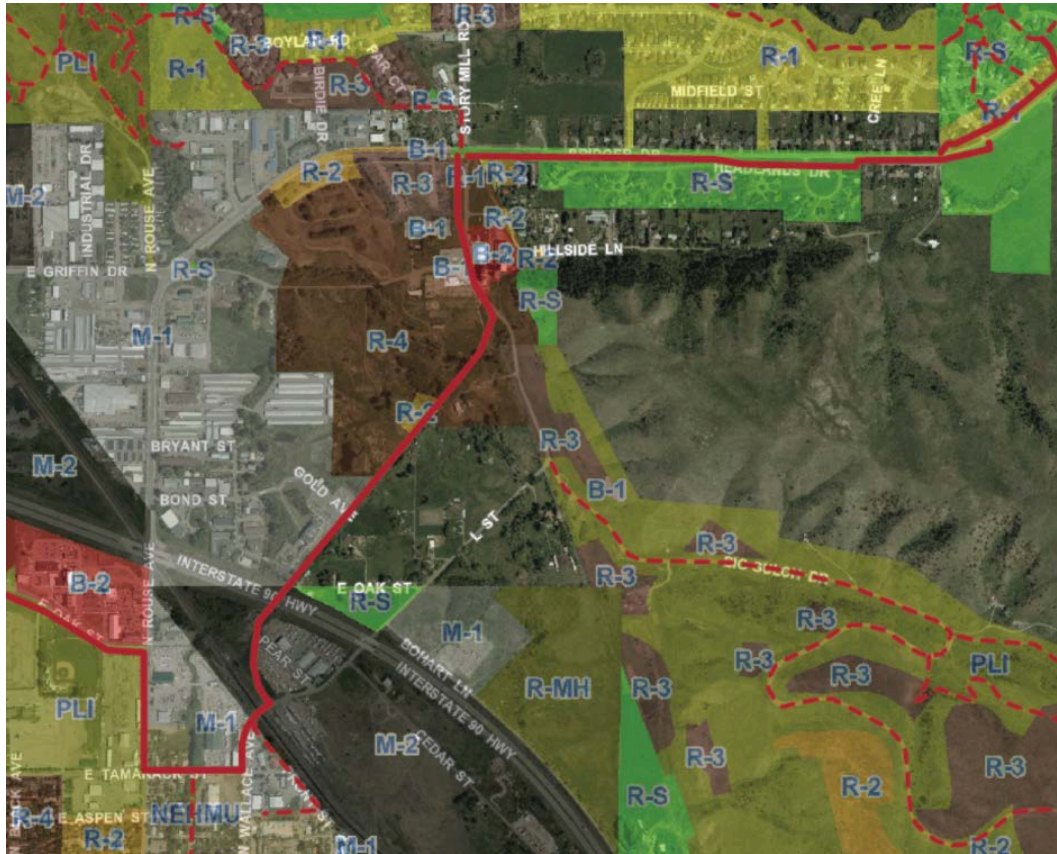
— Great American Rail Trail

- - - Existing trails

Current zoning conditions on site

Around the site is plenty of green space and some commercial land with opportunity to grow. The residential areas are separate which allows some distance between people's private areas to the new incoming campers.
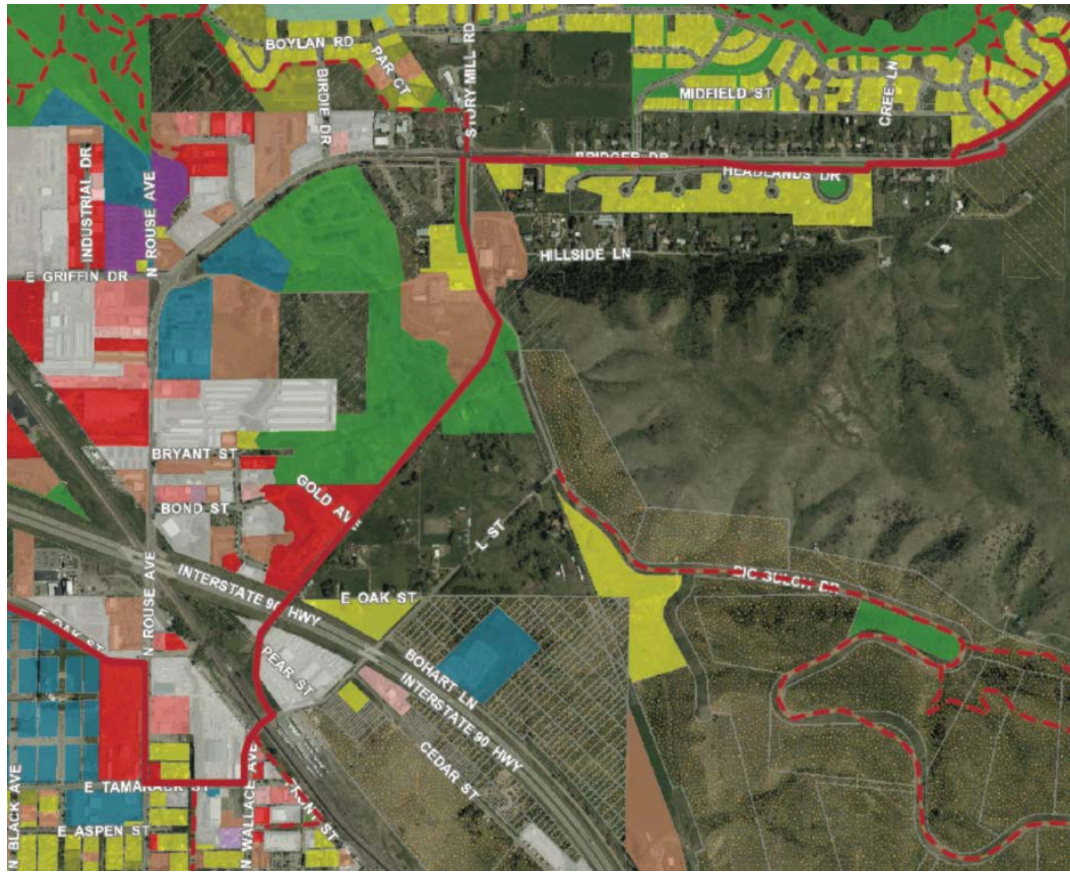
Great American Rail Trail

Existing trails

Current land use on site

Proposed site

Legend:

— Great American Rail Trail

- - - Existing trails

● Proposed site

— Survey trail

WORKERS WHO WALK

Total ■ Tract 5.03 ■ Tract 5.02 ■ Tract 2 ■ Tract 1.01

WORKER MEANS OF TRANSPORTATION.
CAR, TRUCK, VAN
2018

Total ■ Tract 5.03 ■ Tract 5.02 ■ Tract 2 ■ Tract 1.01

91.7%
93.4%
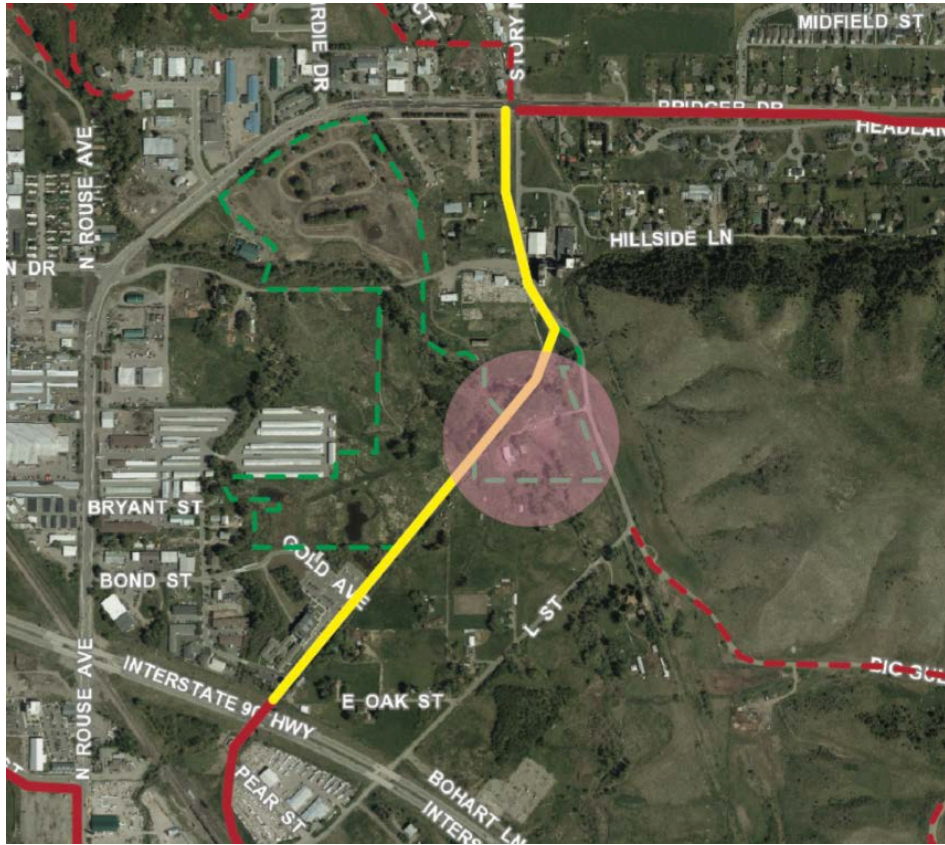93.5%
86.9%
93.1%

WORKERS WHO BIKE

Total ■ Tract 5.03 ■ Tract 5.02 ■ Tract 2 ■ Tract 1.01

0.9%
1.2%
0.6%
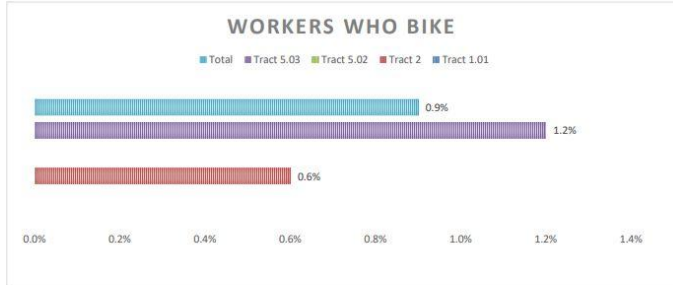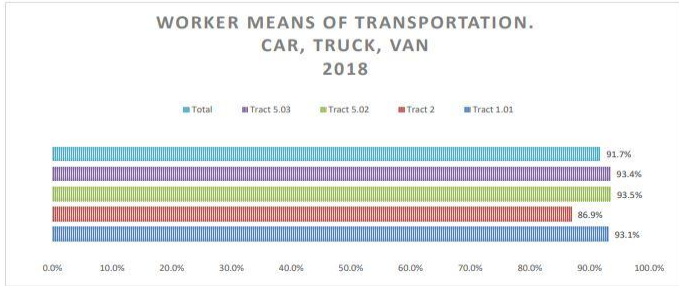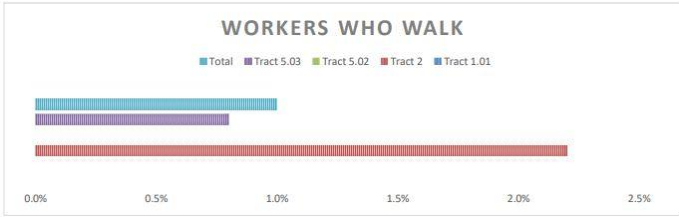
Based on census data as to how citizens of Bozeman commute, the proposed Great American Rail to Trail expansion would primarily benefit those using it for recreation rather than transportation.

Census Tract Transportation Demographics

Proposal

We propose to make Bozeman not just another part of the Great American Rail Trail, but instead to make it one of the major points of interest for cyclists to stop at. By promoting this section of trail to encourage cyclists to come and experience the town of Bozeman, we can add a significant boost to the local **economy,** and additionally promote the collective culture of **sustainable and healthy living.**

———

Strategy

- Move the Rail Trail Site to allow for more connection to the downtown core.
- Position the route to pass by local businesses (grocery stores, bike shops, restaurants, etc.)
- Provide camping amenities along the route.
- Celebrate the route within Bozeman to promote local usage as well as tourists.
- Avoid larger roadways to highlight the more natural areas of Bozeman's urban ecology

Economy

Case study - Ovando, MT

- Population of 75
- About 1,000 bicycle tourists/ year from the Great Divide Mountain Bike Route of Lewis and Clark Trail by highway 200
- Bicyclist can stay for free at a campsite or pay$5+ for different sleeping arrangements
- Toilets, shower, laundry, grocery stores and travelers' message board nearby
- The Bicycle community adds to the economy of Ovando

Economy

The University of Montana found that bicycle tourists contribute $337 million every year from a 2014 study.

Case study - Twin Bridges, MT

- Population 400 people
- In 2009 Bill White opened a bicyclist campground that provides toilets, shower, screened eating area, and grass for tents
- The town estimates roughly $10,000 in new business every year
- Another example of how bicyclist help promote the economy

Trail Usage

Category	
Commuting to work	
Going to School	
Shopping	
Exercising	
Dog Walking	
Enjoying Nature	
Other	
No Answer	

0   10   20   30   40   50   60   70   80

Growth in economy around trail

Education of outdoors

Healthy lifestyle

Education of history

Promotes community

Therapeutic

Unity throughout America

Encouraging a sustainable mode of transportation

Adaptive reuse of industrial infrastructure

Campsite

A Major amenity that we can add to the great American Rail Trail in Bozeman in order to make it a celebrated part of the system is to add a campsite in an area of town to promote growth and differentiate our site from other parts of the trail.

proposed campsite and toilet

We propose putting a campsite with simple amenities to provide a place of refuge for bikers who want to travel through Bozeman and experience the town as well as the trail as part of their ride.

The proposed campsite will be on the East end of town by Story Mill.

