

Jocko Valley Trails



A project submitted
in partial fulfillment of the requirements
for the degrees of
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(Natural Resources and Environment)
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Project Abstract:

The Jocko Valley Trails Master's Project team assisted community members and tribal employees in the planning and conceptual design of a non-motorized trail system in the Jocko Valley, located on the Flathead Reservation in Montana. The Master's project team worked closely with community groups and the Confederated Salish and Kootenai Tribal government, through meetings and public outreach, to create trail design recommendations. Specifically, this project developed a series of tailored trail feature recommendations, educational/interpretation options and trail design alternatives for the Jocko Valley community. On a broader scale, a detailed report on the current status of trail systems on American Indian reservations throughout the United States was written. The major findings from this research were then combined with information gathered from comprehensive personal interviews with tribal natural resource managers to offer insights for tribes considering trail development on their reservations. Unlike other trail development research, these findings are sensitive to the unique challenges and benefits trail systems may provide reservation communities.

Project History and Overview:

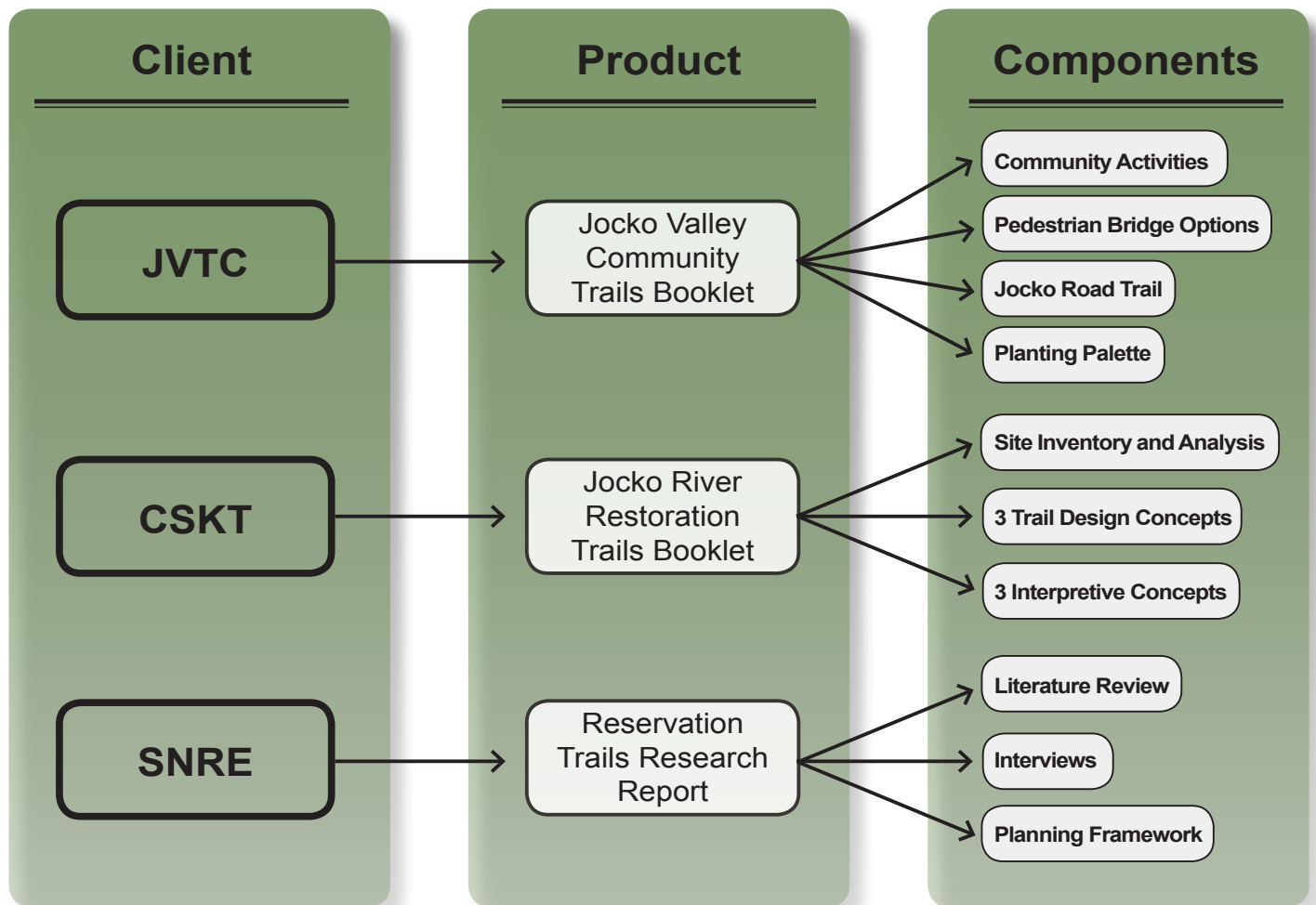
The Jocko Valley Trails Master's Project involved two clients: the Jocko Valley Trails Committee (JVTC) and the Confederated Salish and Kootenai Tribe's (CSKT) Natural Resources Department. The project idea originated from a conversation between members of the JVTC and Nicholas Deyo, a Master of Landscape Architecture student in August of 2009. The JVTC is an organization of the Arlee Community Development Corporation, whose members are bettering their community through the creation of non-motorized trails. Arlee is a small town of 600 people located in the Jocko Valley at the southern end of the Flathead Reservation in Northwestern Montana. After initial conversations with the JVTC, the Confederated Salish and Kootenai Tribe's Natural Resources Department was contacted and became involved as an additional project partner. The CSKT were particularly interested in developing an interpretive trail system for the Jocko River Restoration Area.

In February of 2010, the Jocko Valley Trails Master's Project team was formed and included two landscape architecture students: Robin Burke and Nicholas Deyo; an Environmental Policy and Planning student, Meredith Bohdan; and two Behavior, Education, and Communication students, Ann Kelley and Brittney Van Der Werff. This interdisciplinary team was chosen because of its capacity for social science research, environmental education, planning, and landscape design. Landscape architecture professor Robert Grese became the project's advisor with professor emeritus Donna Erickson serving the role of co-adviser. Both professors' skill sets in design and planning and past experiences working with rural and reservation communities were valuable for the planning of this Master's project.

Following initial project planning in the winter of 2010, the student team spent an intensive four week period working in Montana. During May of 2010, the team engaged the community in trails planning activities, conducted site visits, and met with project partners. A survey was distributed to gauge community interest in trails development and trail design; 115 responses were collected. Youth workshops were conducted and involved 130 high school, middle school, and 4th grade students. Additionally, a community open house was

organized. Several meetings were held with the JVTC and the CSKT, which helped refine the content and scope of this Master's project. Site visits acquainted the team to areas of specific design concern, including the Demonstration Reach portion of the Jocko River Restoration Area, where the CSKT are interested in developing a trail system and associated interpretive materials. Other areas of concern included Highway 93's Jocko River Bridge. This 400 foot long, three-lane bridge had recently been constructed, and lacked pedestrian facilities as part of its design. The JVTC was interested in the feasibility of providing pedestrian access across the Jocko River in the vicinity of this highway bridge. Other major transportation routes and community focal areas were investigated.

After initial work in Montana, the project's scope was refined to include three major components. These components included concepts for a Jocko River Restoration Area trails system, investigating Arlee's community trail needs, and broader issues of trails planning and development for American Indian reservations. Adhering to this project scope, three individual products were designed to best meet the needs of our clients and the project team's own academic interests. These three products are outlined in the following numbered paragraphs.

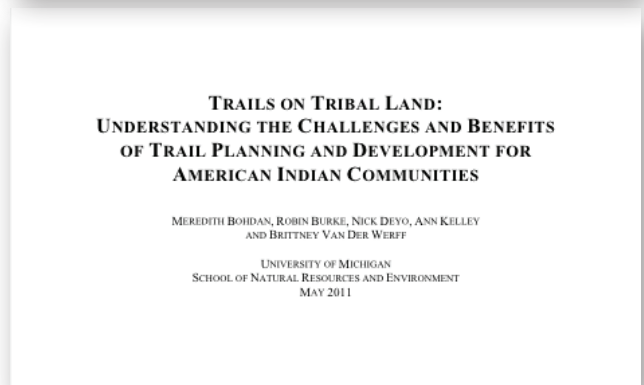


This graphic provides an overview of the scope of work conducted for the Jocko Valley Master's Project. Three separate stand-alone documents were produced to meet the specific needs of clients and to fulfill the Master's students' own academic interests.

1. A booklet titled **Jocko Valley Community Trails** was written specifically for the JVTC. This booklet includes a synopsis of the community activities and research conducted in Arlee. Specific design elements include pedestrian crossing options for the Jocko River Bridge area, trail designs and research for trails along county roads, and planting designs for trail borders.

2. A **Jocko River Restoration Trails** booklet was created to meet the needs of the CSKT. This document includes three conceptual trail designs, supported by site inventories and analyses. Interpretive/educational strategies accompany each design concept; these designs offer a range of options for tribal decision makers.

3. Finally, an academic paper entitled **Trails on Tribal Land: Understanding the Challenges and Benefits of Trail Planning and Development for American Indian Communities** was written to address broader issues of trails on reservations. This paper was inspired by the trail planning leadership of both the CSKT and the JVTC and is a compilation of both literature reviews and interviews conducted with natural resource managers, scientists, planners, and other decision makers from reservations throughout the United States.



Graphics showing the three products created for the Jocko Valley Master's Project.

The three products listed here comprise this Master's project and are intended to be stand-alone documents directed toward specific project partners. The *Jocko River Restoration Trails* and *Jocko Valley Community Trails* booklets are landscape orientation legal size documents. This was done to accommodate numerous graphics. The academic paper maintains a conventional letter-sized page layout.

The Master's project team sincerely hopes that these products will provide guidance and inspiration for both the JVTC and the CSKT. The work that these groups are doing will provide a valuable asset to the Jocko Valley and the larger Flathead Reservation community. Without a doubt, this project has been a tremendous learning opportunity for all of the Master's students involved.



Jocko Valley Community Trails



NATURAL RESOURCES
AND ENVIRONMENT
UNIVERSITY OF MICHIGAN

A Master's Project for the Partial Completions of a Master's Degree for the School of Natural Resources and Environment at the University of Michigan

Project Partners:

The Confederated Salish and Kootenai Tribes

The Jocko Valley Trails Committee*

The School of Natural Resources and Environment

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Acknowledgements

Our deepest appreciation goes out to the JVTC including Gary Decker, Mary Stranahan, Elon Gilbert, Jack and Dale Duff, Pelah Hoyt, Susan Carney-Lammerding, Jerry McGahan, and Andrew Maluceli. A special thanks is deserved for Mary Stranahan who generously accommodated us at the Heart View Center for the month of May. Elon Gilbert's hospitality also must be recognized...his barn is the most luxurious we have ever stayed in. Jack and Dale Duff were also a great help, both for supporting our community activities, and for feeding five hungry Master's students.

Susan Carney-Lammerding, Brett Sproull, and the Arlee Community Schools were very gracious with their time and expertise when we performed our school activities. Sue's enthusiasm was infectious, and her students were well behaved and a joy to work with. We could not have organized and implemented the school activities without her assistance, suggestions, and support.

Germaine White has been an inspiration to us, starting from her warm welcome at the River Honoring Ceremony. We congratulate her on all of the incredible work she is doing on the Flathead Reservation; she is a true leader and steward of her Nation's resources.

We also want to extend our heartfelt thanks to Les Evarts and the Restoration Team. We learned a great deal during the tour of the Jocko River Restoration area; the volume and quality of their work on the Jocko River is a real model for other restoration projects. Gary Weiner of the Rivers Trails and Conservation Assistance program also provided important guidance.