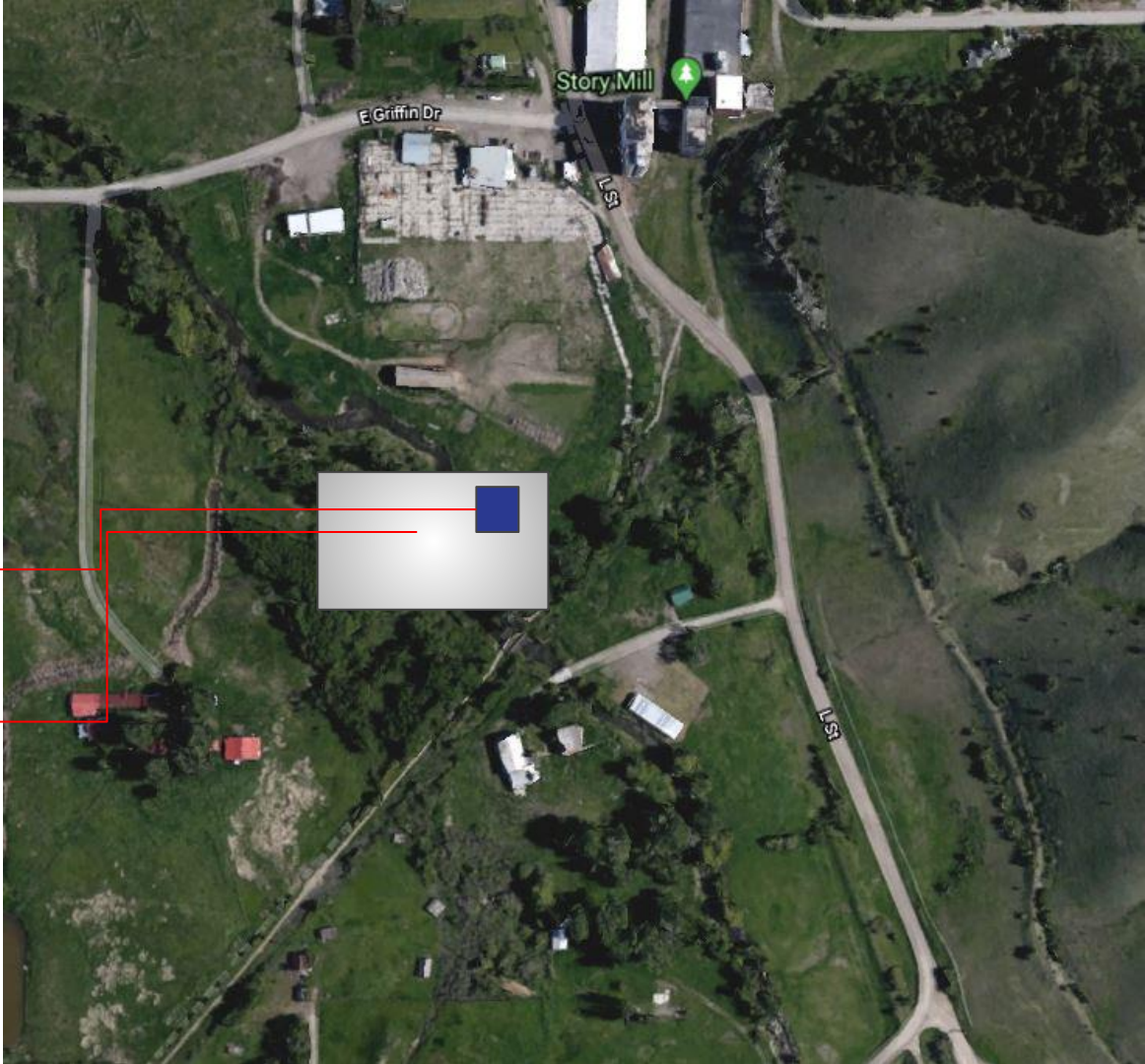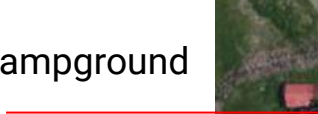This site is near a bike store, coffee shops, petrol station

N orth

Toilet

Campground

Adding amenities like a campsite and rest stop will ensure the Bozeman part of the trail be the part that the guidebook talks about. The part that people come to the trail for, not just a stop along the way.

ARCH 452: Final Group Project

• • •

Group 7B
Scott Mooney; Grant Dokken; Paul Patterson

Usage of Public Trail in West Bozeman

West Bozeman is the fastest growing portion of the city and is becoming more populated; because of this, the trails of Bozeman are seeing greater usage.

This usage is diverse; from young children to college students to retirees. This diversity must be accounted for in the wayfinding system selected.

Population breakdown of Census Tract 7.02
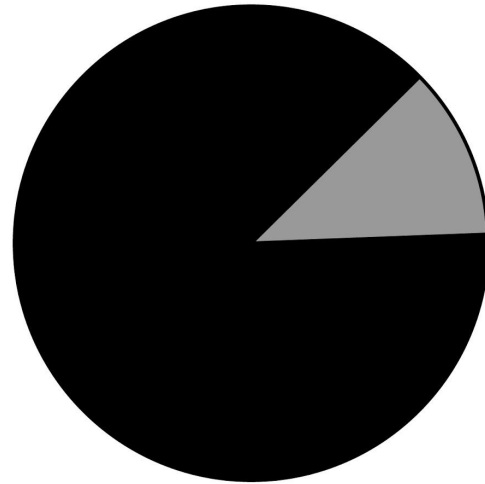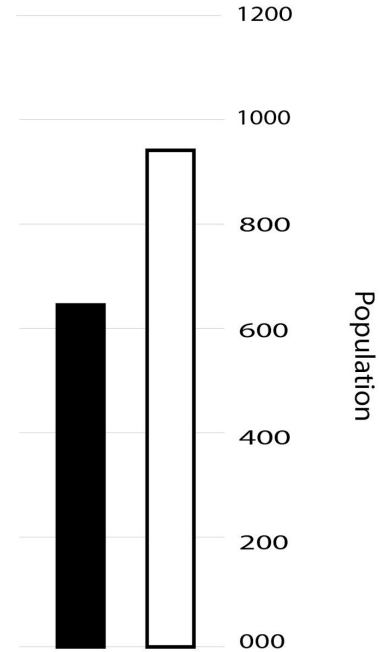
Utilization of Temporal Order Memory

It is shown in Denise Head's work, *Age effects on wayfinding and route learning skills,* people between the age of 56 and 85 struggle with navigational learning and decreased performance in spatial navigation.

One of the most significant decreases in navigational operations in older people is Temporal Order Memory.

This is correlated with memory and pattern recognition, this can be benefited by altering and improving the existing trail markers to be more memorable and recognizable.

Usage of Wayfinding by Age on Bozeman Trails

People who utilize trail markers

People who do not utilize trail markers

Based on this data, the Temporal Order Memory of Older Adults is substantially reduced, this makes the role of the wayfinding system more important to this demographic.

Younger Adults (18-22)

Older Adults (56-85)

0%   50%   100%
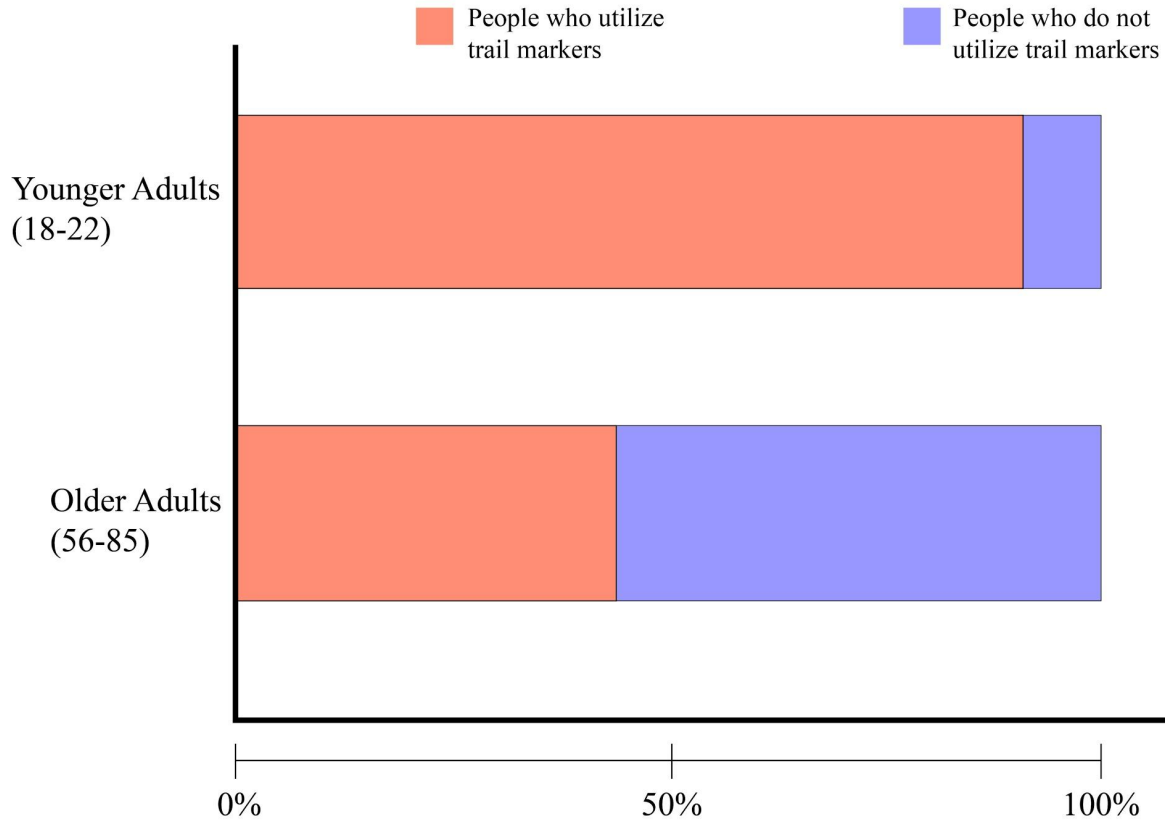
"IF YOU LOOK AT TRAIL SIGNAGE, WHAT ARE YOU LOOKING FOR?

Response (y-axis, top to bottom):
- Other
- Information about Park Amenities
- Who to call to report maintenance issues
- Dog Leash Rules
- Doggie Bags
- The distance to points of interest
- How to connect to other trails
- Maps
- "You are Here" icon
- I don't look at trail signage

Number of Responses (x-axis): 0, 5, 10, 15, 20, 25
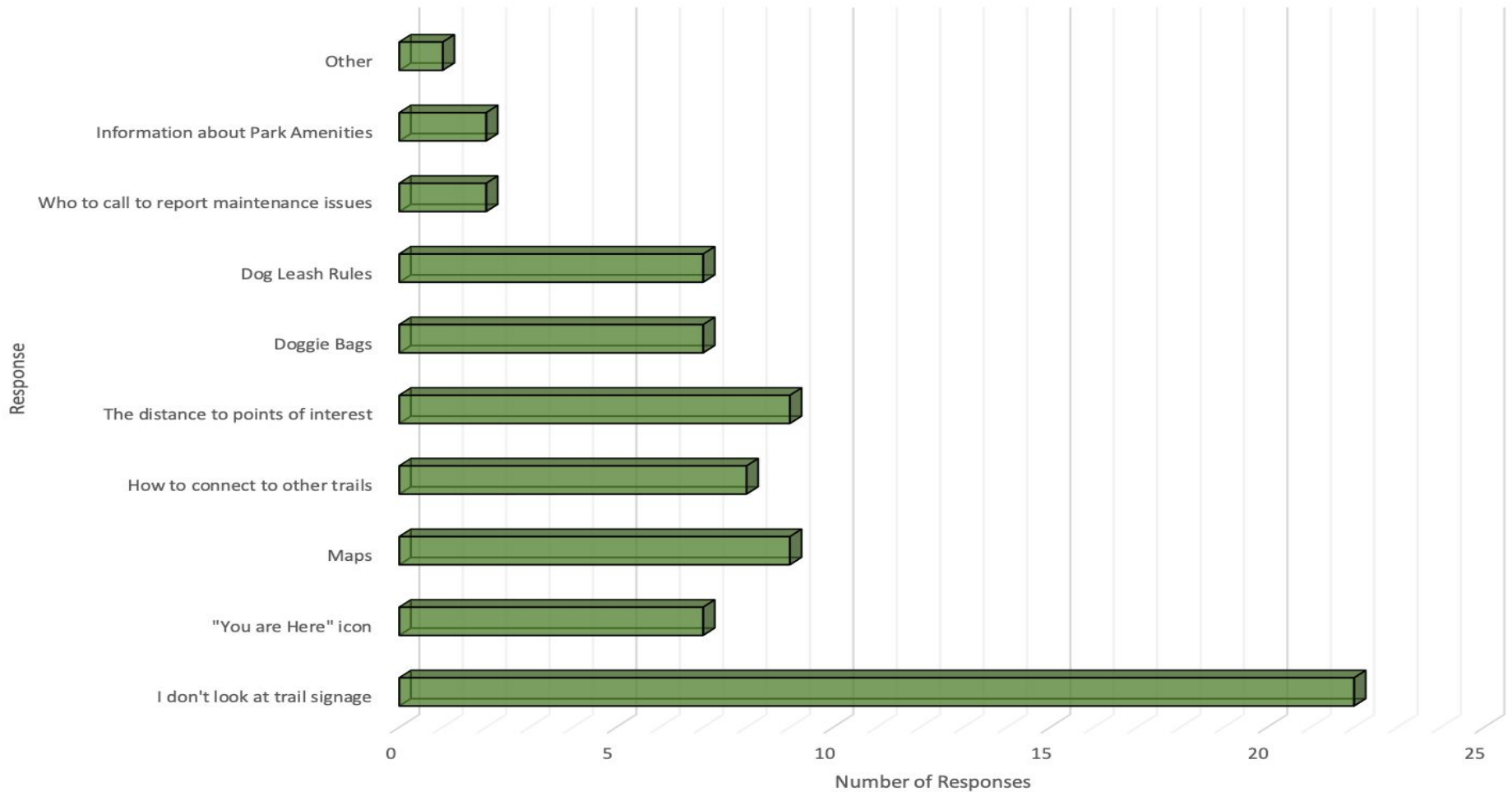
Existing Conditions

When looking at the existing conditions of the trails on our site we found a lack of signage at transition points. The trails run through all types of residential development from open fields to small gaps between houses. The tread type varies between cement pavers, sherpack, and raw dirt.

Neighborhood Trails

Lack of Signage
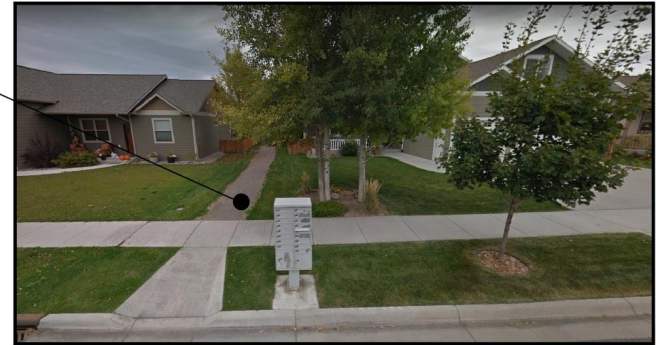
Private Easements

Doggy Bag Dispensor

Varied Tread Types

Bordering Subdivision

Open Fields / Parks

HOW DO YOU CHOOSE YOUR TRAIL ROUTES?
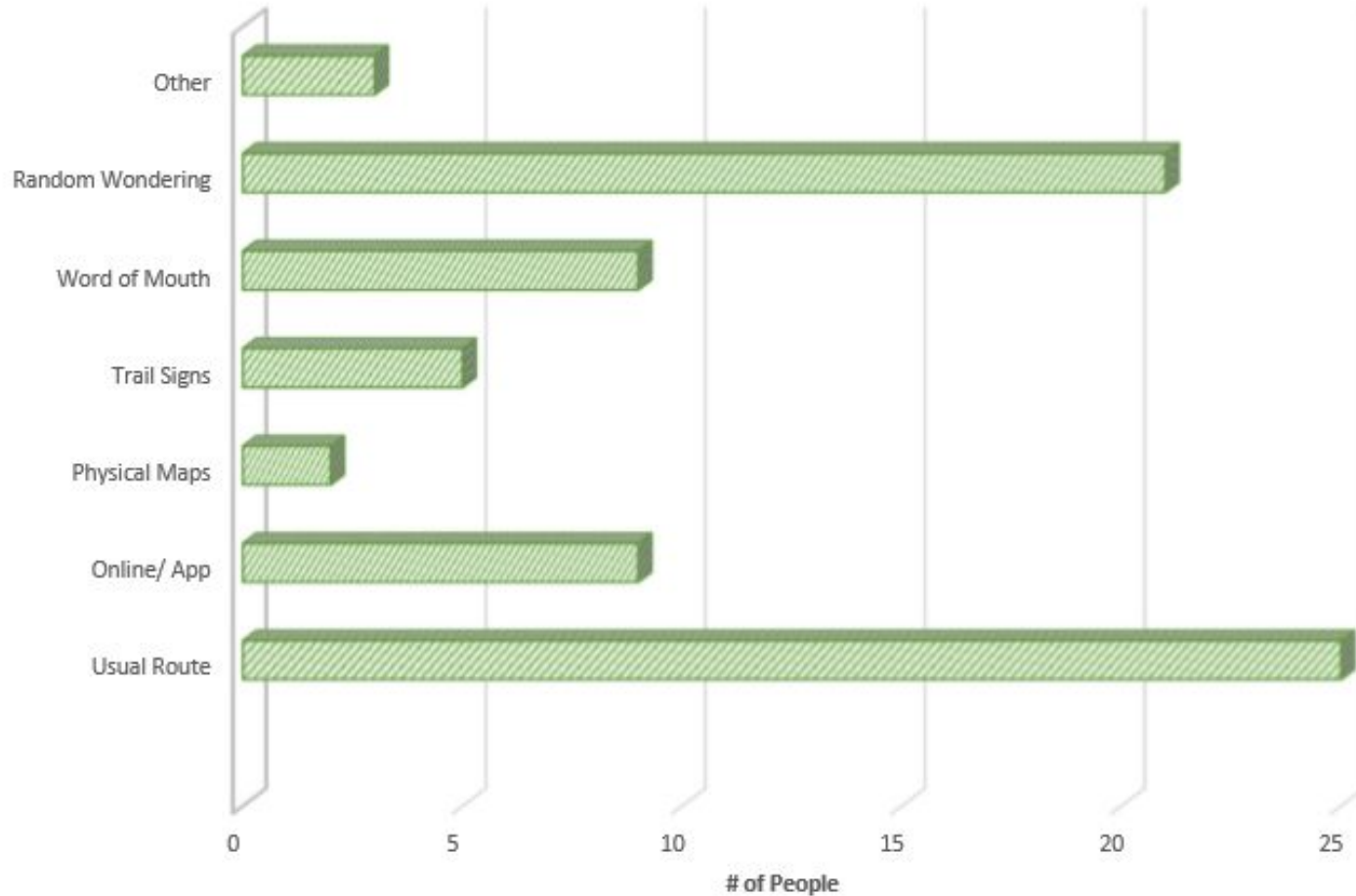
A large percentage of trail users navigate the trails via "Random Wondering". This group of users are unaware of the surrounding trails and conditions. By developing a system of signage and wayfinding points these users would be able to better understand the routes they want to take. The people who take the "Usual Route" also would benefit from the proposed wayfinding installations as it might increase their awareness of the surrounding trail system.

Proposed Conditions

Our proposed installations would include a series of colored totems / maps that direct the users throughout the trail system. In addition to this street markings would be put in place to navigate users from one path to the next. By doing this we are expanding the usable pathways and creating a clear navigation system.

Signage Totems

Neighborhood Trails
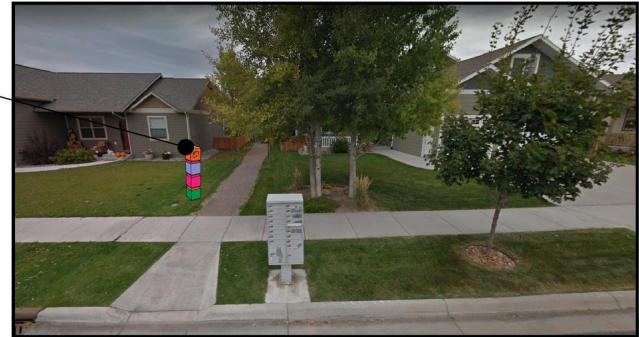
Private Easements

Maps / Information

Street Markings

Bordering Subdivision

Open Fields / Parks
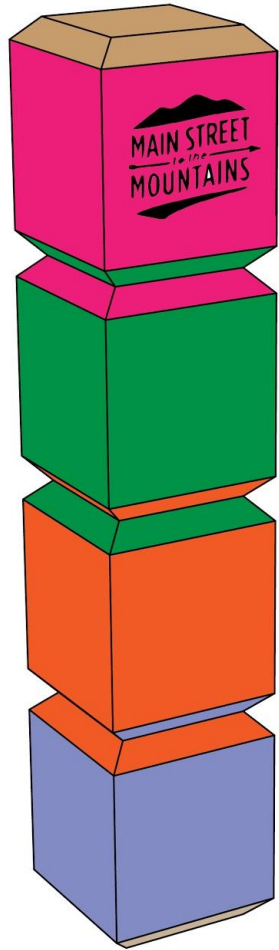
Making recognizable markers for Bozeman Trails

In looking at the research of Head and Hansen, we determined that the most important element of creating a cohesive and recognizable language within markers was through bright colors that organized the trail user to their surroundings.

We attempt to orient trail users to their location in Bozeman by color coded totem. These colors will correspond to a series of color regions radiating from a central core of Bozeman. The color organization of the post represent the distance and direction from the center point.

How to create a better language of signage?

Cassie Hansen's text, Falls Creek Wayfinding Signage illustrates the many factors to effective signage.

Being mindful of the ranging demographics within Bozeman when designing trail signage.

This includes avoiding colors that might blend with nature as well as colors that are commonly associated with hazards. (blue, green, red, yellow)

Additionally the signage should be intrinsically understandable to those who may not understand the sign from words.

Utilizing a community marker for wayfinding.

After talking to the GVLT it is important to orient signage and trail access around recognizable community markers rather than commercial ones.

In West Bozeman the most ideal central markers are schools and parks.

If signage is not provided to these trail systems, it is possible that many of them will become obsolete and start to disappear.

WEST BOZEMAN TRAIL SYSTEM

holistic overview

Key

City Limits

Existing Trails

Potential Trails

Water

Site

Census Tract 7.02

1.00 mile

0.75 mile

0.50 mile

0.25 mile

Census Tract 7.09

Census Tract 7.02

Census Tract 9

Census Tract 11.02

Census Tract 5.03
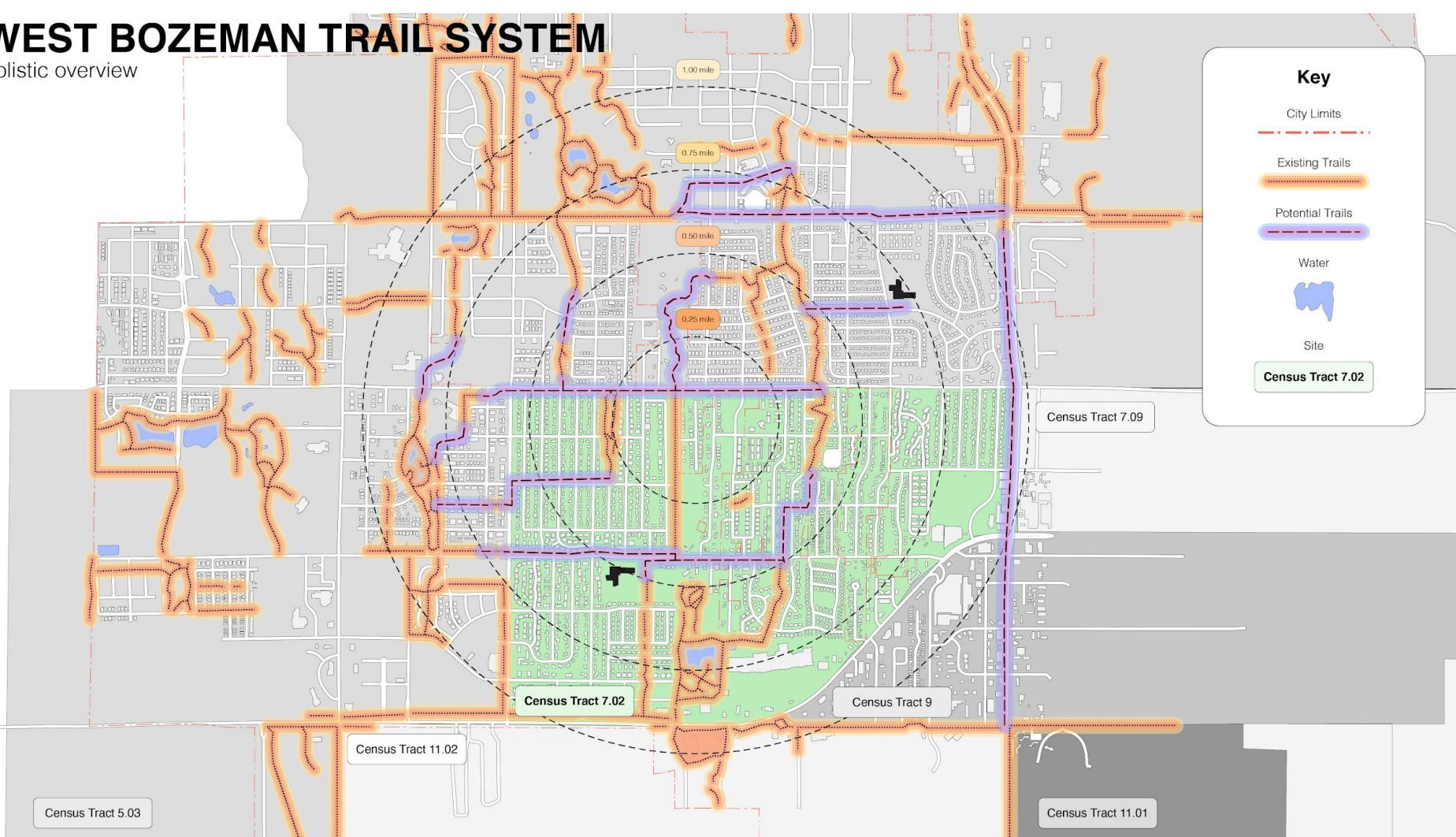
Census Tract 11.01

WEST BOZEMAN TRAIL SYSTEM

zoomed to the center of the trail system

1] Hyalite Elementary School

2] Emily Dickinson Elementary School

1.00 mile

0.75 mile

0.50 mile

0.25 mile

Census Tract 5.03

Census Tract 7.02

Census Tract 9

Key
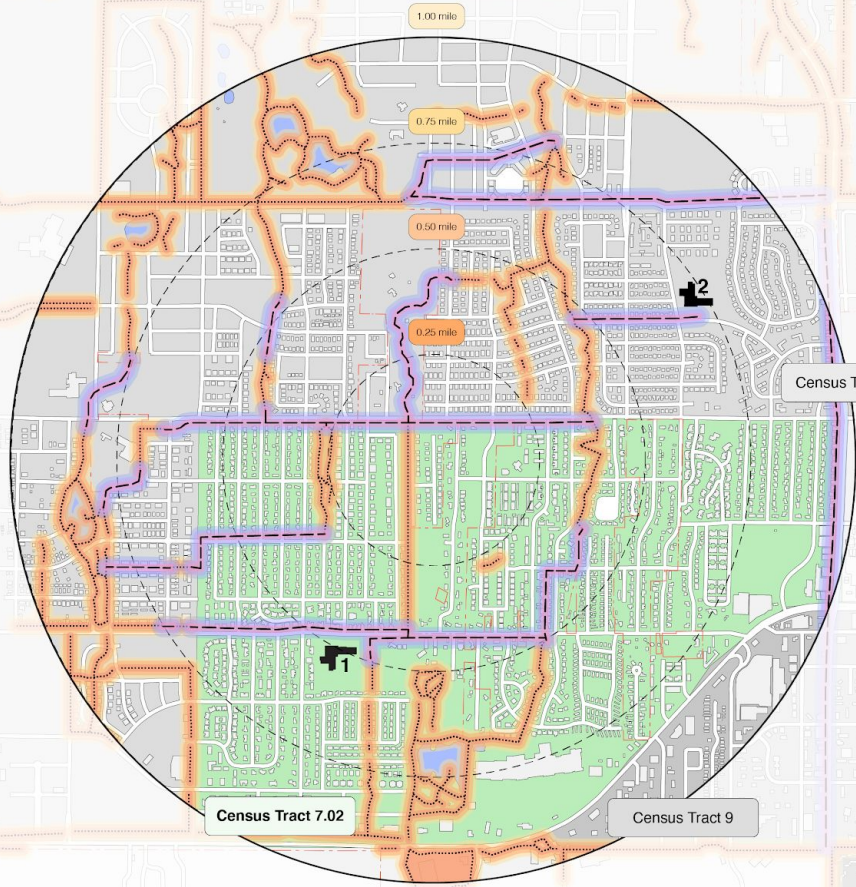
City Limits

Existing Trails

Potential Trails

Water

Site

Census Tract 7.02

WEST BOZEMAN TRAIL SYSTEM
relationship to Hyalite Elementary School

Census Tract 5.03

0.75 mile

0.50 mile

0.25 mile

Census Tract 7.02

Census Tract 9

Census Tract 11.02

Key
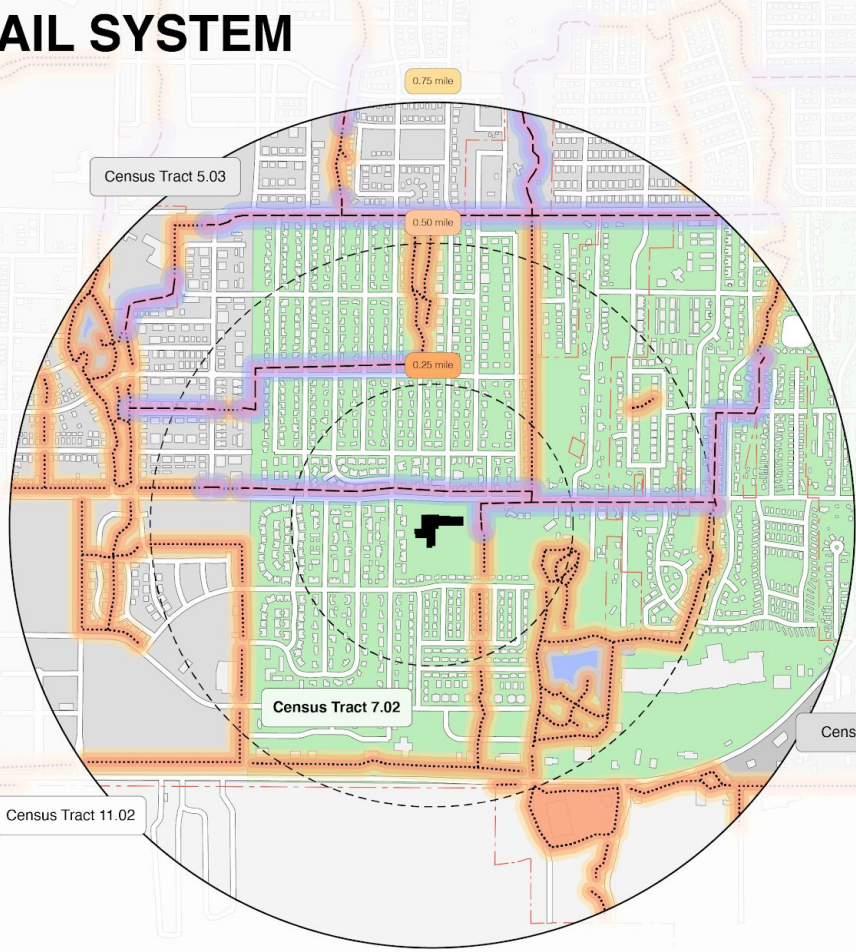
City Limits

Existing Trails

Potential Trails

Water

Site

Census Tract 7.02

Hyalite Elementary

WEST BOZEMAN TRAIL SYSTEM
relationship to Morning Star Elementary School

Census Tract 5.03

0.75 mile

0.50 mile

0.25 mile

Census Tract 7.09

Census Tract 7.02

Key

City Limits

Existing Trails

Potential Trails

Water

Site

Census Tract 7.02

Emily Dickinson Elementary

Conclusion

Creating a cohesive wayfinding system through recognizable colors and orientation with local community markers will create a stronger trail system with greater continuity between trails.