Five Valleys Land Trust was generous with their time, facilities, and equipment. Pehla Hoyt and Ryan Chapin were particularly helpful and encouraging.

Of course, we would like to thank our adviser, Bob Grese, for his guidance through this project. He was always diligent in providing feedback on our work, and helped us overcome many obstacles along the way. Donna Erickson was also very influential in shaping this project in its early stages; her advice was invaluable. Stan Jones provided consultation on developing design activities with children. Nick Reo took valuable time away from his other projects and provided us with critical perspective on our writing.

Finally, we want to thank all of the friendly and informative people we spoke with during our reservation interviews. We learned a great deal from them, and we hope that our work will be useful to other hard working resource managers like them.

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The Master's project team from left to right: Brittney Van Der Werff, Robin Burke, Ann Kelley, Meredith Bohdan, and Nick Deyo.

Booklet Introduction

This Master's Project booklet originated from a conversation between members of the Jocko Valley Trails Committee (JVTC) and Nicholas Deyo, a Master of Landscape Architecture student in August of 2009. The JVTC is part of the Arlee Community Development Corporation, and since its formation in 2007, has been successful in receiving grant funds and promoting non-motorized trail projects on the Flathead Reservation in Northwestern Montana. Following this initial meeting, the JVTC became interested in working with a student team on specific trail planning issues, and became an official Master's Project client soon after. The Confederated Salish and Kootenai Tribes' (CSKT) Natural Resources Department also became project partners.

In February of 2010, the Jocko Valley Trails Master's project team was formed, and included: two Master of Landscape Architecture students, Robin Burke and Nicholas Deyo; Meredith Bohdan, an Environmental Policy and Planning student; and two Behavior, Education, and Communication students, Ann Kelley and Brittney Van Der Werff. This interdisciplinary team was selected for its capacity for social science research, environmental education, planning, and landscape design. Landscape Architecture professor, Robert Grese, ASLA became the project's adviser with professor emeritus Donna Erickson serving as a co-adviser.

Following initial project planning in the winter of 2010, the University of Michigan student team (hereafter referred to as the 'planning team') spent an intensive four-week period working on the project in Montana in May. The planning team engaged the Jocko Valley community in trails planning activities, conducted site visits, and met with project partners. A survey was distributed to gauge community interest in trails development, and youth visioning workshops were conducted involving 130 high school, middle school, and 4th grade students. Additionally, a community open house was organized. During this time, several meetings were held with the JVTC in order to refine the content and scope of this Master's Project. Site visits acquainted the team to areas of specific design concern, including Highway 93's Jocko River Bridge, potential trail routes, and community focal areas.

Three major components were addressed by the planning team, and included design development for trails within the Jocko River Restoration Area, investigation of Arlee's community trail needs, and research of the broader issues of trails

planning on tribal lands. Adhering to this project scope, three individual products were designed to best meet the needs of the JVTC, CSKT's Natural Resources Department, and the School of Natural Resources and Environment (SNRE). The Jocko Valley Community Trails booklet is one of these products.

There are four sections within this booklet, addressing the work the planning team conducted in Arlee and work accomplished remotely at the University of Michigan. Community activities and report findings from the youth visioning workshops, community surveys, and other related activities are discussed first. Next, pedestrian options for the Highway 93 Jocko River Bridge are presented. Another section offers conceptual designs and analysis for a trail along Jocko Road. Finally, a planting pallet is provided, giving suggestions for landscape designs adjacent to trails. These sections are aligned with the requests of the JVTC, and should prove useful for their efforts.

The goal of these sections is to provide material that can be used for future grant writing and trail planning activities. The information gained from the youth and community activities provide insights about what type of trail facilities are needed in the community, and in what areas trails are desired. The other three sections offer specific research and design concepts.



Youth Involvement

Younger members of the community are not only primary users of trails, but are also a group that stands to gain significant cognitive and physical benefits from trail use. In order to gather feedback and information from local youth to help inform design and planning recommendations for both the proposed trail system and future trail development in Arlee, a youth visioning workshop was designed and implemented for high school, middle school, and fourth grade classes at Arlee School District 8J. Nine classes from Arlee School participated in the workshops, including 31 4th graders, 34 Middle School students, and 58 High School students. For each workshop, the class was split into 4 groups of 7-8 students each, with a member of the planning team facilitating the activities for each group for the entirety of the workshop. The workshop activities were also brought to The Nkwusm Salish Language School, where 7 students participated. Overall, 130 students participated in the workshops.

The workshop consisted of two activities: a cognitive mapping activity, and a post-it activity. Detailed explanations of the activities and results gathered are provided below.



Fig. 1.1: Middle school students participating in the cognitive mapping exercise.

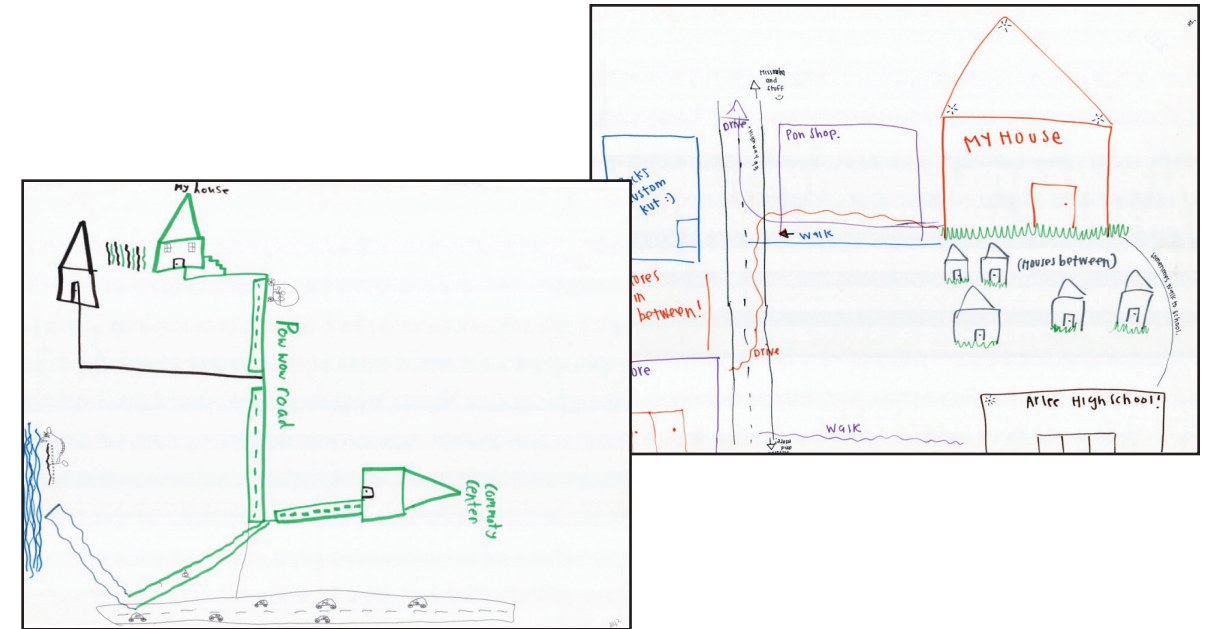


Fig. 1.2: Two examples of cognitive maps that students drew. For a broader sampling of these maps see Appendix II.

Cognitive Mapping Activity

Cognitive maps refer to mental models humans create of the relative locations and attributes of phenomena in their everyday physical environments. Humans create these mental representations, images, or models based on perceptions of themselves and their surrounding environment (Lynch 1960). By gaining an understanding of others' cognitive maps, planners and designers can learn more about peoples' use and needs in certain spaces (Halseth and Doddridge 2000).

In this activity, students were given blank sheets of paper, and asked to draw maps of their environment, which was explained as “places you go every day,” “your territory,” and “where you spend your time.” In essence, the planning team asked students to share their cognitive maps. Students were encouraged to include information about where they go, how they get there (eg. walk, bike, skateboard), and places they like to explore or spend time in nature. The maps provided insight into students' use of outdoor areas in the community, and the extent to which natural areas are being used by youth.

Results showed that Arlee School (present on 63% of students' maps), Wilson's Grocery Store (present on 38% of students' maps), and the Community Center (present on 29% of students' maps) were places drawn by the most students, suggesting the frequent use of these places by Arlee youth. Other places mentioned by 10% or fewer of students included the Hatchery, the Post Office, Rick's Restaurant, and the Hummingbird.

In terms of natural areas, 35% of students drew the Jocko River, 40% drew trees, and 22% drew mountains. Although this does suggest that these students are aware of and have interactions with natural areas in their environment on a regular basis, these percentages are still much lower than the 48% of students who drew Highway 93 on their maps. Highway 93 is a prominent and centrally located feature of the town, but unfortunately it is also a transportation route for students walking to and through the town. Hopefully, the addition of trails in natural areas, such as the restoration trails along the Jocko River, will allow youth the opportunity to not only use safer transportation options, but also to interact with nature on a regular basis. Despite the lack of formal trails present in the community, 27% of students drew trails, illustrating the fact that many students already use informal trails as a means of transportation in Arlee.

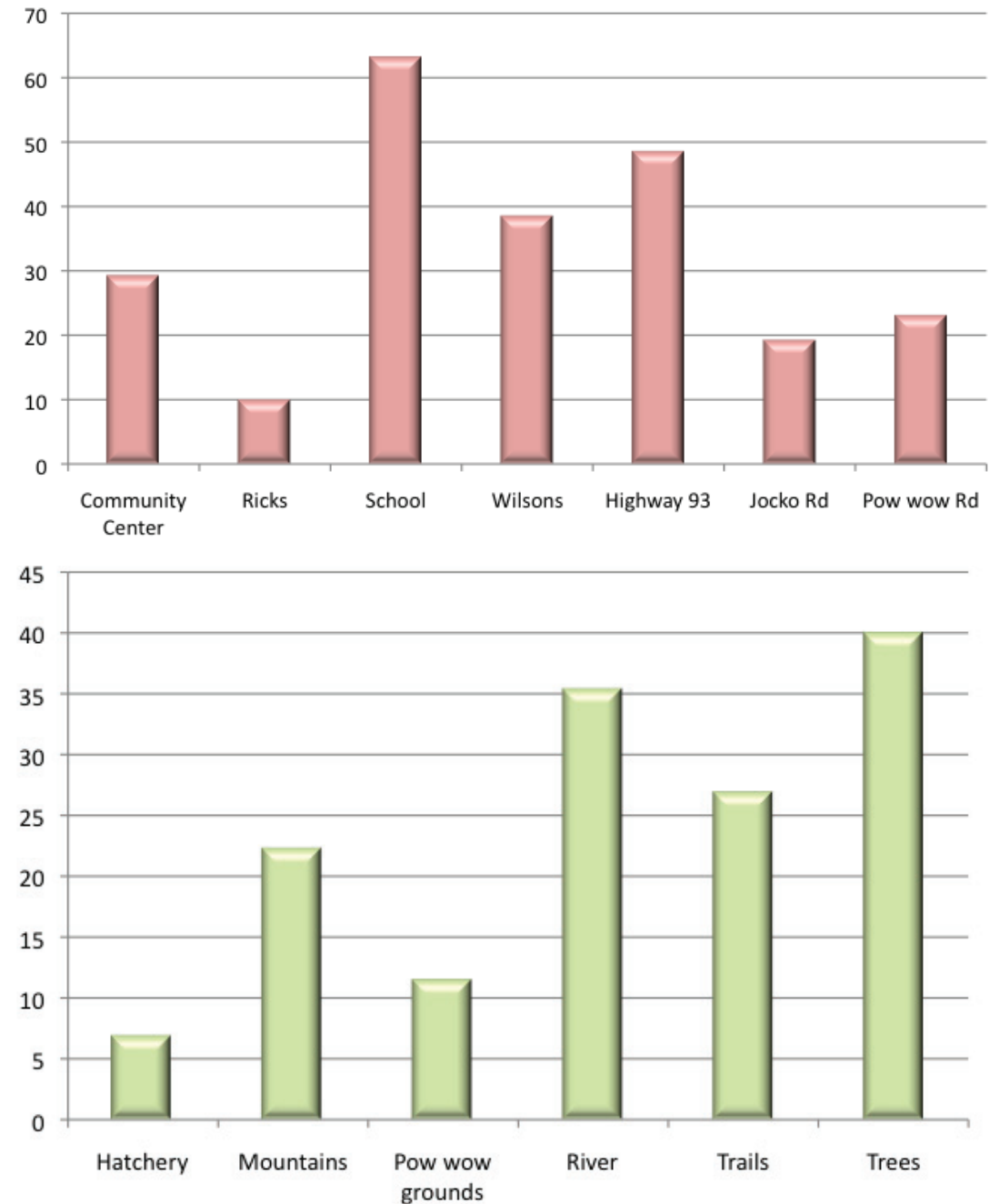


Fig. 1.3 Results from the cognitive mapping activity showing the percentage of students' maps with the following buildings and roads in town (top graph) and natural features (bottom graph).

Post-it Activity

The post-it activity was designed to gather information on youth's perceptions of safety in their environment. Students were given 3 red post-its and 3 green post-its, and were informed that the red post-its symbolized places they feared or feel unsafe in Arlee, while the green post-its symbolized places the students like to spend their time and feel safe. Students wrote the names of these places on the post-its, and placed them at those locations on a large map of Arlee. Each class was split into 4 groups, with each group working with a separate map.

In total, 157 post-its were placed on the maps, including 93 green post-its and 64 red post-its. Common themes from the 64 red post-its included wild animals, such as bears or



Fig. 1.4: Elementary school students participating in the post-it exercise under the guidance of a University of Michigan Master's student.

coyotes, in the mountains (6 post-its), places in town where students felt people engaged in drinking or drugs (5 post-its), and mean dogs (3 post-its). The most commonly referenced place students felt unsafe in Arlee was along Highway 93 (15 post-its). Students wrote comments on the post-its such as "crossing highway 93," "people not slowing down..." and "maybe too many cars." A middle school student listed "walking on the [Highway 93] bridge" as a place he or she felt unsafe. The majority of the red post-its placed on Highway 93 were in the center of the town, where on a daily basis students cross the busy highway to walk home from school or to access shops in the town. "Need a trail here between highways," one student wrote. Two red post-its were labeled specifically as "Highway 93 in town."

Common themes on the 93 green post-its included students' houses or relative's houses (19 post-its), outdoor activities such as walking (8 post-its), biking (3 post-its), horseback riding (1 post-it), fishing (2 post-its), camping (2 post-its), and hunting (2 post-its), and natural features, including mountains and the river (9 post-its). Of the 93 green post-its, approximately a third referenced an outdoor activity, natural feature, or outdoor area such as the hatchery or trails as a place they feel safe and enjoy spending time, highlighting the importance of providing access to natural areas for youth.

Information from this activity should be used to influence future trail design in Arlee in such a way that encourages children to feel safe and enjoy using the trail. Specifically, a safe walking trail allowing youth to safely cross Highway 93 has been and should continue to be a main focus of current trail planning in Arlee. Future trail development should address issues of safe access for non-motorized transport into town; one student noted on a post-it that they "would like to be able to ride a bike into town." Trails should also allow youth access to the most-often mentioned outdoor activities written on the green post-its, including camping, hunting, fishing, biking and walking.

Trail Logo Design

Students from Arlee School were also involved in the creation of a trail logo. A 'Trail Logo Contest' initiated by the planning team allowed students to create and submit a logo for the trail system. Students were encouraged to think of prominent animals, plants, or symbols important to the community to be incorporated in the logo. A total of 29 logos were submitted. These submissions were given to members of the JVTC, who chose two submissions as the winners. The JVTC is currently in the process of working with a graphic designer to combine the two winning submissions into a completed logo, which will be incorporated into all trail signs.

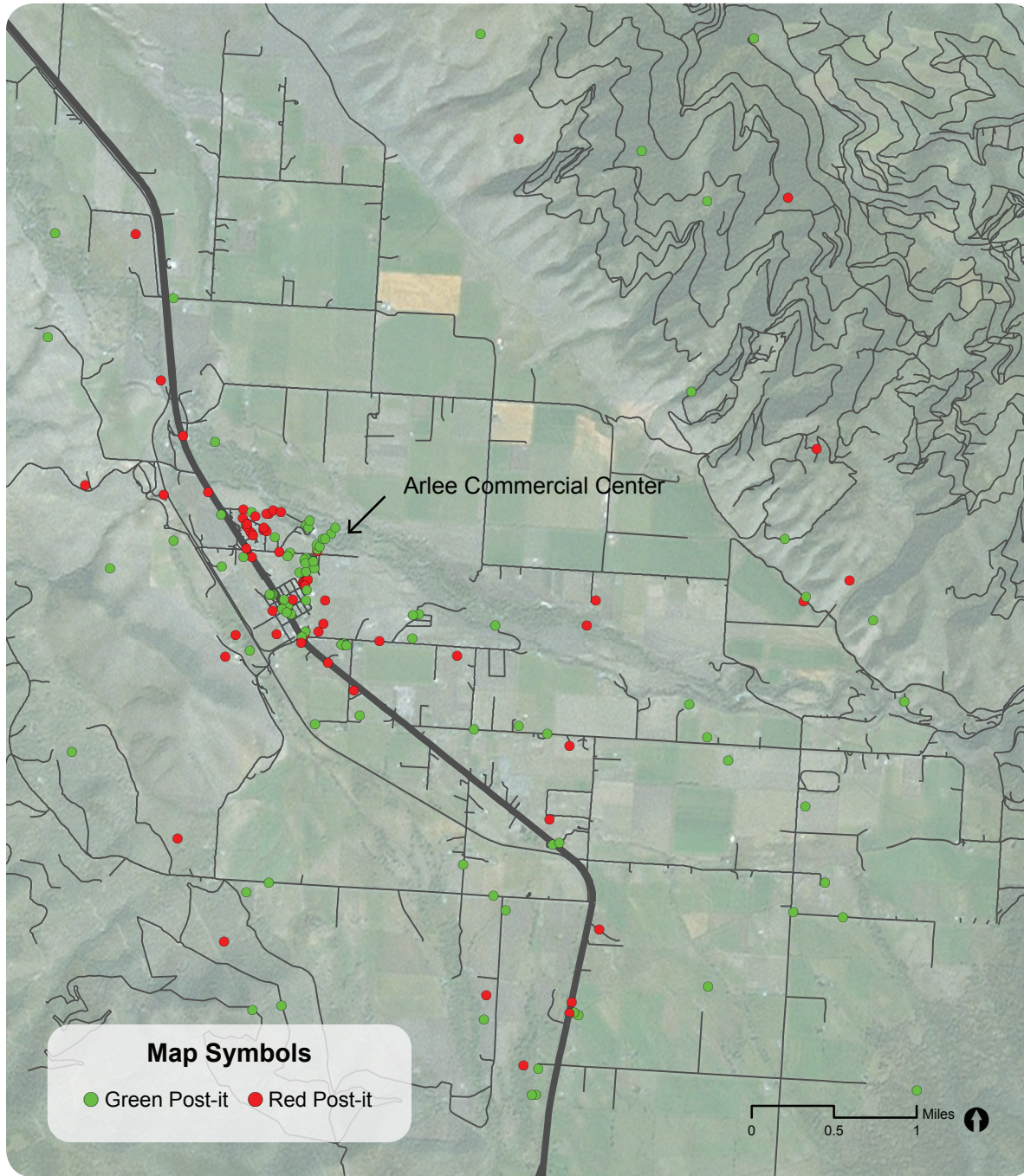


Fig. 1.5: This map shows the locations student's identified as being safe vs. locations where they did not feel safe. To see individual comments on the post-it notes see appendix

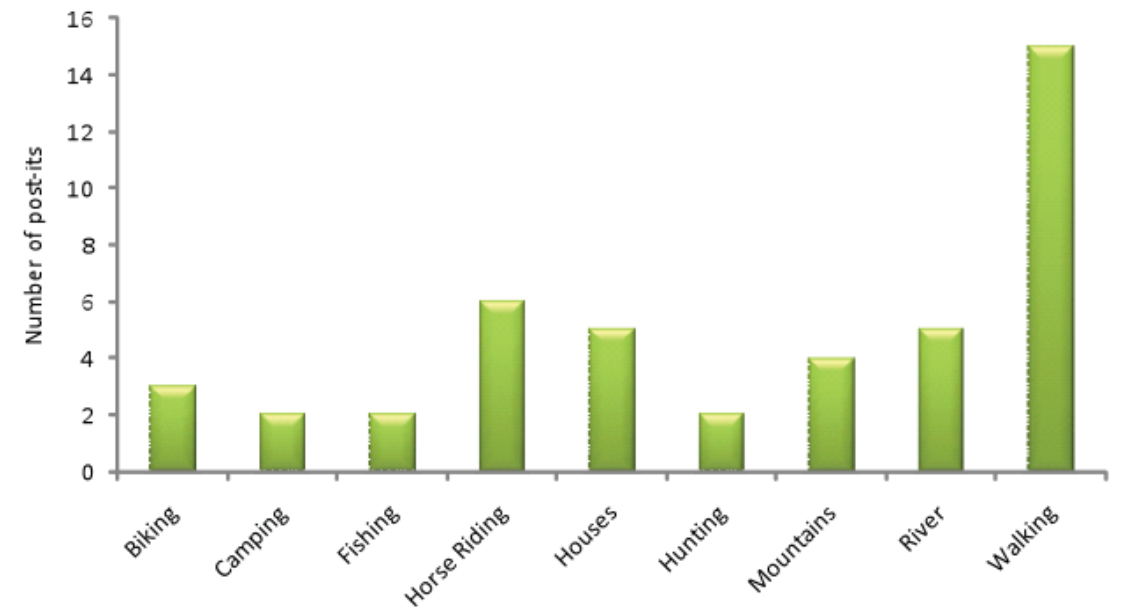
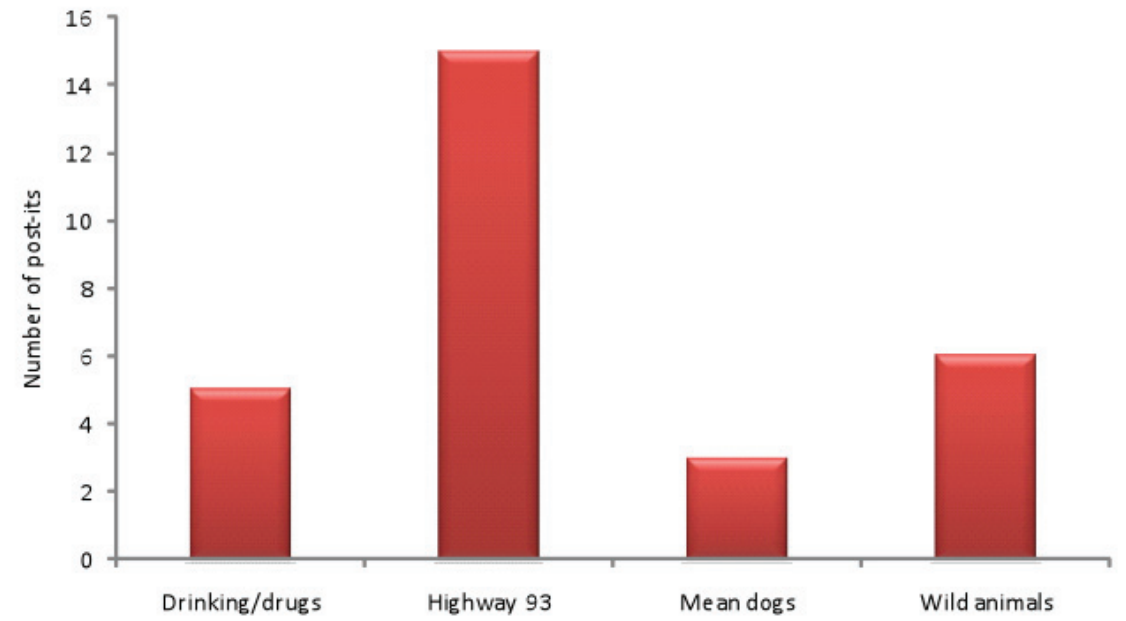