Improving the wayfinding will create more value in the community of West Bozeman.

Research Question

How can trail connectivity be improved in the West side of Bozeman through improved signage and wayfinding techniques?

Bozeman, MT.
Heather Stevenson,
Kameron Conklin, Lindsey Teply

Hypothesis: Through the addition and improvement of signage and wayfinding techniques and the promotion of the presence of trails in the West side of Bozeman, trail usage for commute and recreation will increase over time.

―――

Project Goals:

- Increased trail usage for recreation and commuters to work in the West side of Bozeman.

- Visually Connect the new Gallatin Valley High School to neighborhoods

- Increase signage and crosswalks on busy streets.
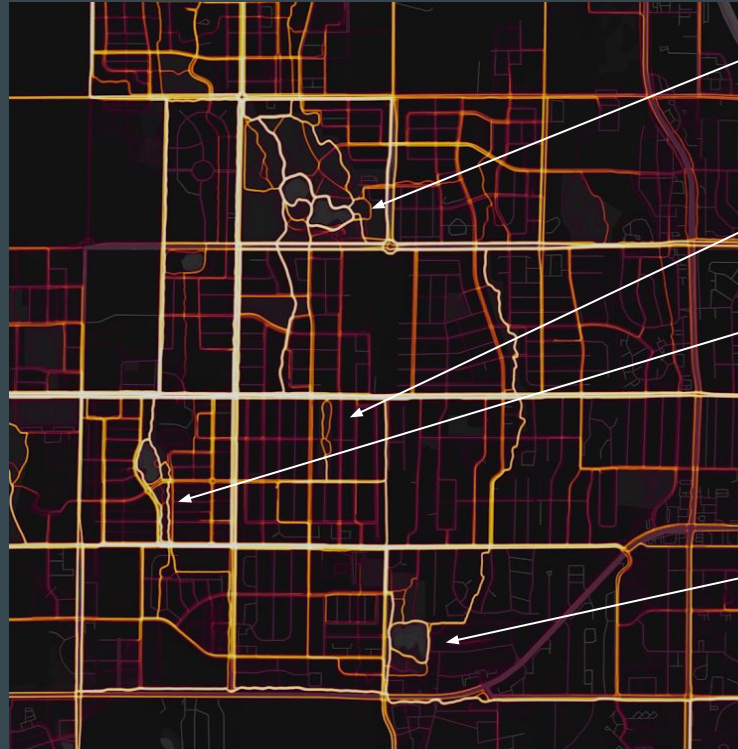
Site Selection

The site is located between Cascade and Durston Rd.

There is the possibility to connect to the trail system across Durston, but no crosswalk is present.

There is low usage of Valley Unit Park compared to neighboring trails.

Usage is isolated between parks

Gallatin Valley Regional Park
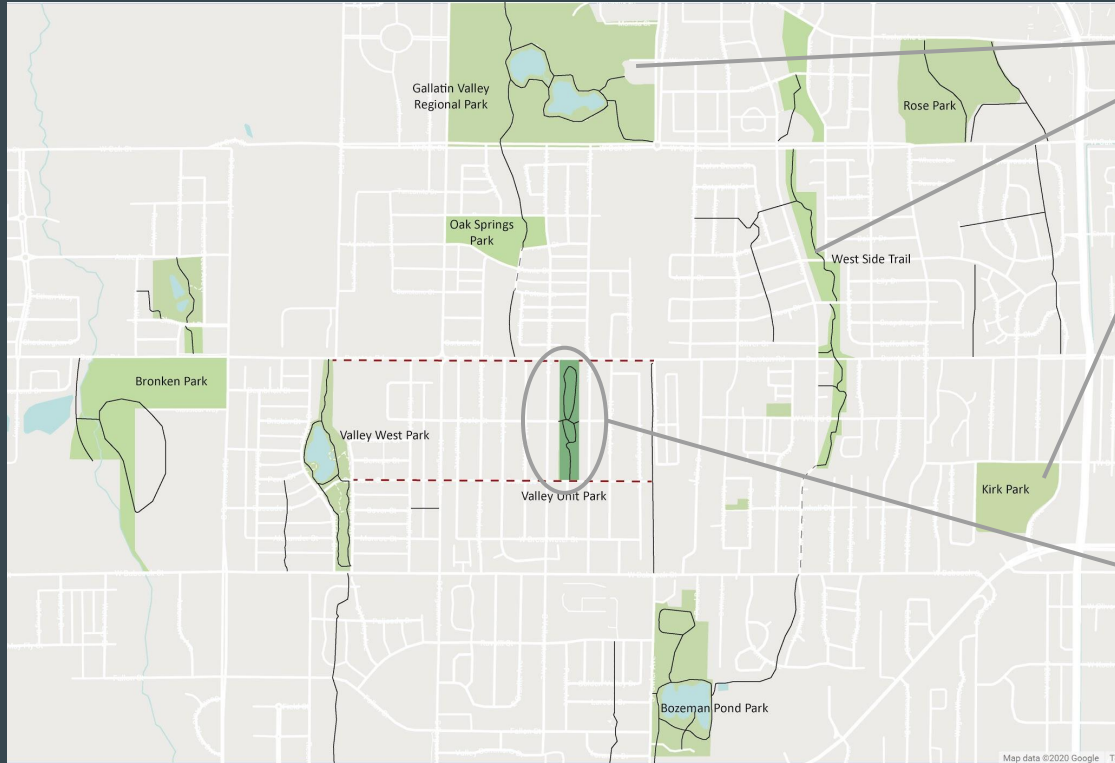
Valley Unit Park

Valley West Park

Bozeman Pond Park

Site: Valley Unit Park

With a central location to many parks, adding wayfinding strategies to this site could give it potential to act as a link between trails.

No signage marking trails

Connectivity is very limited

Long sides of site are bordered by residential land, decreasing visual access to site and trail.

Aerial View of Surrounding Parks

There are several trail systems in close proximity to this site; however, this trail is not heavily used.

Residences limit visual access to the site.
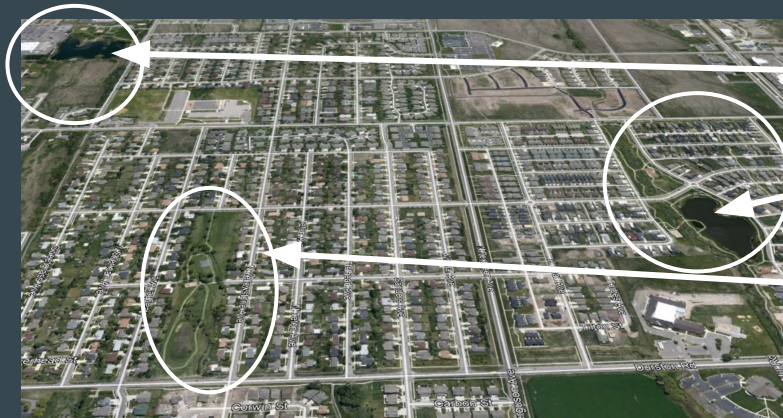
Bozeman Pond Park

Valley West Park

Valley Unit Park

Park Boundaries - East & West

The east and west boundaries of the Valley Unit Park are residential plots of off Meagher Ave and Yellowstone Ave. Adding signage along the bordering streets would increase awareness of the site though it has limited visual access.

Park Boundaries - North & South

The north and south boundaries of Valley Unit Park are much more open, but the lack of signage for this park make it obscure and uninviting.

With the enclosure of the homes surrounding the park, there is little to no visual information to allow for travel though the park.

Census Data Analysis: Site Population Density
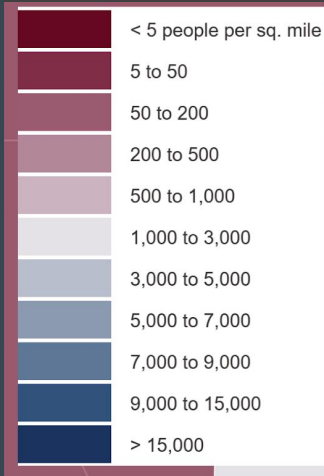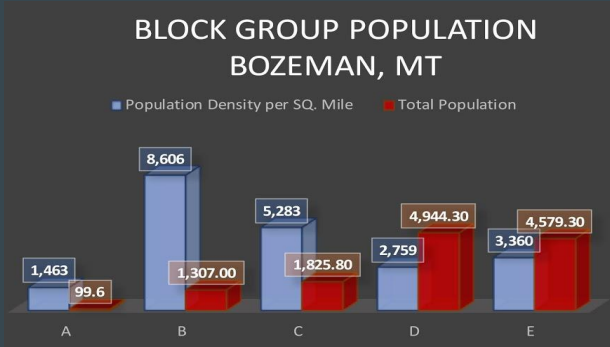
Valley West park is in block group C containing between 1,000 to 5,000 residents. Valley Unit park is in block group D has between 5,000 and 7,000 residents.

This shows the density of residents that are potential users of the trail system in this neighborhood.

Census Data Analysis: Transportation Usage
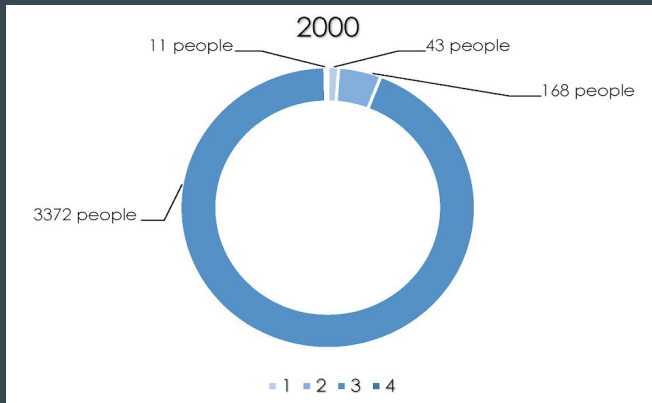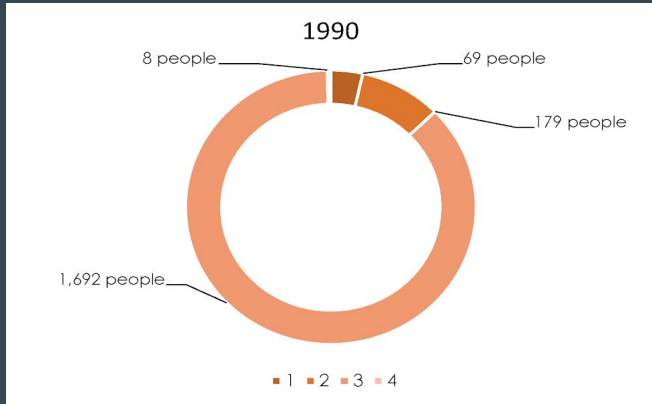
1 = Biked to work

2 = Walked to work

3 = Drove to work

4 = Took Public Transit to work

Despite increasing density between 1990 and 2000, the use of non-car transportation for commuting to work actually decreased as more suburban homes were built in the western part of the area. The percentages of transportation usages inform whether or not signage would be useful to the majority of people.

Census Data Analysis: Age Demographic
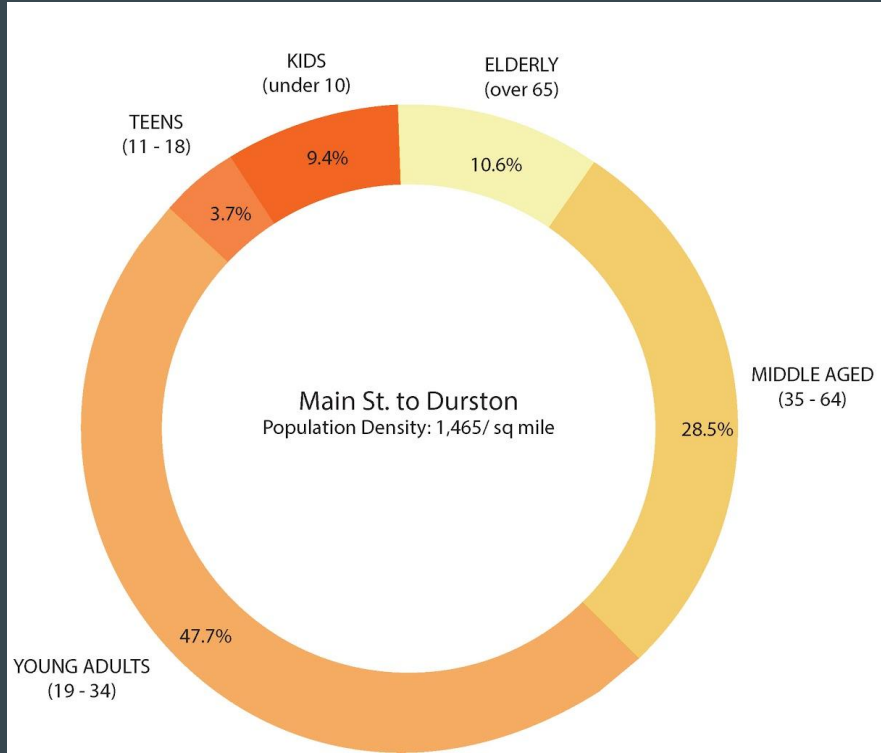
Young adults make up nearly half of the total population in the area of the site. This age group is likely to use trails, and likely to want to journey farther than other generations. Implementing wayfinding strategies would allow this these people to find a longer route when using the trails for exercise, transportation, etc.