Fig. 1.6: Results from the post-it activity showing the number of post-its displaying where, when, or why students do not feel safe (top graph) and do feel safe (bottom graph) within Arlee

Community Involvement

Trails Survey

As a part of the planning process for trail renovations or the installation of a new trail, it is important to assess who is using or likely to use a trail and gather information and feedback from these groups. One of the most effective ways to identify barriers and opportunities to trail planning is by interviewing residents, who hold crucial local expertise usually out of reach to planners and architects. To gather information to help inform design and planning recommendations for the proposed trail system, a survey was constructed and distributed in popular venues throughout the community. Surveys were also made available at the community open house, described later in this section. The survey questioned community members on issues such as: how they anticipate using the trail system, and what kind of amenities they would like to see on the trail. In total, 115 surveys were collected, consisting of responses from both tribal and non-tribal community members.

Data analysis revealed forty-six percent of those surveyed said they would use the trail most often for walking. The second highest anticipated use was bicycling. Community members felt they would most often use the trail to 'engage in recreation' (42%), as a means to 'get to other trails' (28%), or to 'get fit' (26%). Furthermore, respondents indicated that the main users of the trail would most likely be 'families and adults' followed by 'elementary children.' However, other age groups were also reported as likely users of the future trail system.

Community members were also asked how important it was that certain amenities were present on the trail. Sixty-one percent of respondents indicated it was 'very important' for the trail to have garbage bins, while forty-four percent reported parking was very important. Benches and trailhead markers were also seen to be very important features of the future trail system.

Open House

Community feedback was also collected at a community open house event hosted in the local high school cafeteria by the JVTC. Cognitive maps from the previously mentioned school activities were displayed throughout the space, and attendees were given the opportunity to provide their feedback at various interactive activity booths. Activities included a modified version of the youth post-it activity, a question and answer booth, and

an anonymous suggestion box. Food was also provided, as well as an informative slide show about the goals and individuals involved in Jocko Valley Trails Master's Project. These community activities provided an opportunity to gather input and feedback from multiple levels of the community that crafted the foundation for the resulting design recommendations.



Fig. 1.7 and 1.8: University of Michigan students collecting surveys at the Arlee Farmers Market (above) and community members participating in a workshop held at the Arlee Community Schools (below)

Primary Trail Users

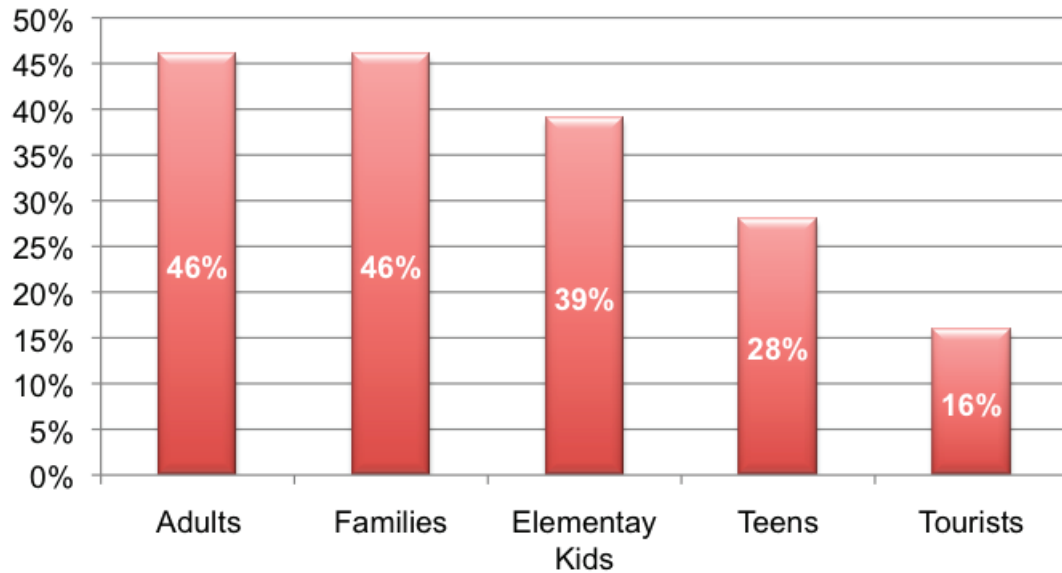


Fig. 1.9: Survey results showed that according to community members, the primary users of trails in the Jocko Valley would be adults and families.

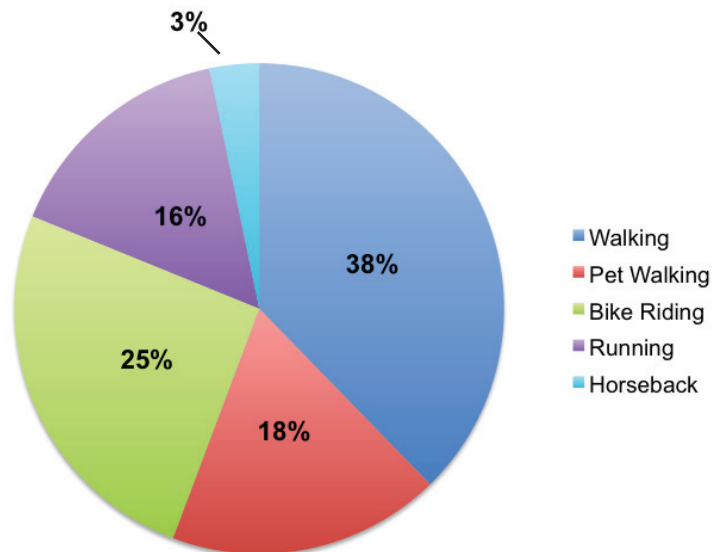


Fig. 1.10: Survey results showed that community members thought that the primary use of trails would be for walking followed by biking. Few people thought that the trails would be used for horseback riding.

Community Outreach Conclusion

Results from both the youth workshops and community survey activities not only provide important information that should be considered for trail design, but also demonstrate the desire and need for trails within the community. Walking was shown to be the most prevalent outdoor activity written on green post-its by children, and was selected by the most survey-takers as the activity for which they would use a trail most often. Throughout the feedback-collecting process, community members, especially youth, emphasized the need for safe walking routes in town. Biking also arose as a common activity in both the survey and the school workshops, suggesting the need for safe biking routes in town in addition to walking trails.

Data from these community feedback-seeking activities should be used to create trail systems that better meet community needs and preferences. By seeking out and incorporating user input, the planning team hopes to increase community pride and ownership of the trails, avert ill-conceived designs, and maximize trails' utility as quality of life enhancements.

(Endnotes)

1 Community Library, both senior citizens centers (tribal and non-tribal), The Hummingbird, Arlee Farmers Market, Rick's Kustom Kut, Hanging Art Gallery and Coffee Shop, Arlee Community Center, and the Pigasus

Pedestrian Options for Highway 93's Jocko River Bridge

Introduction

The lack of pedestrian accessibility across Highway 93's Jocko Bridge was the first issue brought to the planning team's attention by the JVTC. Characterized by a narrow shoulder and frequent high-speed traffic, the bridge is extremely hazardous for pedestrians who have no other nearby alternative for crossing the Jocko River. The Jocko River Bridge prevents residents on the north side of Arlee from walking or biking to town. School workshop activities, discussed in the previous section, also emphasized the danger the Highway 93 Bridge presents to walking and biking in the area, as discussed above. This section provides five conceptual design options for routing pedestrians across the Jocko River within the Highway 93 right-of-way. An analysis of each option is provided in terms of safety, accessibility, ecological impacts, engineering, aesthetics, and cost.

The Jocko Bridge redesign was part of a larger effort by the Montana Department of Transportation (MDT) to improve the safety and efficiency of Highway 93. Negotiations for highway improvement began in the 1980s, and after much deliberation between the CSKT Government, the MDT, and the Federal Highway Administration, construction began in 2004, and was completed by 2010. The highway redesign team made great efforts to protect the ecology of the region, thanks to the leadership of the CSKT government (Marshik et al. 2001). In the process of the redesign, the old and functionally obsolete 104' single-span Jocko River Bridge was removed, and a much longer multi-span bridge replaced it. The larger span permits natural flooding and wildlife movement along the Jocko River (Jones, Parker, and Scott 2009). Unfortunately, the bridge redesign did not include pedestrian and bike facilities.

The specifications for the bridge were derived from construction documents graciously provided by Brad Miller of HDR Engineering and are as follows: the current Jocko River Bridge spans nearly 400' from abutment to abutment and is 55' wide. It has one 19.7' wide northbound lane and two 15.8' wide southbound lanes. Traffic speeds along the bridge are 55 MPH. In addition to the bridge structure, an extensive retaining wall runs for approximately 1,000' along the northeastern side



Fig. 2.1: The new Jocko River Bridge showing its multiple spans and the adjacent retaining wall. (photo credit: Brad Miller HDR Engineering)

of the highway. The wall varies in height, but reaches 40' tall in some areas. The retaining wall has a guardrail that separates traffic from the edge of the wall by 2.5'; this provides some margin of safety from traffic. These dimensions were used to construct the three-dimensional computer model that was used to design and represent the alternatives in this section.

MDT construction documents were used to identify the highway right-of-way along the road. The graphic representations of the right-of-way included in this report were approximated from these documents, but by no means should be substituted for an actual survey of the highway right-of-way. GIS data was also used to help inform these designs. The CSKT Department of Natural Resources provided the planning team with LIDAR data to accurately represent the site's terrain. This was used to

identify steep slopes, and to build the 3D computer models shown in the five design options. Additionally, National Wetland Inventory data was downloaded from the Natural Resource Information System through the Montana State Library.

Brad Miller also helped with the cost estimates for the design alternatives. He is a bridge engineer by profession, and has worked extensively designing pedestrian bridges and other non-motorized facilities. Mr. Miller provided much-needed guidance in the early planning stages of this report. The cost estimates used are provided below. Estimates not supplied by Mr. Miller are noted.

- Bridge costs were estimated at \$2,800.00 per linear foot for all designs except the first option, the “pedestrian retrofit”, which used an estimate of \$3,000.00 per linear foot because of the higher costs for additional supports.
- Trail costs were estimated at \$45.45 per linear foot.
- Boardwalk costs were estimated at \$225.00 per linear foot (NCDOT 2007).
- The New Jersey Concrete Barriers used in the fourth option, the “pedestrian lane on existing bridge deck”, were estimated at \$34.00 per linear foot (FHWA 2011).



Fig. 2.2 and 2.3: The 1,000' long retaining wall on the south side of the river makes routing a trail down to the level of the floodplain difficult.

Ecological Context

An additional challenge to a safe pedestrian path at the Highway 93 Bridge is the ecologically sensitive nature of the Jocko River and adjacent Jocko Hollow area. The highway bridge lies directly downstream from the Jocko River Restoration Project, an ongoing effort to reconnect the river to its historic floodplain and recreate bull trout habitat. The restoration of the river means the path of the river may migrate over time, and a pedestrian bridge constructed over it may need to be moved as its banks shift. The Jocko Hollow area is wet and mucky, designated as a wetland. Installing a trail with minimal effects on the wetland, maintaining a dry trail surface, and negotiating the slope of the land from the level of the town to the level of the river are all considerations that must be taken into account in planning a safe pedestrian path in this area.

The top figure at right shows the current path of the Jocko River, its floodplain, and the designated wetland in Jocko Hollow. This area presents problems to the construction of a trail at the same level as the ground. Over time, the banks of the river may shift, meaning that a small, pedestrian-only bridge closer to ground level than the highway bridge may need to be moved. Drainage ditches along the dirt access road under the highway bridge need to be maintained beneath any path constructed over them. Care must be taken in trail construction to minimize impacts on Jocko Hollow. The design of the trail itself must consider the wet nature of the ground in Jocko Hollow and around the river, making sure a dry surface is maintained, and that portions of the trail cannot wash away.

The lower figure at right highlights steep slopes in the vicinity of the Highway 93 Bridge. To negotiate these slopes, the highway and bridge are supported well above the level of the river. On both sides of the river, slopes are steep enough to potentially impede access by foot or bicycle. If a trail is to meet ADA guidelines, the slope must not exceed 5 percent. Generally, where daily-use trails encounter such steep slopes, the trail creates switchbacks to reduce the rate of descent on the trail itself. Here, property ownership, wet soils, standing water, designated wetlands, and other factors may impede space for switchbacks.



Fig. 2.4: Looking east over the ecologically diverse Jocko Hollow area. Building a trail through this important ecosystem could cause harm to the wildlife and plants that depend on it.



Fig. 2.5 and 2.6: A closer look at the wetlands and native plant communities that found in the Jocko Hollow area. Building a trail along the east side of the highway would require clearing a great deal of vegetation and engineering boardwalks.

Fig. 2.7 Steep Slopes in the Jocko River Bridge Area

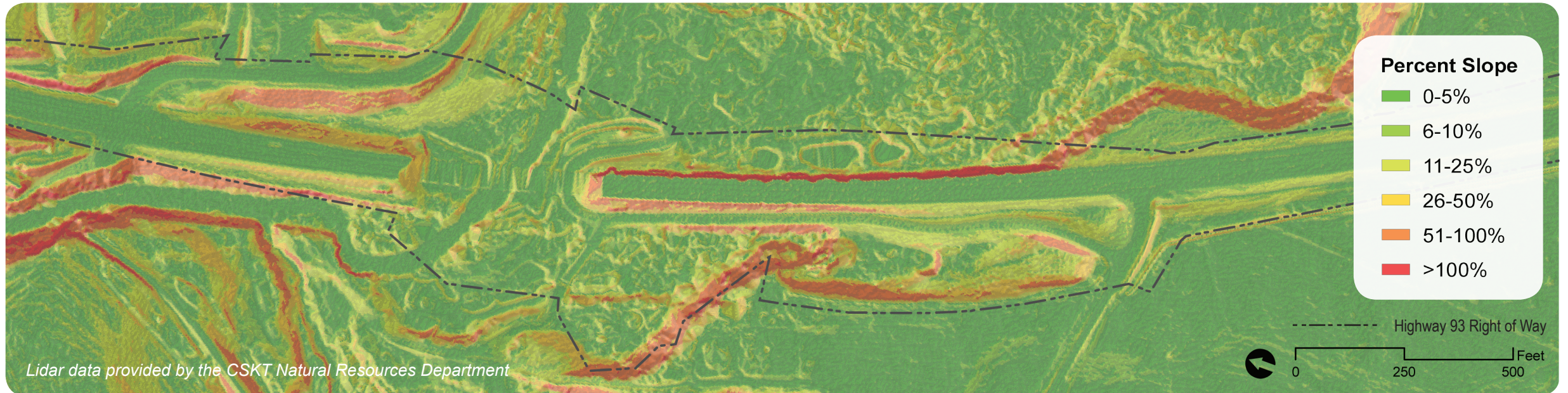
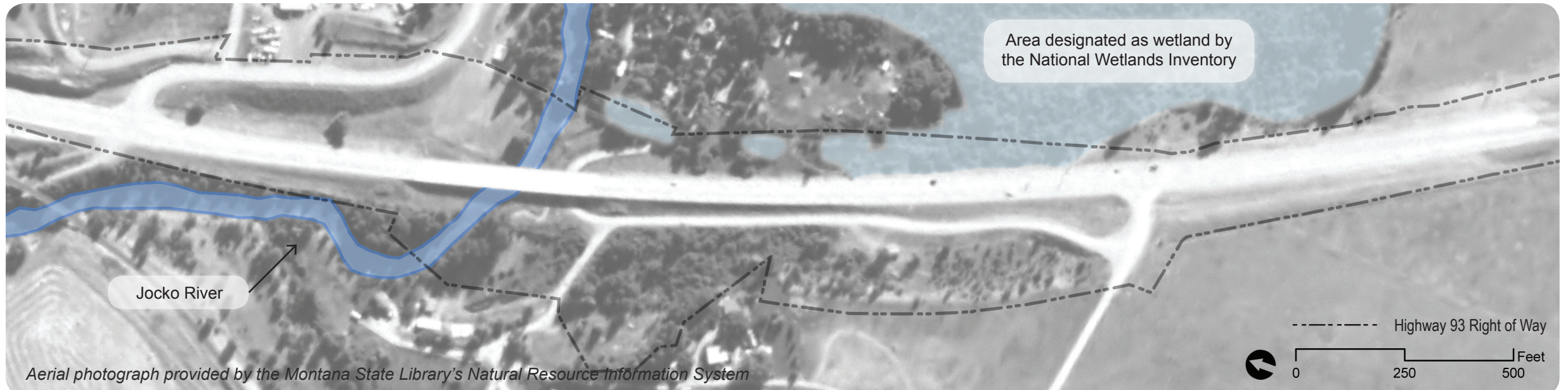


Fig. 2.8 Wetlands in the Jocko River Bridge Area



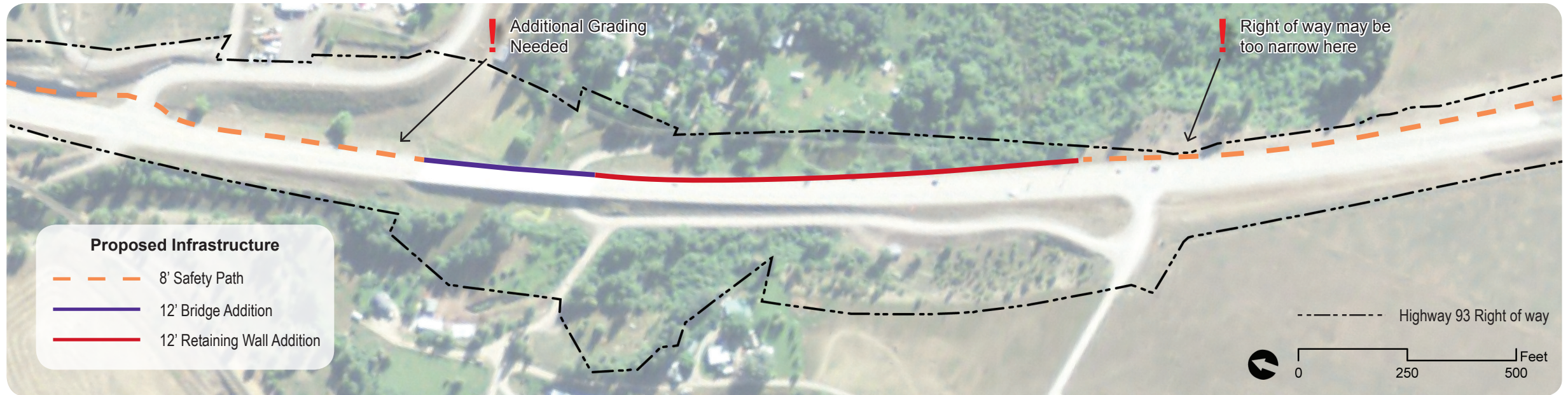


Fig. 2.9: Pedestrian Retrofit: Highway 93 Bridge and Retaining Wall Map

Pedestrian Retrofit: Highway 93 Bridge and Retaining Wall Challenges and Opportunities:

Description:

This option would offer pedestrian and cycling facilities along the east side of Highway 93 at the existing road grade. An additional structure would have to be engineered to run the length of the retaining wall and along the length of the bridge, 1500' in total. In this option, a 12' wide pedestrian bridge addition runs the length of the retaining wall (1,040') and the bridge (410'). Because of the extreme length of this structure, and the likelihood that existing bridge could not support the additional load, additional footings and piers would be required to support the weight. It would also be extraordinarily expensive.

Pedestrians and cyclists would be able to transition smoothly from asphalt safety paths located in the highway right-of-way without having to descend to the floodplain below. This scenario would require the greatest amount of engineering and thus financial resources, but would offer considerable advantages in terms of safety, ecology, and aesthetics. Note: to truly assess the feasibility of this option, a thorough engineering analysis of the Highway 93 retaining wall and bridge structure would be required.

Safety

- Pedestrians and cyclists would be clearly visible and would not have to descend to the base of the retaining wall. A high level of visibility is related to pedestrian's perception of safety.
- This option would provide a completely separate structure for pedestrians and cyclists.

Access

- This option would offer considerable benefits in terms of ADA accessibility. Pedestrians would not have to navigate steep switchbacks to descend to the level of the floodplain. Additionally, pedestrians would not have to navigate boardwalks and other infrastructure that could provide challenging walking conditions in the floodplain.
- While this option would be highly accessible for pedestrians and cyclists, it would not be amenable to equestrians who would have to contend with the proximity of traffic that could frighten horses.

Ecological

- Aside from the construction of additional footings and piers to support the weight of this structure, little infrastructure would have to be built in the Jocko Hollow areas and associated floodplain.
- This option does not constrain the natural movement of the Jocko River channel. Pedestrian options involving the construction of an additional pedestrian bridge in the floodplain would inhibit the natural movement of the channel, which was one of the main reasons for the bridge redesign in the first place.
- Because less infrastructure would have to be placed in Jocko Hollow, there would be decreased disturbance to wetlands there. However, wetland permitting would still be necessary.

Engineering

- Many unknowns still exist in terms of the feasibility of engineering a separate pedestrian facility along the Highway 93 retaining wall and the Jocko Bridge.
- It is unclear if portions of this structure could be cantilevered off of the retaining wall and existing bridge superstructure.

Aesthetics

- This design is utilitarian in nature, and intended to guide pedestrians safely across the Jocko River at the level of the existing highway.
- The attached structure may mar the appearance of the existing bridge, but would convey the message that the community cared about non-motorized forms of transit.
- People traveling on the structure would still experience the noise of passing traffic.
- Outstanding views of Jocko Hollow would be an attractive feature of this option.

Other Issues

- Earth moving (grading) will be needed to transition the pedestrian bridge retrofit into the existing highway grade at the north end of the Jocko Bridge.
- The Highway 93 right-of-way may have to be renegotiated as noted on the map on the opposing page.