Case Study Site
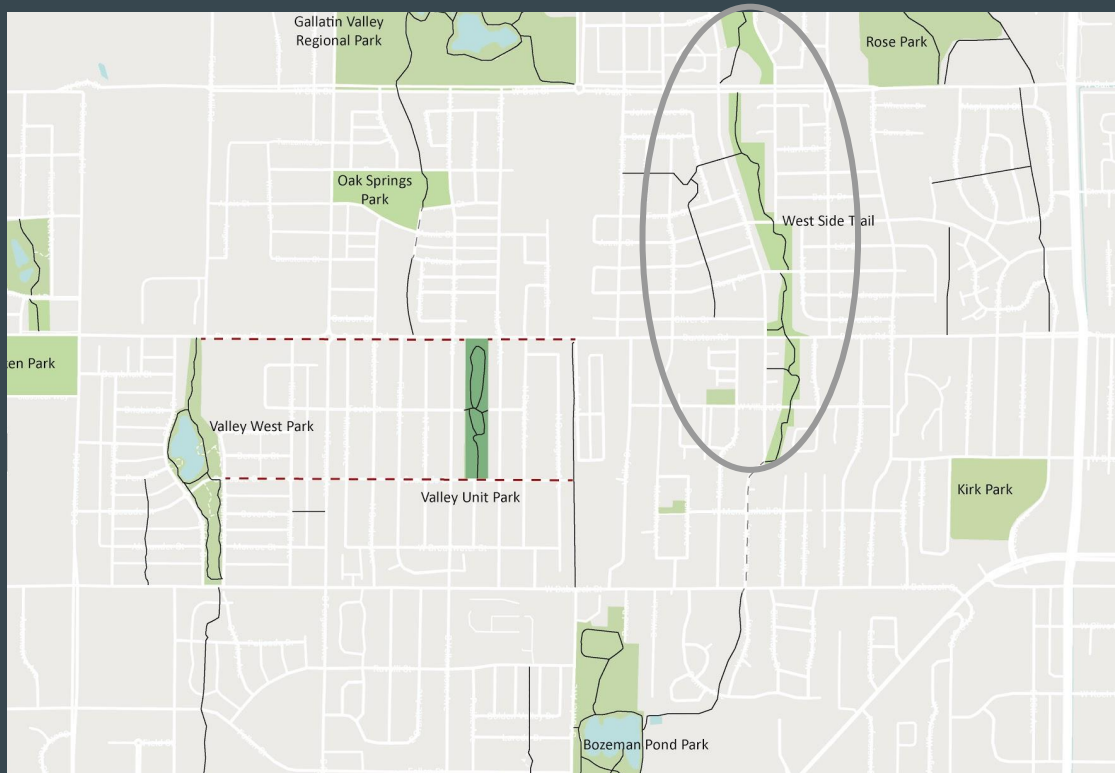
The following data was collected from a survey conducted on the West Side Trail in the spring of 2019. This data, along with an interview with Matt Parsons from GVLT will influence our proposed solution.

Survey Data: What information are you looking for?
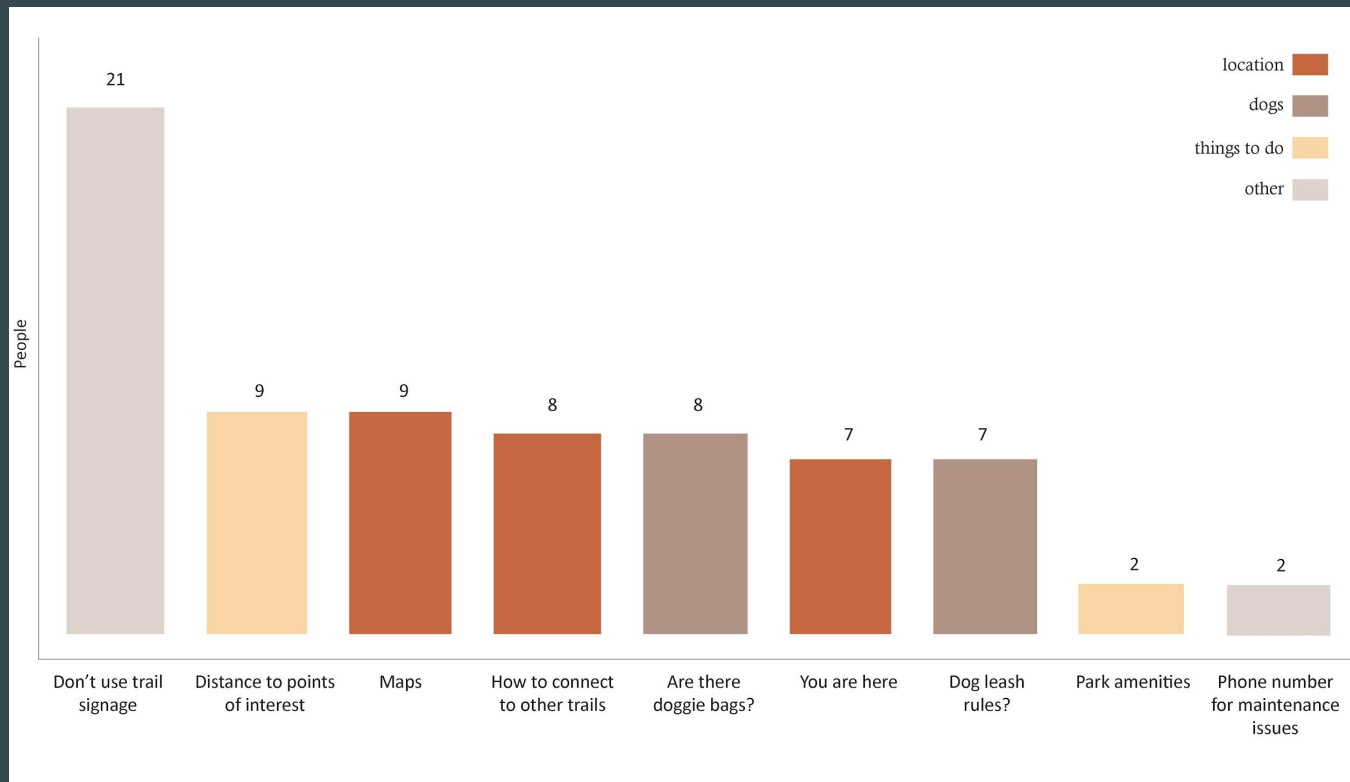
People most commonly use trail signage to find the distances between landmarks or other trails. Others need to know what is on the trail such as doggie bags, and other park amenities

Interview: Matt Parsons, GVLT

Q: What have you found to be successful with the current signage in place?

A: "Certainly from a branding perspective, they're great...From a wayfinding perspective, I have found them (the little maps) completely useless. The labeling is confusing and the names do not line up with the names the public uses."

Totem

GVLT prefers post signs ($150 each) to totems ($800 each) because they are easier and cheaper to implement. These signs have been making their way around the trail system, but due to funding, it is more spuratic than helpful in the grand scheme of the trail system. Budget includes signage, trail construction, and upgrade trails (6ft wide) totalling $345,000 for changes.

Post Signs

Proposed Solution:

- Increased amount of signage at intersections
- This will be expanded to a nearby site with little pedestrian traffic due to lack of signage.
- Information on signs altered to include relevant landmarks and information for users based off of surveys

Placement of Post Signs

Most users wanted to know the distances of landmarks and trails. By placing these signs at intersections, users will know where they are, and where to go.

Proposed Solution:

Improved techniques of wayfinding in Bozeman can be done by lowering the cost per sign by implementing post signs ($150 each) rather than designing a totem ($800 each). Although the totems look nice, this installation could be left up to sponsorship funding of parks and other heavily used areas. By placing eleven posts in valley west park and four posts in Valley Unit park the overall cost has been lowered to $2,250 rather than $12,000 for totems

Wayfinding on Trails

Cassie Coate, Alex Simensen, Stephanie Weddle, Sage Triantis

Importance of Wayfinding

-Improves efficiency, accessibility, and safety.

-Decreases frustration, stress, and extra time spent

-Shows a commitment to the user

-Should combine signage, maps, symbols, colors, and a variety of communication

Types of Wayfinding

1. Identification Signs
    a. Identify location, landmarks, structure, etc.
2. Directional Signs
    a. Keep people moving, especially in busy areas
3. Informational Signs
    a. Provide useful information along the way
4. Regulatory Signs
    a. Inform users on certain regulation and requirements

What different types of wayfinding would be most helpful on trails?

Hypothesis

The trails on the west side of Bozeman are greatly

fragmented. The addition of clear and increased signage will

help to increase the usability and connectivity of the trails,

and in turn help the health of the surrounding community.

Location of Existing Wayfinding
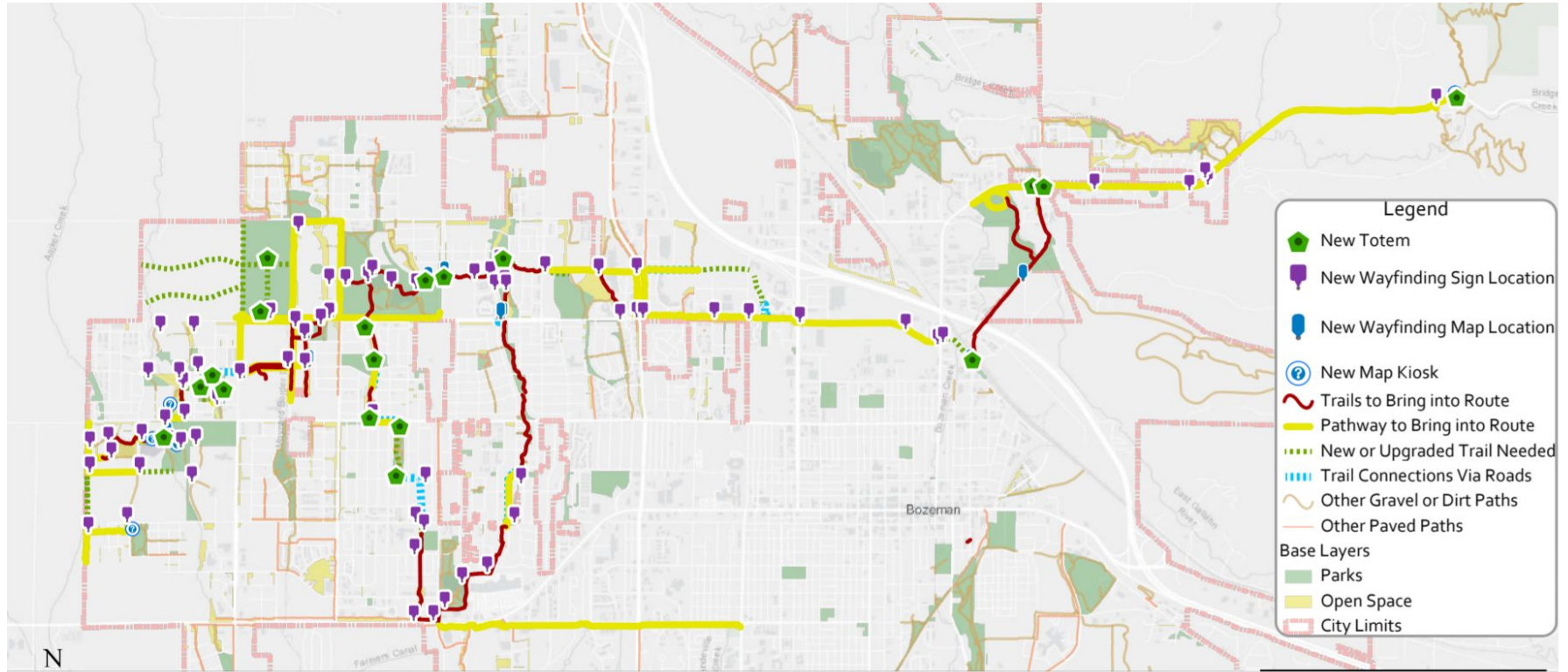
**Does fragmentation become mitigated when adequate signage is on the trails?**

Problems

- There are a lot of **trails that don't have signage**
- There are a lot of **trails that don't connect to other trails or have obstructions** such as curbs, medians, and roads preventing smooth connections
- **Signage and fragmentation are equally important** in wayfinding on the west side of Bozeman
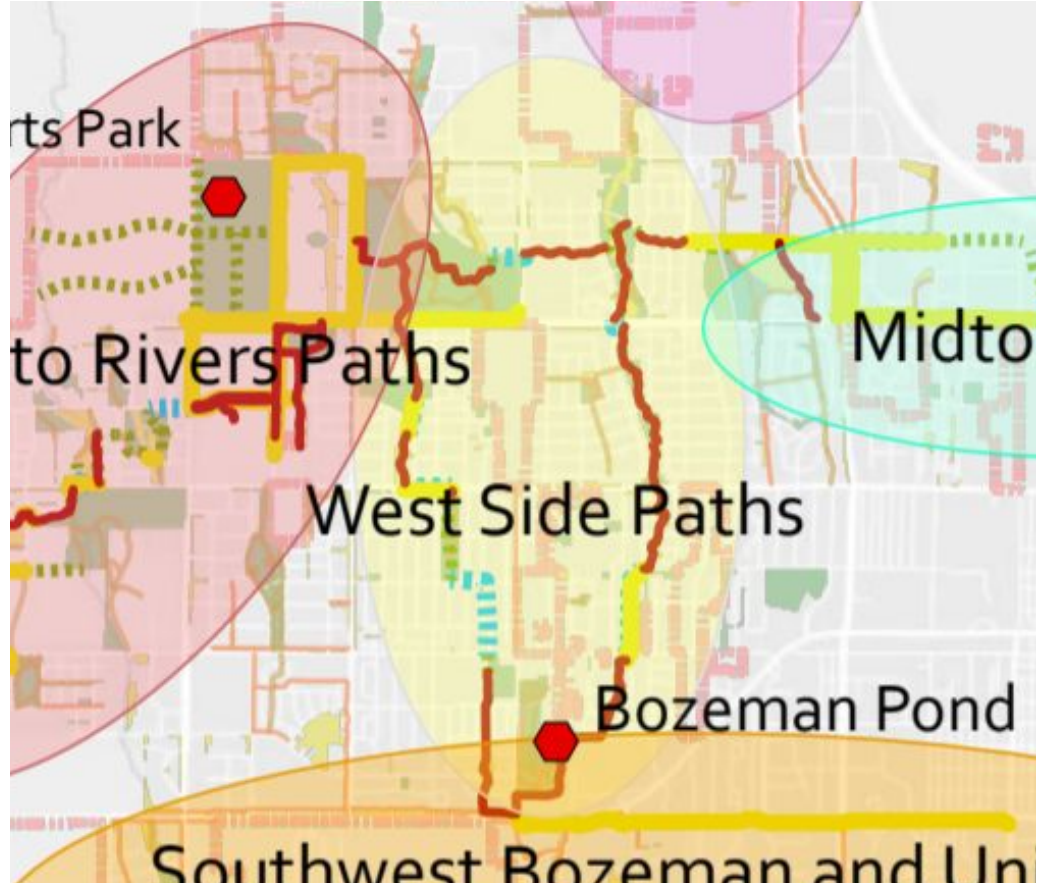
Proposed Solutions

- GVLT's new signage that is similar to most street signs but maintains the 'main street to mountains logo' costs $150 per sign versus the $800 totems.

Future Plans

Gallatin
High School

Proposed Route
— Proposed Pathway and Trail Route
— Other Paved Path
⋯ Other Gravel or Dirt Path
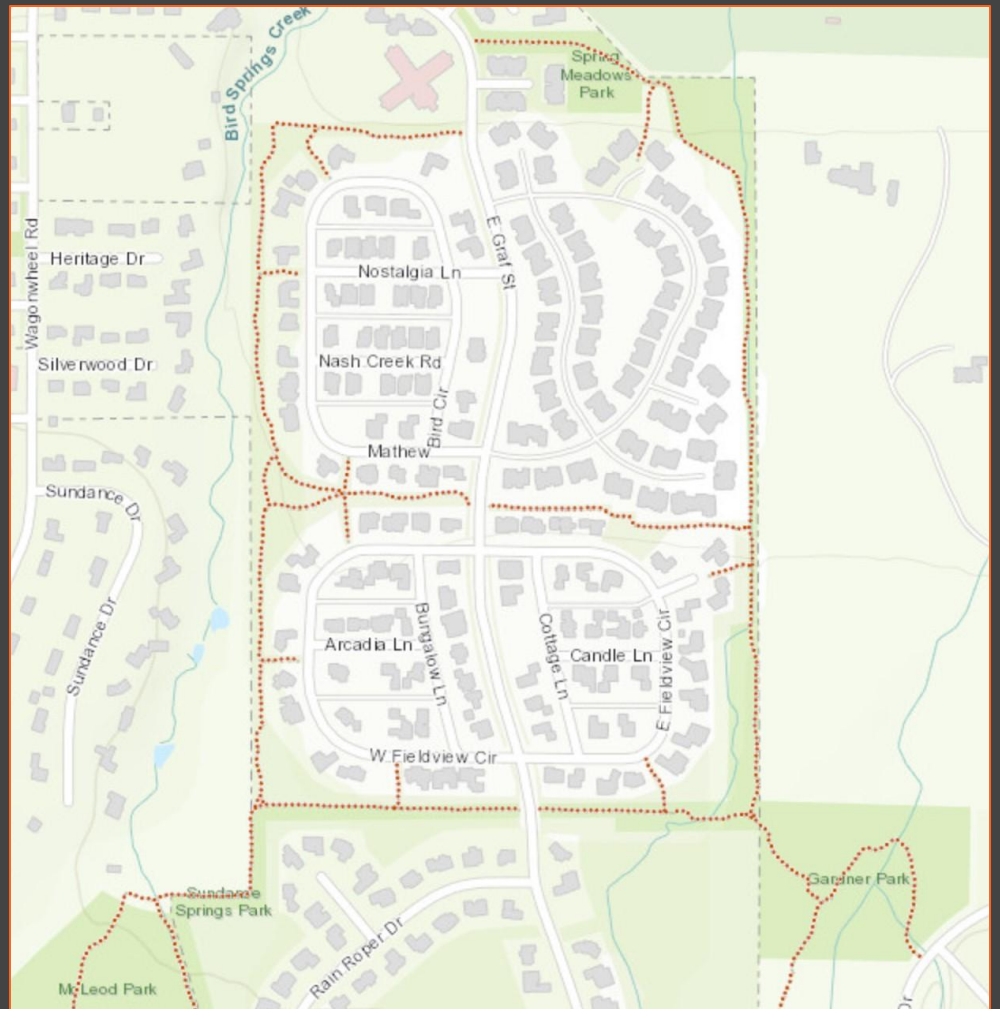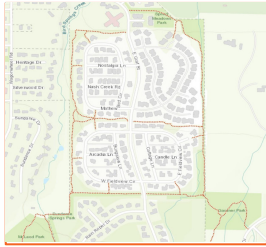
- West side trails are going to be **organically shaped** and used for **recreation.**

- A **linear trail** off of oak street will be developed for **commuting** to work.

Control Site

- Connectivity
- High usage
- Access from many points

Demographics of Control Site

Population Density

There are <u>3,334</u> people that live on this control site. We are analyzing this area and the people who live here to see what factors contribute to a successful trail system.

Age

21%   23%

13%   ■ under 18
      ■ 18 to 34

43%   ■ 35 to64
      ■ 65 and older
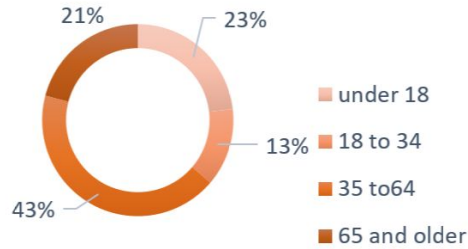
Average age of people in the control site is ~46.7 yrs.

Family Structure

12.27%   **Female: Head of Household**

20.72%

Married Couple   92.25 %

79.28%

7.96%   **Male: Head of Household**

■ Family
■ Non- Family

Other   7.45%

Control Site

Economic Statistics

Occupations

Employment Status

- Not in Work Force
- employed
- unemployed

1%
39%
60%

Occupations chart:
- Agriculture: 1.21%
- construction: 3%
- manufacturing: 3%
- wholesale: 3.63%
- retail: 7.32%
- transportation: 2.63%
- information: 0.51%
- real estate: 7.77%
- waste mang.: 26.50%
- edu./healthcare: 27.52%
- Arts, entertainment, & rec.: 12.29%
- other: 3.76%
- public admin: 2.93%

■ Occupation of workers 16+

Mode of Transportation Statistics

75.24%

Of residents in the area get to work by car, truck, or van instead of the nearby trail system even though work is ~12 min away
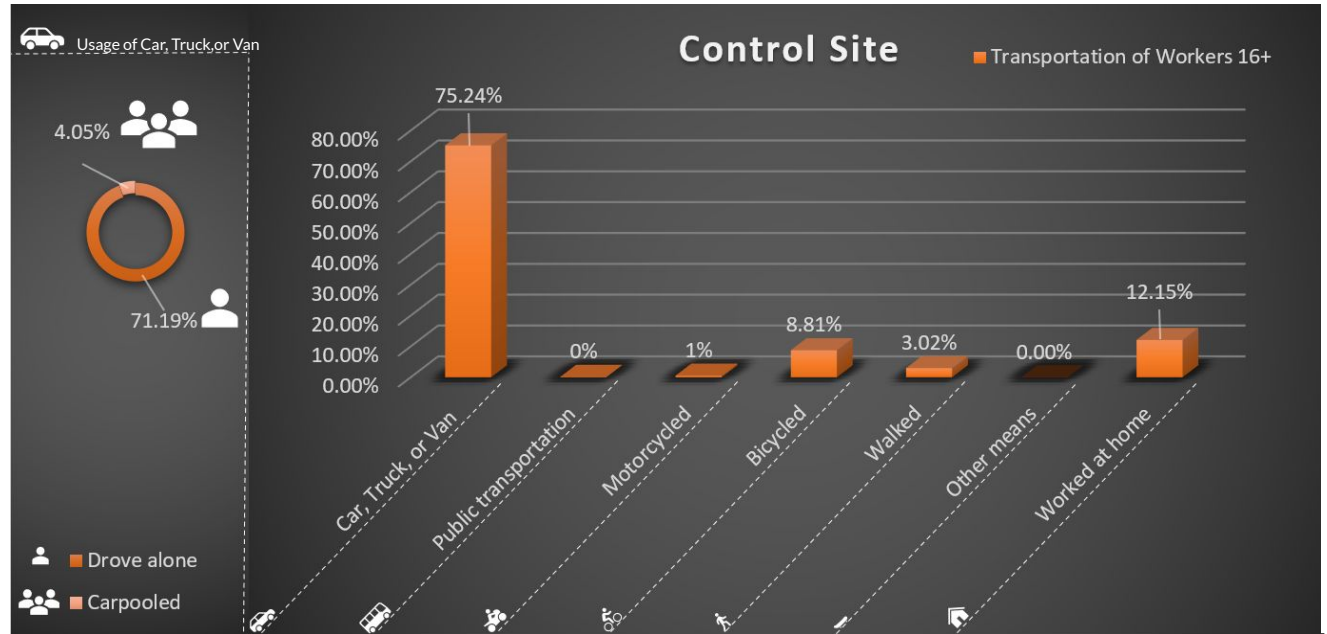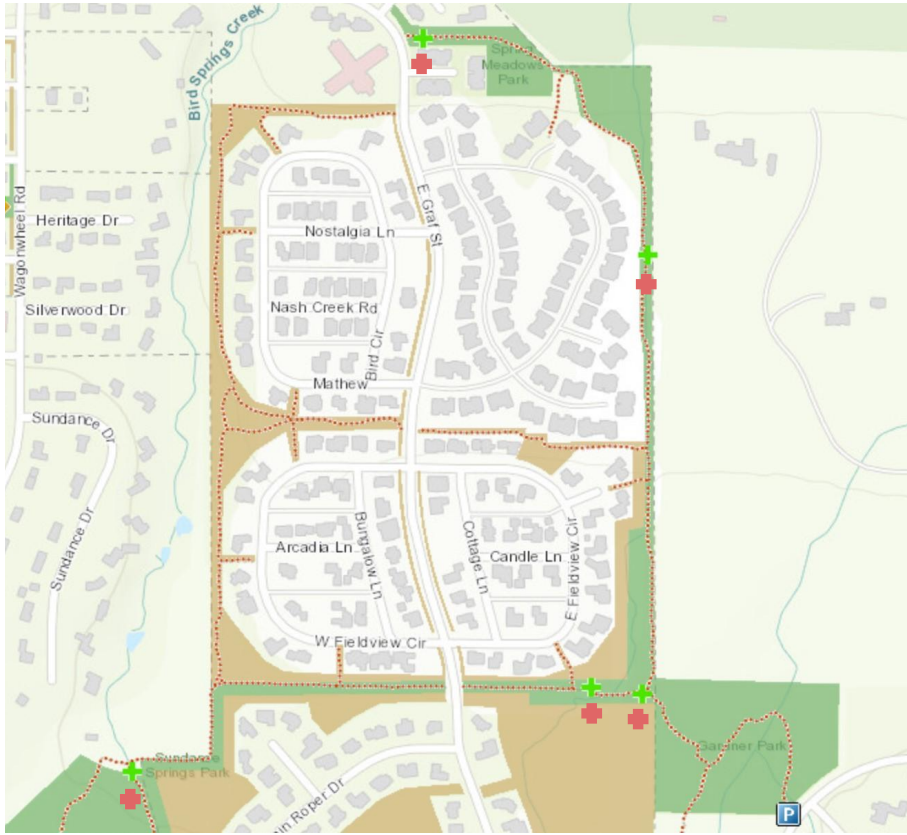
Control Site : Southern Bozeman, near Valley View Golf Course

This site shows how more developed trails have higher cohesion than the more fragmented Northern trails.

Though there are relatively the same amenities, it requires less signage as the wayfinding is more clear with continuous trails.

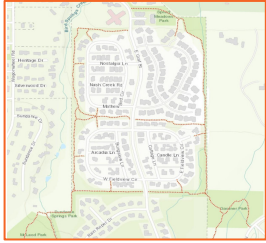This map shows the 'easy to use' wayfinding we hope to achieve in our case study site to implement in the more fragmented sections of GVLT trails; offering less confusion with broken trail systems.

Park Space   Open Space   Bench/Pavilion   Parking   Playground

Case Study Site

- Heavy fragmentation
- Lower usage
- Limited direct access

Demographics of Case Study Site
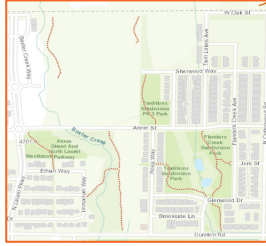
Population Density

There are <u>13,889</u> people that live in this case study site. This fragmented and sprawled site will be analyzed and compared to the control sites results to compile a remedy for its fragmented trails.

Age

8%
20%
33%
39%

- under 18
- 18 to 34
- 35 to64
- 65 and older
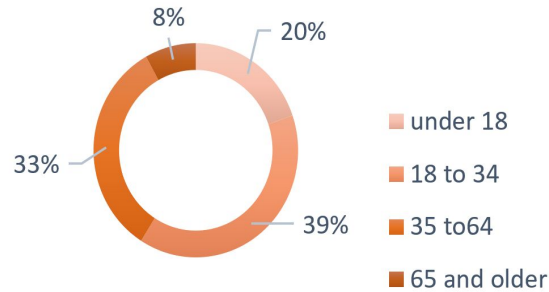
Average age of people in the control site is ~ 29.1 yrs old.

Family Structure

Household Status

24.7%
40.35%

Male: Head of Household

15.66%

Female: Head of Household

59.64%

83.74%

Married Couple

Other.