Cost Estimate

- Bridge alone: **\$4,500,000**
- Trail (Oxford Lane to Dumontier Road): \$163,200 + Bridge: \$4,500,000 = **\$4,826,400**

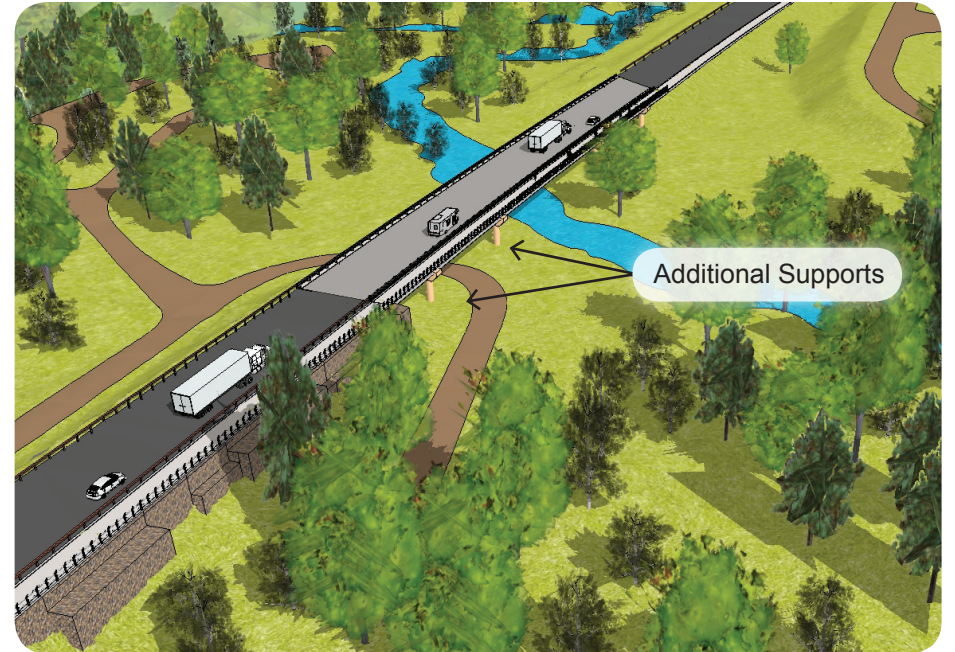


Fig. 2.10: Bird's-eye view of the pedestrian retrofit along the retaining wall and Jocko Bridge superstructure.

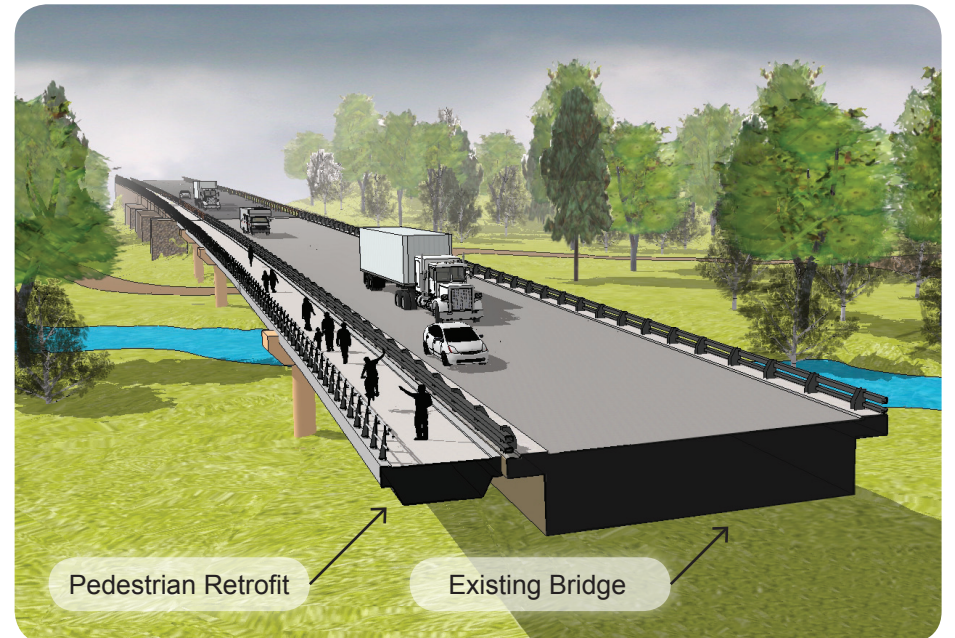


Fig. 2.11: View of the attached pedestrian retrofit showing a cross-section of the structures. Additional footings and piers can be seen in the background.

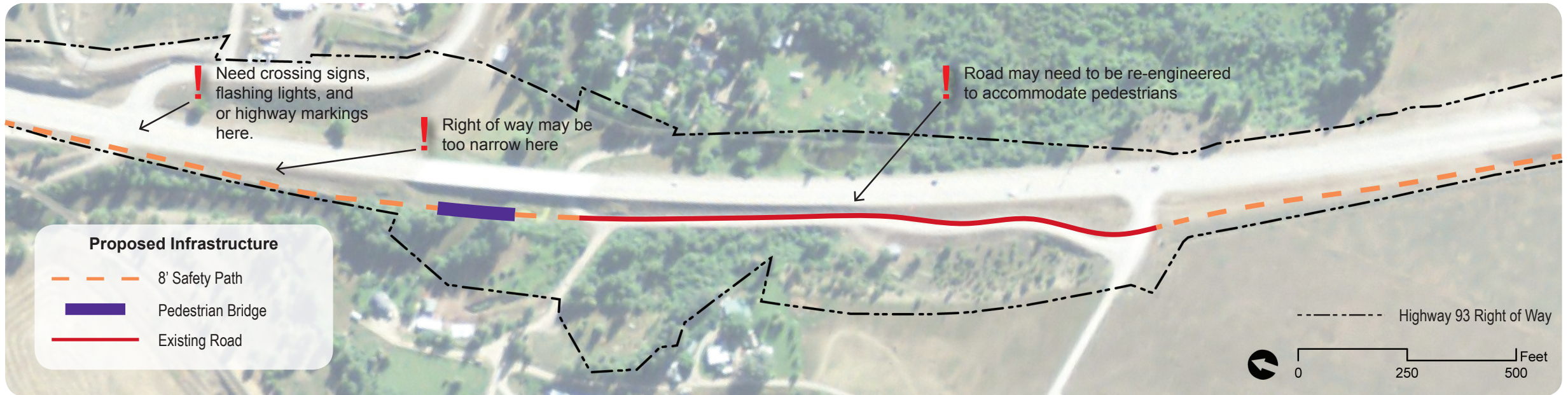


Fig. 2.12: West Side Trail and Pedestrian Bridge

West Side Trail and Pedestrian Bridge

Description:

This option would offer pedestrian and cycling facilities along the west side of Highway 93. A combination of 8' wide crushed limestone safety paths and existing gravel road in the Highway 93 right of way would connect pedestrians from Arlee's commercial center to residents on the north side of the Jocko River. A separate pedestrian bridge, spanning a least 100', would have to be constructed in the highway right of way on the west side of the existing Highway 93 Jocko Bridge.

Pedestrians and cyclists would be able to safely cross the Jocko River without worrying about highway traffic. The separate pedestrian bridge could be constructed in the highway right-of-way, and without routing pedestrians and cyclists through the steeper grade changes located on the east side of Highway 93. This option allows pedestrians, cyclists, and equestrians to be seen from Highway 93, offering a sense of safety that would not be possible because of the lack of sight lines caused by the 40' high retaining wall on the east side of the highway. Because fewer people live on the west side of the highway, this design would necessitate pedestrians crossing the highway on the north side of the Jocko River. Pedestrian crossing signs, highway markings, flashing lights, and a reduced speed limit in the vicinity of Dumontier Road may help mitigate this risk.

Challenges and Opportunities:

Safety

- Pedestrians and cyclists would be clearly visible and would not have to descend to the base of the retaining wall, providing an increased perception of safety.
- Residents who live north of the Jocko River and east of Highway 93 would have to cross the highway to access the pedestrian bridge.
- Pedestrians, cyclists, and equestrians would have to contend with low volume traffic on the recent Saddle Mt. Road extension that leads to the Jocko Hollow campground.

Access

- The grade changes along the west side of the highway are less steep, making the design of ADA accessible facilities more feasible than on the east side.
- Equestrians would be able to use this route; however, they may still have to cross Highway 93 north of the bridge.

Ecological

- The construction of an additional pedestrian bridge in the floodplain would inhibit the natural movement of the channel, which was one of the main reasons for the existing Jocko Bridge redesign.
- While wetland impacts would be a concern, this option would not affect the significant wetland and other habitat resources located in the Jocko Hollow area.

Engineering

- It would be easier to engineer safety paths along the west side of the highway because the grade changes are less severe.
- Further analysis would have to be conducted to determine the design of a pedestrian bridge on the west side of the highway. However, many options exist.
- If a trail was proposed along the Saddle Mt. Road extension, the road would have to be re-engineered (not included in this design).

Aesthetics

- The addition of a pedestrian bridge along the west side of Highway 93 could prove to be an attractive addition to the Arlee community. It would certainly convey the community's support for non-motorized transport.
- People using the pedestrian bridge would be separated from the commotion of highway traffic.
- Views of the Jocko Hollow area would be limited.

Other Issues

- This option incorporates an existing low volume gravel road into the design. If federal dollars are used to fund this project, the road may need to be redesigned to accommodate an ADA accessible pedestrian path along the shoulder.

Cost Estimate

- Bridge alone: **\$280,000**
- Trail (Wessinger Street to Dumontier Road): \$235,200 + Bridge: \$280,000 = **\$515,200**

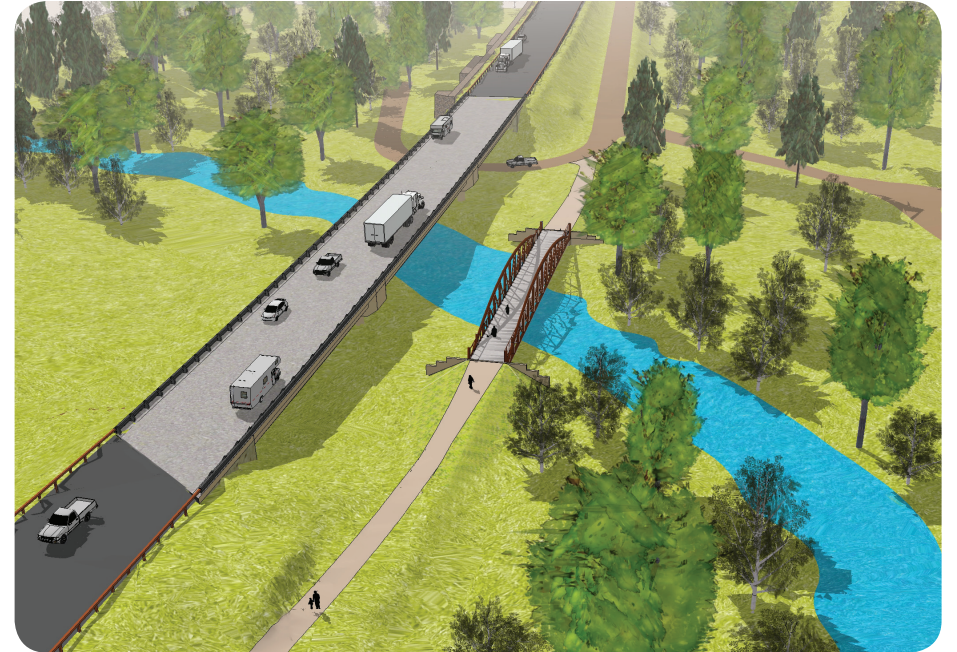


Fig. 2.13: Bird's-eye view of safety path and pedestrian bridge looking south.



Fig. 2.14: Looking north at the pedestrian bridge. This style of bridge is known as a steel truss construction.