16.25%

- Family
- Non- Family

Economic Statistics

Occupations

Employment Status

- Not in Work Force
- employed
- unemployed

2%
21%
77%

25.00%
20.00%
15.00%
10.00%
5.00%
0.00%

2.36% Agriculture
10% construction
6% manufacturing
2.98% wholesale
16.16% retail
2.43% transportation
0.24% information
4.51% real estate
9.68% waste mang.
24.43% edu. /healthcare
11.97% Arts, entertainment, & rec.
6.67% other
2.93% public admin

■ Occupation of workers 16+
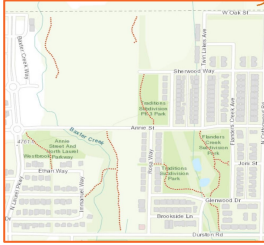
Case study site

94.46%

Of residents in the area get to work by car, truck, or van instead of the nearby trail system even though work is ~15 min away

Mode of Transportation Statistics

Case study site — Transportation of Workers 16+

8.93%

85.53%

Drove alone
Carpooled

94.46%

0% 0% 0.75% 0.48% 0.72% 3.59%

Car, Truck, or Van
Public transportation
Motorcycled
Bicycled
Walked
Other means
Worked at home
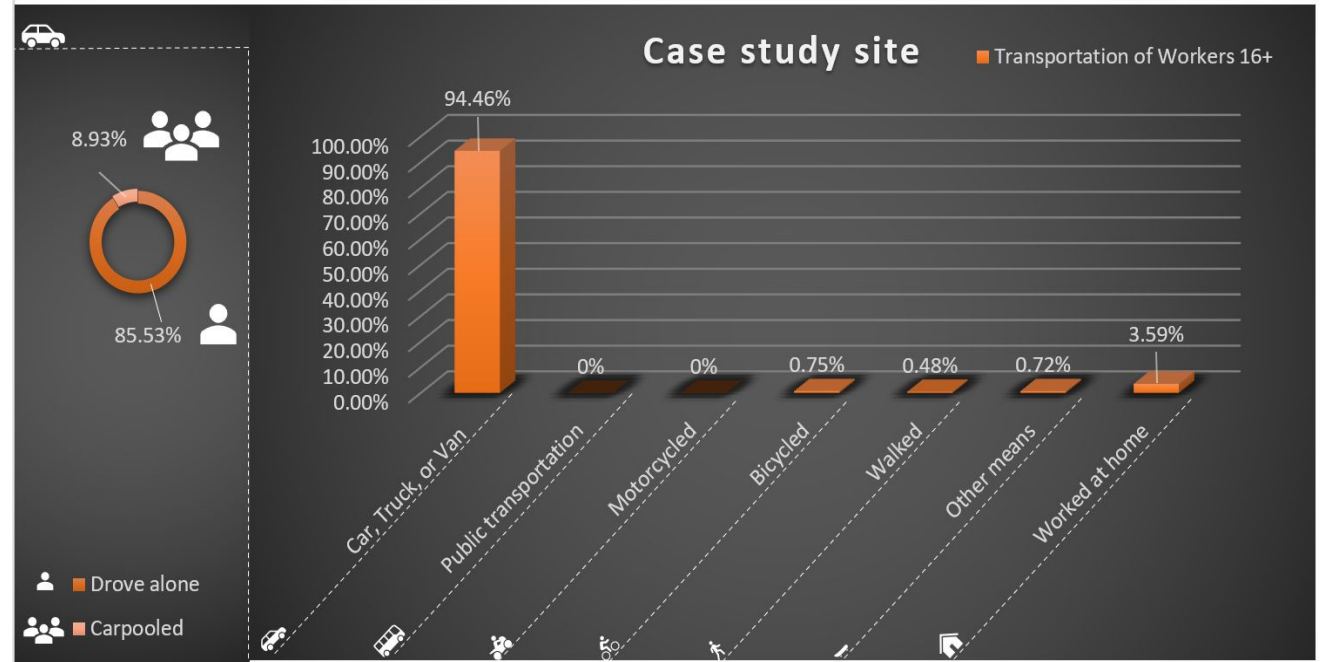
Case Study Site: Western Bozeman, near Adam Bronken Soccer Complex

This site shows an example of the issue facing many of the trails in the Northern part of Bozeman.

Though there are many amenities, like the control site, the trails here are much less cohesive, and have a fragmented system.

With the implementation of new and specific signage, we hope this site will have the easily navigable feel that our control site on the Southern end of Bozeman has.
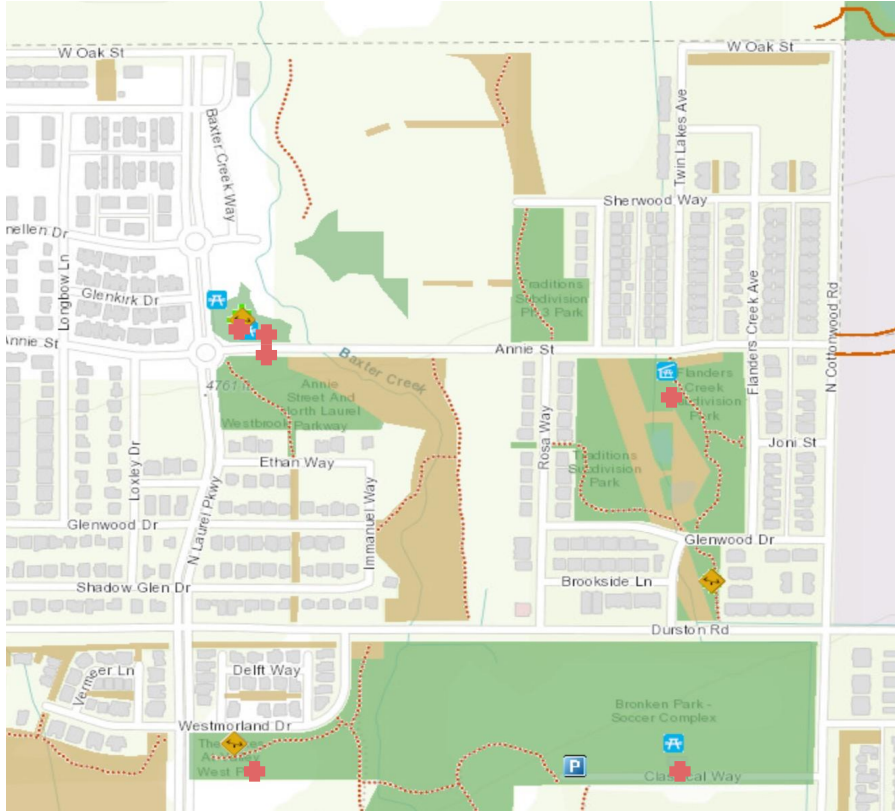
Park Space   Open Space   Bench/Pavilion   Parking   Playground

Both Sites Have Similar Amenities

Control Site

Case Study Site

Park Space

Open Space

Bench/
Pavilions

Parking

Playground

However, each site represents vastly different amounts of use.
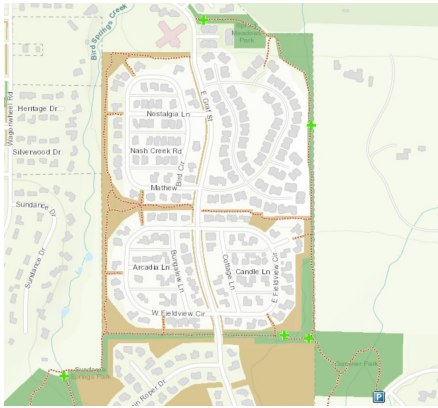
Control Site
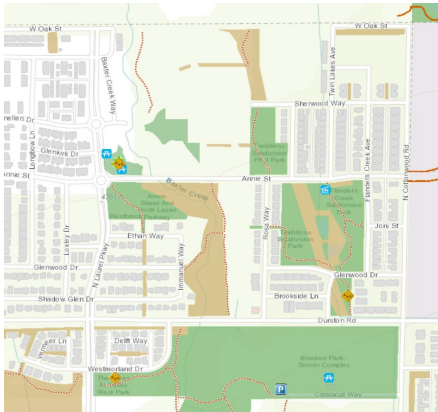
Case Study Site

What we learned from sites

Q: What needs to be included in signage to make wayfinding more possible in situations where wayfinding is difficult?

A: In order for people to wayfind with ease, things must become familiar. Therefore, signage should be consistent and repetitive in its graphic com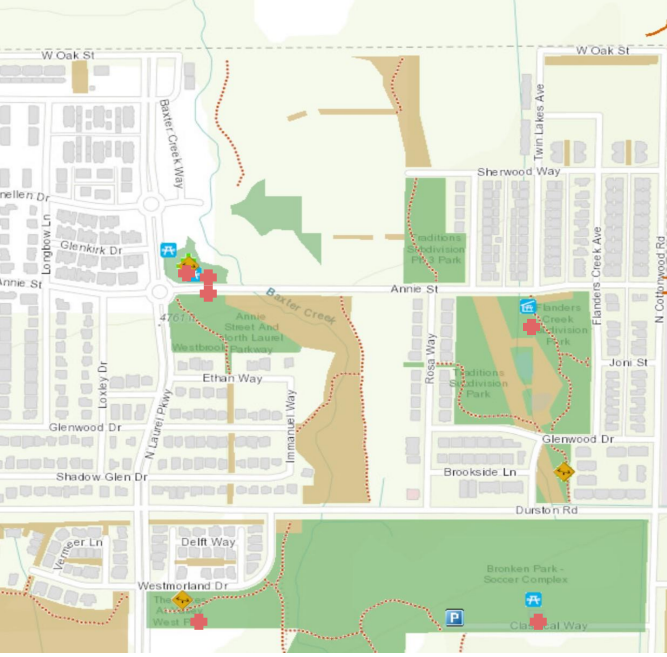munication. Signage should include maps, symbols, comprehensible lettering, and differentiating colors correlating to that specific trail with a wider range of information when switching between systems. These qualities make it possible to communicate to a variety of individuals with ease.

Q: Does an increase in allowing aided wayfinding result in the trails having an increased sense of useability?

A: We can assume that with a higher amount of ease in wayfinding, fragmentation becomes less of an issue and the flow of the trail then represents one of a trail without fragmentation.

68
people took the survey

44 | 22
walked to the trail | drove a car to the trail

HOW PEOPLE USE TRAILS ON THE WEST SIDE OF BOZEMAN

33% walk their dog (34),
33% exercise (34),
25% enjoy nature (27),
5% run errands + shop (5),
and
2% commute to work (2)

(102 total responses. this was a check all that apply question so people were able to select multiple options)
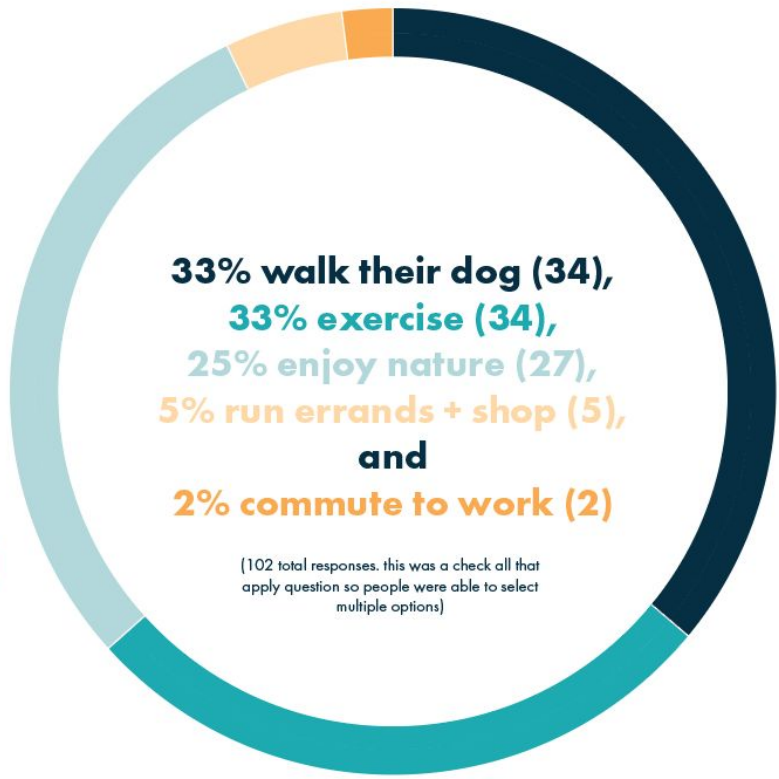
1/3

of people using the west end trails drove to the trail. This number can be reduced by connecting more trails. Do these people live by other trails? Or are these people using these trails because they prefer them to trails they live nearby? With more specific implementation of wayfinding, connecting nearby trails, and communicating how the trail systems connect. We hope people will then utilize these trails to get to the destination they desire.

91%

of people are using the trails for leisure i.e. exercise, walking their dog, enjoying nature. This means that the trails on the west end could better serve the community through having longer uninterrupted trails with scenic wandering paths rather than straight commuting paths.

Location of our Proposed Signage

- Simple yet precise location markers at areas of fragmentation
  - Doesn't require large scale intervention at smaller points
  - Only information about upcoming areas of interest/deviation
  - Results in less confusion and immediate answers
  - Non cluttered signage
- Larger scale interventions are greater points of trail deviation, where choices to turn result in potentially leaving specific system
  - Allows for users to be aware of larger scale fragments
  - Doesn't become confused with smaller scale signage

⊙ Larger Scale   ⊙ Smaller Scale

Conclusion

The Bozeman trail systems offer a easy getaway from the city.

With the implementation of simple and precise signage at possible confusion causing fragments of the trails, we hope to allow even easier access to the outdoors. This precise signage will show where the trails continue, while also allowing for more detailed signage for when one may be leaving a specific section of the systems.

We hope this allows for easier access for all by giving quick information about the next trail to take. Thus, removing the feel of fragmentation, aiding in an overall continuous feel during your time enjoying the GVLT trails.

Group 8

___

Digital Wayfinding

Travis Boyer, Christian Snell, Stallone Cruz, Willie Leidolf

Abstract

Now more than ever technology is becoming more prevalent and integrated in the way navigate our urban infrastructure. While more common apps like Uber and Ways are helping pedestrians find their ways through densely populated cities, the use of innovate technologies for wayfinding can also be applied to more rural areas such as Bozeman, Montana. One specific area where this could thrive, especially in Bozeman, would be in wayfinding trails around the community. This opportunity could easily be taken advantage of as Bozeman continues to grow at rapid rates, meaning new trail systems and pathways are being created every year. In order to efficiently accomplish this it would be most beneficial to hands on with the community to combine expertise and ensure that the these methods are integrated in the most beneficial ways possible. What this means is not only the involvement of GVLT, but heavy research into what the community needs. The following research not only seeks to accomplish this, but to take it a step further by researching and determining the correct technology to be paired with the citizens. The target audience of this investigation is to be bound by Cottonwood Road, Durstin Road, Gooch Hill Rd, and West Oak Street. In the following presentation we we use the tools of mapping, diagramming, interviewing and more to provide insight that will expand the way we navigate and make Bozeman a better place to live for its residents.

Sample Survey Site Location and Selection Criteria.

This survey site was chosen by the researches in due to its location on the edge of Bozeman. As GVLT expands it's trail coverage to the west to allow greater access and use this area represents a small portion of that plan. The researchers wanted to develop a better understanding of how and why the public trails are used especially along the western edge of the city.

Specific selection criteria were
:

- Western edge of Bozeman sprawl
- Diverse demographics
- Med. size sample area
- Low access to trail system

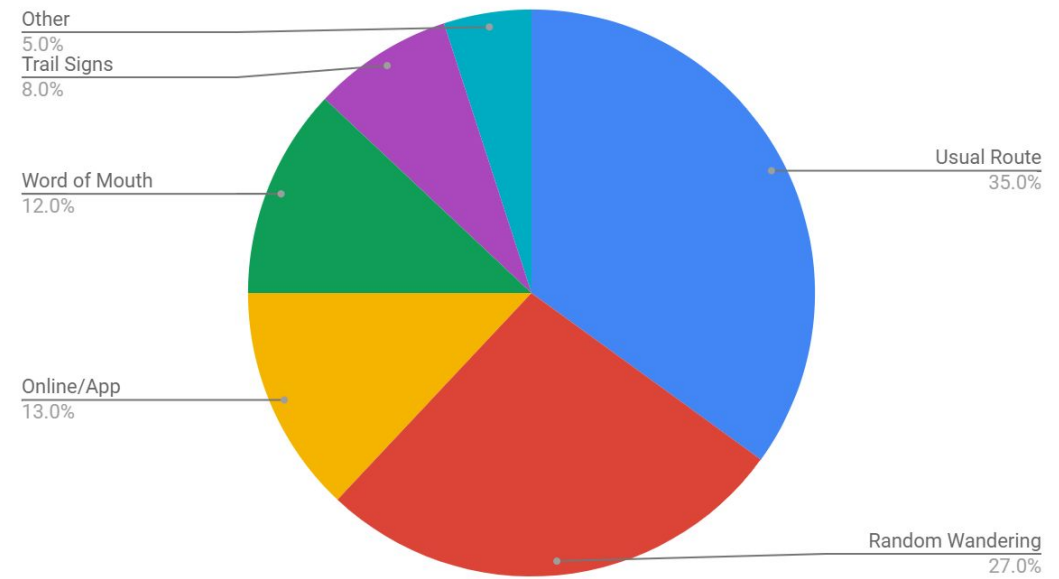Site location: The area between Gooch Hill Rd, Durston, West Oak and Cottonwood

Bozeman, MT Information gathered from Social Explorer

Sensus tract 5.03

US Hwy 191

2010 59 1305
2018 123 3240

2010 1169 1305
2018 3117 3240

2010 9 1305
2018 0 3240

2010 0 1305
2018 0 3240

Survey questions

How do you choose trails?

Other — 5.0%
Trail Signs — 8.0%
Word of Mouth — 12.0%
Online/App — 13.0%
Usual Route — 35.0%
Random Wandering — 27.0%

How do you set trail preference?

Universally Accessib... — 1.8%
Surface Quality — 4.6%
Amenities — 7.3%
Connection to Other... — 8.3%
Lower Traffic Volum... — 12.8%
Most Conveniet or D... — 48.6%
Scenic Qualities — 16.5%
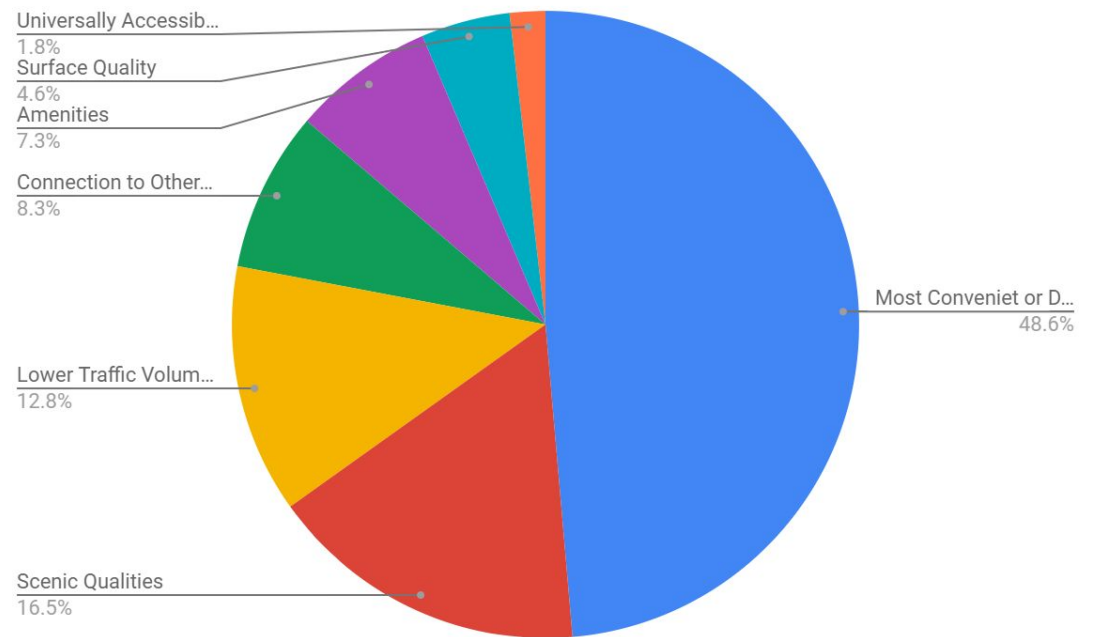
Narrative of potential trail users

Anne, 42

- Visually impaired (uses a cane)
- Loves going to the park with her two kids
- Has a smartphone and likes using apps
- Out for a surprise picnic with her kids

Chris, 60

- Frequent visitor to the park, regularly walks his dog
- Usually goes before work
- Had hip replacement so prefers flat terrain
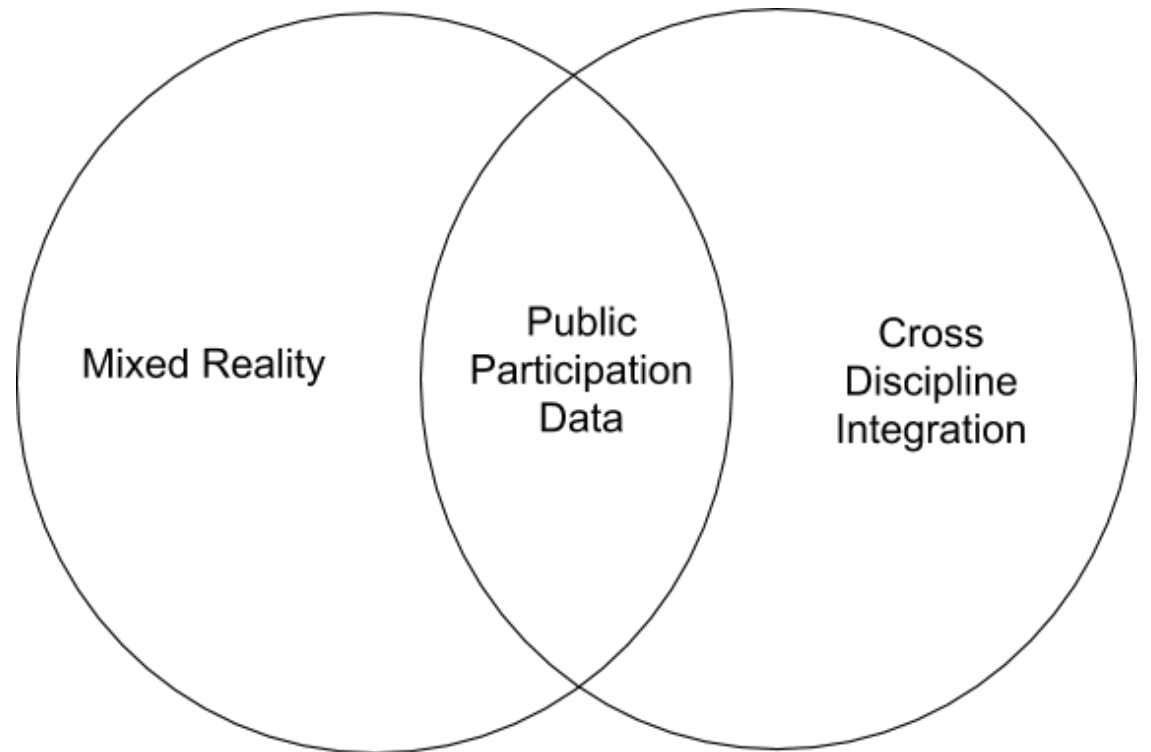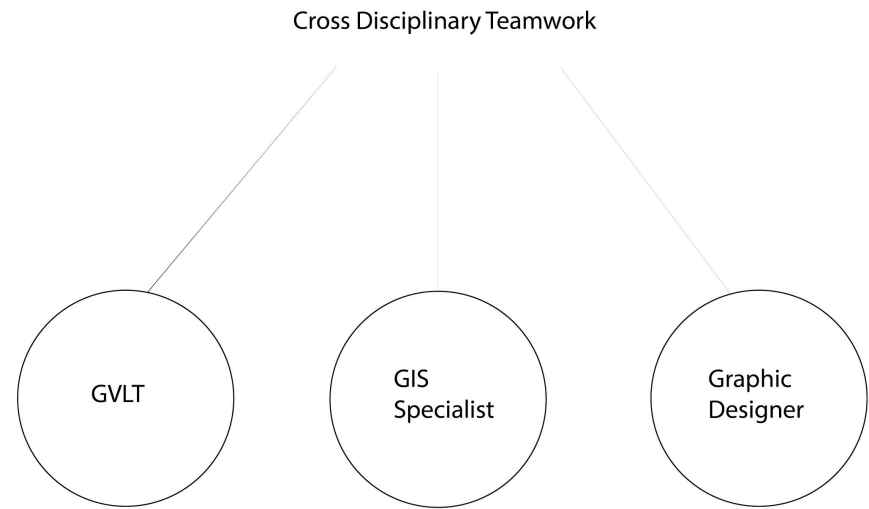- Would like to explore and learn more about the park but has limited time

Fiona, 35

- Wheelchair user all her adult life
- Loves the outdoors and has wheelchair which can handle some terrain
- Goes to the park with her husband on the weekend
- Would like to know which routes are wheelchair-accessible

Patrick, 75

- Daily walker
- Likes to go out and think (currently writing his memoirs)
- Has a GPS device
- Sometimes struggles to find his way if in an unfamiliar area

Community

Village Level

↓

Trail Head / Access

↓

Regulatory

↓

Interpretive

↓

Crossings

↓

Directional

↓

Destination

Cross Disciplinary Teamwork

GVLT

GIS Specialist

Graphic Designer

Mixed Reality

Public Participation Data

Cross Discipline Integration

Relevant Technologies

Wayfinding refers to information systems that guide people through a physical environment and enhance their understanding and experience of the space. As urban spaces continue to grow and become more complex, digital wayfinding is adopting a growing importance in how we interact with our environment. Bozeman, Montana, is no exception to this. Through the use of Overhead messaging, wifi marketing, hand held devices, and interactive kiosks, we can help Bozeman trails to become a more welcoming, healthy, and safe experience.

The data is already being generated through the use of apps such as Strava. The ability to tap into this data and apply to other apps is available for use.
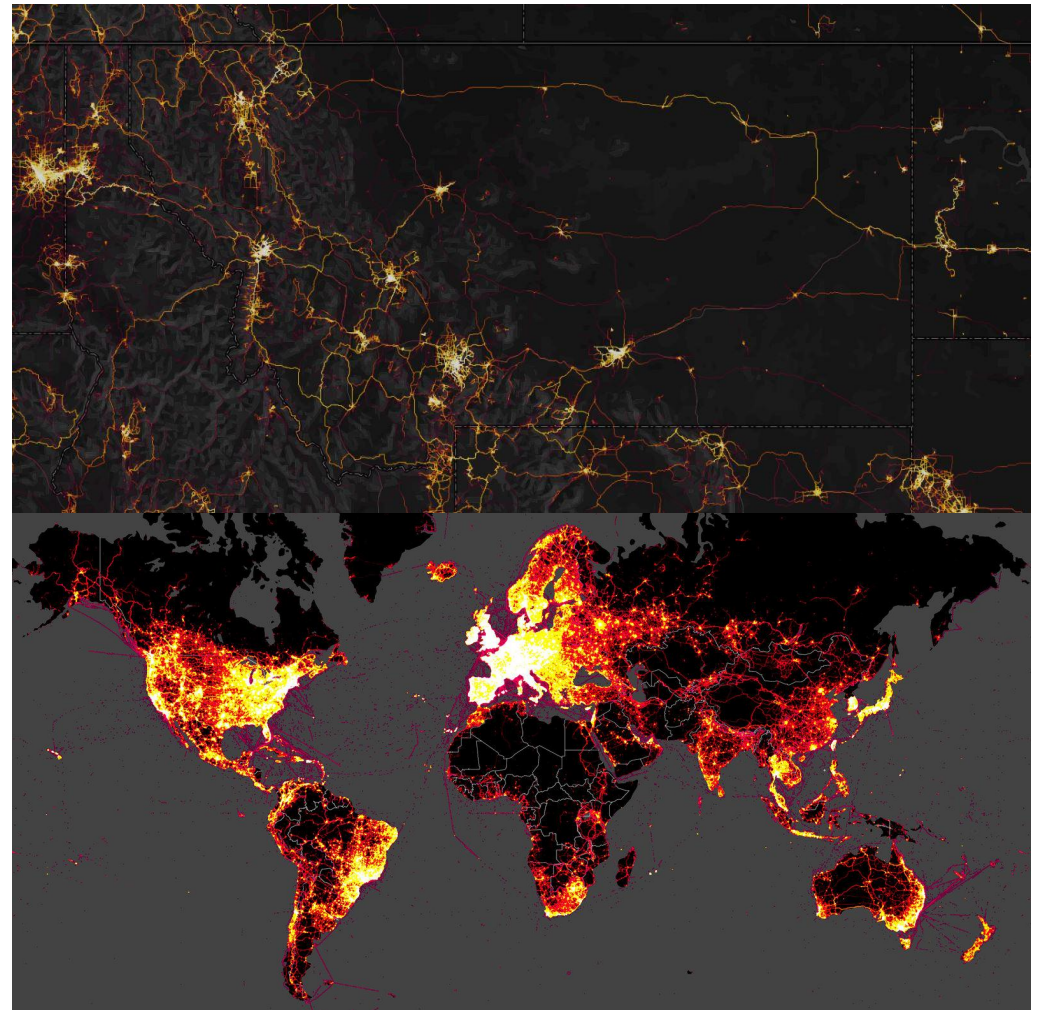
Interactive Kiosks

Perhaps the most common and curiosity provoking method of digital wayfind is interactive kiosks. These kiosks allow trail users to interact with the digital method on their own terms, and if strategically placed on trails can help to create surprises along each turn of a trail. An addition to these posts could be QR codes that would allow users to access real time data and information regarding the public trail system.
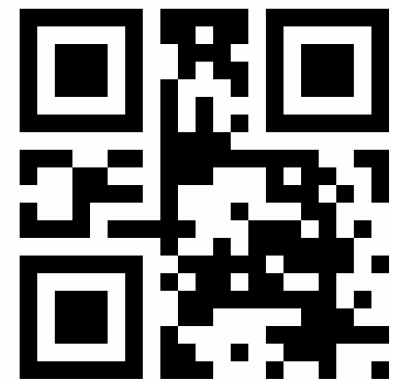
Overhead Messaging

The use of overhead messaging has been implemented in numerous trail systems, museums, and urban areas throughout the country. As a form of digital wayfinding it has multiple uses, such as driving traffic to specific areas, creating interest in historical context of the site, promoting reward systems, and collecting feedback data from users to create a better future. In Bozeman, overhead messaging could be used at the beginning and end of trails to allow a more interactive space for pedestrians.

Interactive Trail Maps

Interactive trail maps are designed to help users understand trail opportunities, information about the trail, and about community assets. Interactive maps are web-based and can be accessed from computers or from mobile phones and tablet devices. In addition to the trail system, interactive maps can provide information about historic sites, restrooms, trail amenities, parking lots, and much more.

Wifi Marketing

If trail users in Bozeman, Montana wish to access a free wifi system whilst hiking, public events can be marketed through use of the network to stimulate community interest in the trail system and events which could utilize the trails. In addition, the wifi network could be used to track patterns in trail use, in order to alter trails to the specific needs of the community which may not have been realized during the trail's construction.

Conclusion

The researchers have found that digital wayfinding will be necessary to keep up with the increasing expansion of Bozeman and its trail system. Within Bozeman exists an active population and a high demand for better and more trails. As a result of this, there is a unique opportunity to be taken advantage of. With the correct combination of technology and surveying, educated innovations can be created. Going forward, we can create a better, healthier, and safer Bozeman by accumulating our best minds and resources.