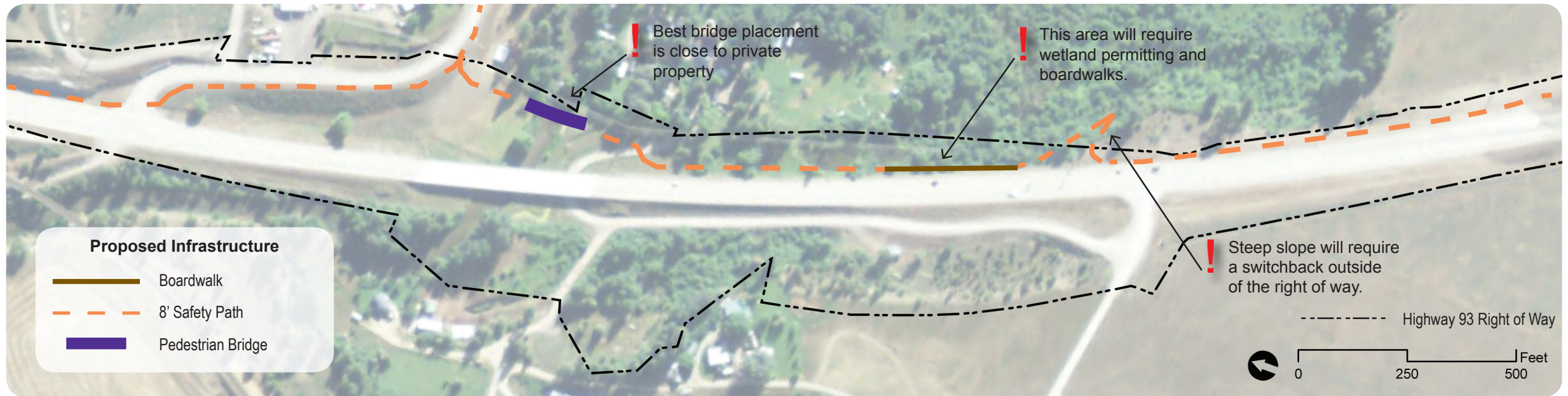


Fig. 2.15: East Side Trail and Pedestrian Bridge Map

East Side Trail and Pedestrian Bridge

Description:

Providing a footbridge across the Jocko River to the east of the existing Highway 93 bridge would provide pedestrians with a scenic experience of the river at a safe distance from the vehicle bridge. The span of the bridge would have to be at least 70' in this location. Crushed limestone paths can connect the footbridge to potential paths along DuMontier Road on the north side of the river, and adjacent to Highway 93 on the south side of the river. While a generous right-of-way on the east side of the vehicle bridge would allow the footbridge to be placed over a narrow part of the river, the trails necessary to access the footbridge from the south must contend with steep slopes, the high retaining wall supporting Highway 93, water-filled borrow pits, dense vegetation, and extensive wetlands.

Challenges and Opportunities:

Safety

- Pedestrians and other trail users are separated from vehicle traffic.
- The portion of the trail south of the Jocko River and east of Highway 93 dips well below the level of traffic. People on this part of the trail would not be visible from the road and be surrounded by thick vegetation. This reduces actual or perceived safety.
- The concealed trail running along the bottom of the retaining wall may lead to illegal activity.
- Residents from the west would need to cross Highway 93 to access the trail leading to the pedestrian bridge off DuMontier Road.
- Footbridge users would not be restrained from direct access to the river in this design.

Access

- Steep slopes on the east side of the highway south of the river will require construction of a series of switchbacks, which may prevent the trail from maintaining the ADA requirement of 5% slope. Constructing a series of stairs could keep the trail in the highway right-of-way, but would also not meet ADA requirements.
- These same steep slopes may make bike access difficult.
- This route would be favorable for equestrian use.

Ecological

- The presence of a separate pedestrian bridge is a constraint to the natural movement and flooding of the Jocko River.
- The trail east of the highway and south of the river is directly adjacent to a designated wetland area. Construction in this area has the potential to negatively impact the existing wetland in Jocko Hollow, and will require extensive wetland permitting.
- Extensive wetland vegetation would have to be removed to accommodate the trail along the retaining wall.

Engineering

- The slope at the base of the retaining wall holding the highway above Jocko Hollow will be an engineering challenge for the trail needed to access this pedestrian bridge.
- The bridge design shown here is conceptual. A simple bridge should be chosen based on structural stability across the width of the Jocko River.
- Boardwalk structures would have to be designed for the Jocko Hollow area.

Aesthetics

- Crossing the pedestrian bridge would be a quiet and scenic experience for pedestrians, allowing close access to the river itself.
- The path south of the river leading to the pedestrian bridge would be in a narrow space between a looming 40' wall and man-made ponds before crossing a low-traffic road. These factors could create an uncomfortably close feeling for trail users.

Other Issues

- Though this design is contained within the existing highway right-of-way, it is very close to private property, which has already been significantly impacted by the Highway 93 vehicle bridge redesign. Any further construction could be a sensitive issue with adjacent private landowners, especially with the intent to increase foot traffic directly adjacent to private property boundaries.
- To allow for switchbacks, the right of way may have to be renegotiated with the CSKT.

Cost Estimate

- Bridge alone: **\$196,000**
- Trail (Oxford Lane to Dumontier Road): \$240,000 + Boardwalk: \$62,500 + Bridge: \$196,000 = **\$498,500**

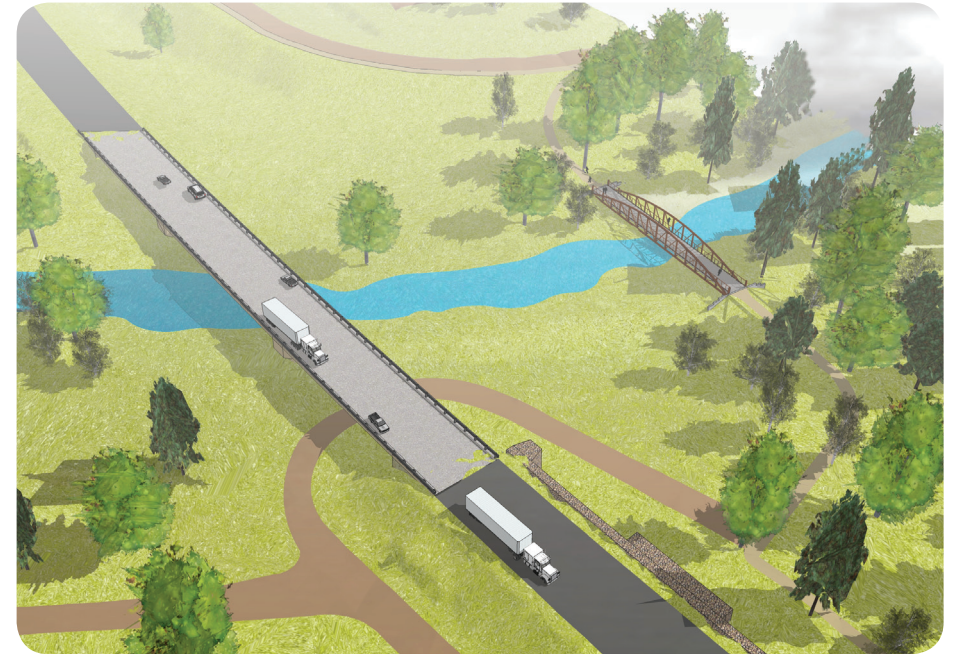


Fig. 2.16: Bird's-eye view of vehicle bridge and pedestrian bridge looking south.



Fig. 2.17 Looking north at the pedestrian bridge and across the Jocko River. Note the distance of the pedestrian bridge from the highway.



Fig. 2.18: Pedestrian Lane on Existing Bridge Deck Map

Pedestrian Lane on Existing Bridge Deck

Description:

Narrowing bridge vehicle traffic to two lanes allows space for an 8' pedestrian and bike path on the northbound side of the Highway 93 vehicle bridge. This lane would accommodate north and southbound pedestrians comfortably. To create this pedestrian lane, a line of interlocking pre-cast concrete barriers will be added to the surface of the existing vehicle bridge, and potentially along the bridge retaining wall area as well. Including a 150' extension of the barriers on either side of the bridge, 560' of barriers would be needed. If the barriers extended along the retaining wall, then 1,700' of barriers would be needed.

These barriers may be one of several types commonly used in highway medians designed to redirect vehicles in case of impact, preventing them from entering the oncoming lane of traffic; in this case, the pedestrian lane. This option requires no new construction on the existing bridge beyond the placement of the pre-cast barriers. Trails adjacent to the highway north and south of the Jocko River could be crushed limestone 8' wide paths, providing connections to DuMontier Road to the north and downtown Arlee to the south.

Challenges and Opportunities:

Safety

- Proximity to fast-moving vehicles may make some pedestrians feel unsafe. Simultaneously, it means they are visible to passers-by, reducing feelings of isolation.
- The noise of vehicles on the road may make pedestrians less aware of one another, reducing feelings of safety.
- Some users will need to cross Highway 93 at DuMontier Road to access the trail and pedestrian lane.
- A higher rail may be required on the east side of the bridge to ensure safety.

Access

- No steep slopes need be negotiated for this design option. ADA requirements of a maximum 5% slope will be easy to meet on the bridge and trails directly on either side of the bridge.
- A wide variety of users may easily cross the Jocko River in this pedestrian lane; however, this option would not be favorable for equestrian use.

Ecological

- This option does not create adverse ecological effects beyond those already existing as a result of the presence of the Highway 93 vehicle bridge.

Engineering

- Minimal engineering effort is expected to be required for this option, without any major challenges.
- Additional earth moving (grading) will be needed to create a trail on the north side of the river, particularly in the area adjacent to the bridge.

Aesthetics

- The concrete barrier may be unattractive.
- Views of the Jocko River and Jocko Hollow from the level of the road are impressive.

Cost Estimate

- 1,700' of barriers (for the retaining wall and the bridge) = **\$57,800**; 560' (for just the bridge) of barriers = **\$19,040**
- Trail (Oxford Lane to Dumontier Road): \$163,200 + 1,700' of Barriers: \$57,800 = **\$221,000**

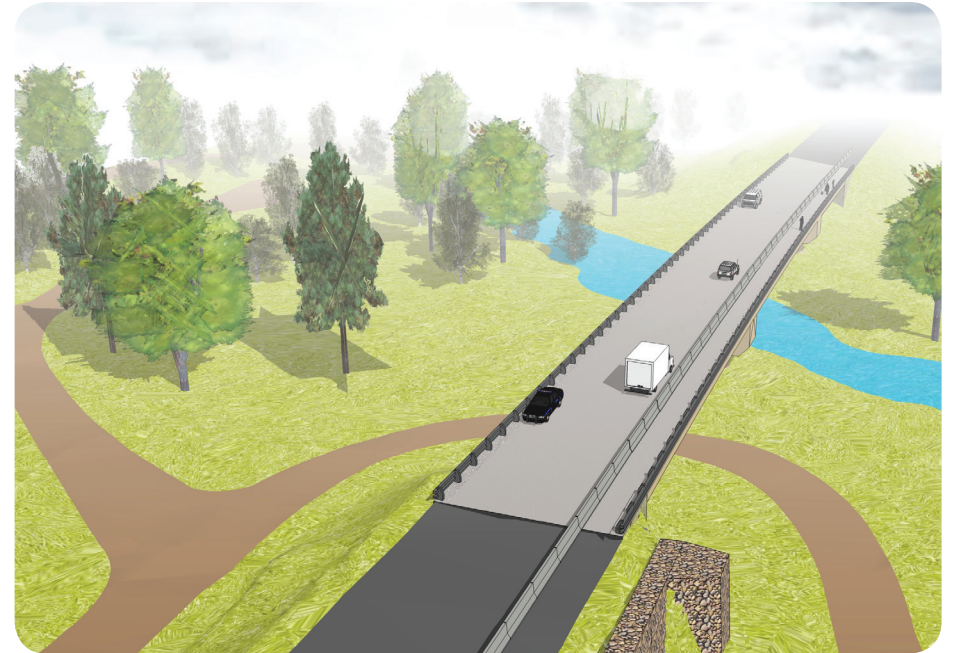


Fig. 2.19: Bird's-eye view of existing bridge reduced to two vehicle lanes. The addition of a concrete barrier creates a pedestrian lane.



Fig. 2.20 Looking south across the bridge. The pedestrian lane is approximately 8' wide.

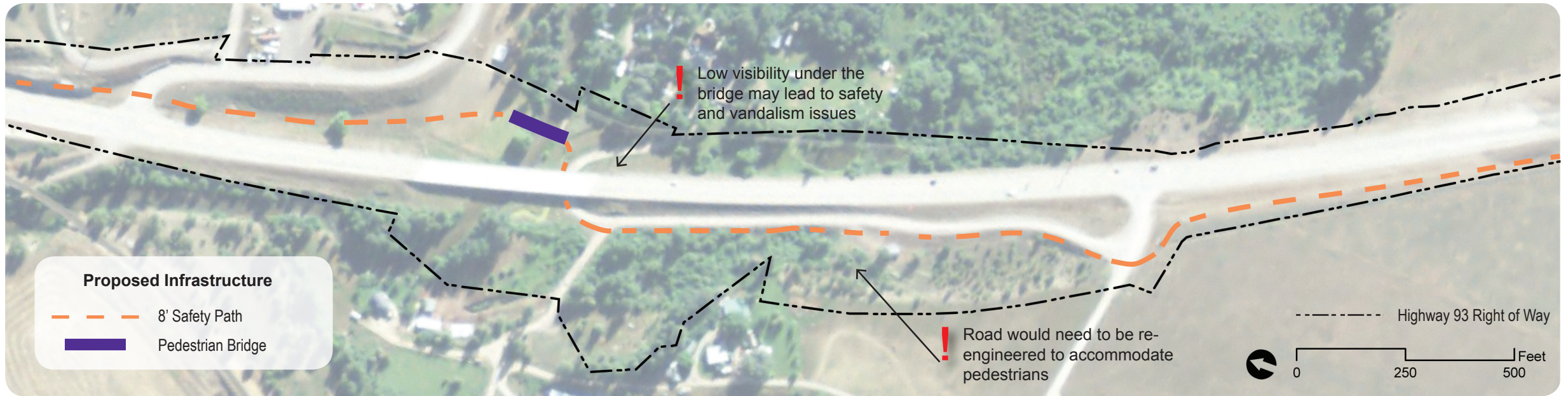


Fig. 2.21: East Side/West Side Trail and Pedestrian Bridge Map

East Side/West Side Trail and Pedestrian Bridge

Description:

This option was suggested by the JVTTC after initial review of the first four options. This design takes advantage of the wide Jocko River Bridge span to allow pedestrians to cross underneath the highway. Routing the trail along the west side of the highway avoids the steep grades and wetlands found on the east side, while still accommodating residents north of the river and east of Highway 93. Like other designs, a separate pedestrian bridge, spanning at least 70', would have to be constructed in the highway right-of-way on the east side of the existing Highway 93 Jocko River Bridge. Because the trail goes underneath the highway bridge, the lack of visibility may result in safety and vandalism issues.

Challenges and Opportunities:

Safety

- For most of this route, pedestrians and cyclists would be clearly visible, and would not have to descend to the base of the retaining wall, providing an increased perception of safety.
- Residents who live north of the Jocko River and east of Highway 93 would not have to cross the highway, increasing safety.
- Pedestrians, cyclists, and equestrians would have to contend with low volume traffic on the recent Saddle Mt. Road extension that goes to the Jocko Hollow campground.
- Paths directly adjacent to roads (such as Saddle Mt. Road here) are not recommended because bikes do not move with traffic, which is a safety issue.

Access

- The grade changes along the west side of the highway are less steep, making the design of ADA accessible facilities more feasible than on the east side.
- Equestrians would be able to use this route.

Ecological

- Little infrastructure would have to be built in the Jocko Hollow area, reducing ecological impacts.
- The construction of an additional pedestrian bridge in the floodplain would inhibit the natural movement and flooding of the channel, which was one of the main reasons for the existing Jocko Bridge redesign.
- While wetland impacts would still be a concern, this option would not affect the significant wetland and other habitat resources located in the Jocko Hollow area.

Engineering

- It would be easier to engineer safety paths along the west side of the highway because the grade changes are less severe.
- Further analysis would have to be conducted to determine the design of a pedestrian bridge on the west side of the highway. However, many options exist.
- The Saddle Mt. Road extension would have to be re-engineered to accommodate a trail.

Aesthetics

- The addition of a pedestrian bridge along the west side of Highway 93 could prove to be an attractive addition to the Arlee Community. It would certainly convey the community's support for non-motorized transport.
- People using the pedestrian bridge would be separated from the commotion of highway traffic.
- Views of the Jocko Hollow area would be limited.

Cost Estimate

- Bridge alone: **\$280,000**
- Trail (Wessinger Street to Dumontier Road): \$235,200 + Bridge: \$196,000 = **\$431,200**



Fig. 2.22: Bird's-eye view looking south of a trail and pedestrian bridge. Notice that pedestrians and cyclists would have to cross underneath the existing Jocko River Bridge.



Fig. 2.23: A view showing how pedestrians and cyclists would have to cross under the Jocko River Bridge. The separate pedestrian bridge can be seen on the other side of the highway.

Conclusion

Reviewing these design alternatives makes it apparent that there is no easy or ideal solution to routing pedestrians across the Jocko River. There are many trade-offs, and no option will be inexpensive or politically easy to achieve. With that understanding, allowing pedestrians to safely cross the Jocko River is critical to providing non-motorized transport for the Arlee residents. An analysis of the major issues, including safety, accessibility, ecological impacts, engineering, aesthetics, and cost is provided here.

Safety

Any of the five alternatives presented in this section would improve the pedestrian safety over existing conditions. However, those options that provide a greater separation between pedestrians and the highway will improve both actual safety and the perception of safety. Likewise, alternatives that do not require pedestrians to cross over the highway would be preferred. Finally, routes that allow pedestrians and bikers to see and be seen will improve feelings of safety. Routes that traverse the retaining wall, and, to a lesser extent, go beneath the existing Jocko River Bridge, might create unsafe environments and result in vandalism.

Accessibility

Many federal transportation grants require projects to be accessible as defined by the Americans With Disabilities Act. Grant requirements aside, providing an accessible trail system is important. Therefore, routes that do not require navigating steep slopes or boardwalks would be preferable. A trail along the Jocko Hollow area would require extensive engineering to be made ADA accessible. Also, if equestrian access is desired by the community, then routes that are adjacent to traffic would be less desirable.

Ecological Sensitivity

Routes that avoid the ecologically sensitive Jocko Hollow area would be preferred. A trail along the base of the retaining wall would require extensive vegetation clearing, necessitate filling wetlands, and create human conflicts with wildlife. Additionally, design alternatives that require separate pedestrian bridges would interfere with the natural flooding and channel migration of the Jocko River. A narrower bridge would essentially 'pin' the meandering river in place, potentially causing damage to the river's ecosystems, and undermining one of the reasons the Jocko River Bridge span was increased.

Engineering

All of the alternatives presented here would require some amount of engineering and consultation with design professionals. Options that would be easier to design and build may speed the process along and reduce costs. For example, options with shorter bridge spans would reduce the complexity of the design. Additionally, avoiding the need for switchbacks and boardwalks would also reduce engineering requirements. Finally, routes that parallel Saddle Mountain Road on the west side of the highway would likely require road modifications.

Aesthetics

People are more likely bike or walk on a trail they find appealing. In this case, routes that provide open views of the Jocko River and a separation from traffic would be most appealing. Routes along the existing bridge deck may provide good views of the Jocko Hollow area, but this may be offset by the proximity of traffic. Depending on the design, the addition of a pedestrian bridge in the Jocko River floodplain may prove an attractive sight to passing motorists. Routes along the retaining wall would most likely feel claustrophobic, and offer unappealing views of dense vegetation.

Cost

Alternatives that minimize bridge span, avoid the use of switchbacks and boardwalks, and road re-engineering will minimize costs. Bridge structures are the single most expensive elements in these designs. Funding is a major issue, but the design of safe, attractive, and lasting facilities should not be discounted.

The intent of these designs and analysis is to provide direction to the JVTC, and help influence decision makers to be proactive about providing non-motorized options for the residents of the Jocko Valley. Possible next steps include pursuing additional sources of grant funding, presenting options to the MDT, CSKT, and community members, and contracting design professionals to further investigate these options.

Alternative	Safety	Access	Ecological Impacts	Engineering	Aesthetics	Cost
Pedestrian Retrofit: Jocko Bridge and Retaining Wall	<i>B</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>B</i>	<i>F</i>
West Side Trail and Pedestrian Bridge	<i>C</i>	<i>C</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>
East Side Trail and Pedestrian Bridge	<i>C</i>	<i>C</i>	<i>D</i>	<i>C</i>	<i>C</i>	<i>B</i>
Pedestrian Lane on Existing Bridge Deck	<i>D</i>	<i>A</i>	<i>A</i>	<i>B</i>	<i>F</i>	<i>A</i>
East Side/West Side Trail and Pedestrian Bridge	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>

Fig. 2.24: This table provides a quick comparison between the five design alternatives presented in this section. Grades are assigned on a subjective basis informed by the conclusion section and by the analysis provided with each of the alternatives.

Jocko Road Trail: Conceptual Design and Analysis

Introduction

The purpose of this section is to help the JVTC better understand the opportunities and constraints associated with creating trails along rural county roads in the vicinity of Arlee. The JVTC identified this as a specific area in which they desired further analysis, voicing concern over the lack of safe walking and biking routes leading into the commercial center of the town. This section will focus on Jocko Road (secondary highway 559) from its junction with Highway 93 to where it splits off into Jocko Canyon Road and Blodgett Lane. Jocko Road is one of the main routes connecting Arlee residents living on the south side of the river to the town's center, and is a logical place for concentrating trails building efforts. Jocko Road also provides a discrete study area for investigating the value and design of pedestrian infrastructure along county roads in general. The design guidelines described here can be applied to other county roads in the area.

Goal: Offer the Jocko Valley Trails Committee a vision for what walking and biking facilities along Jocko Road would be like, while investigating the practicality and value of trails along rural county roads in general.

Objectives:

1. Investigate the physical constraints and legal status of the right-of-way along Jocko Road and its implications for trail design and planning.
2. Provide design recommendations for a trail along Jocko Road.
3. Research the value a trail along Jocko Road would bring to the community of Arlee and the Jocko Valley.
4. Offer perspective on the creation of trails along county roads versus other trail promotion opportunities available to the JVTC.

The intent of this document is not to perform detailed legal investigation into ownership along Jocko Road, but rather to better understand the constraints and opportunities for trail creation there. Likewise, the design concepts presented here are grounded

in research about trail development in other rural settings. Guidelines are provided; however, the University of Michigan is not endorsing the creation of these trails without further community involvement, planning, and consultation with design professionals. This section does provide insight, directions, and encouragement for JVTC's efforts.



Fig. 3.1: A view of Jocko Road looking east showing the irrigation canal along the south side of the road and the ditch along the north side. Fences are commonplace along the road. The utility lines shown here move to the north side of the road further east.

Jocko Road Description

Jocko Road is named after the fur trader, Jacques Raphael Finley, as is the Jocko River, which the road parallels (AHS 2006). Officially, the road is labeled secondary highway 559 and is maintained by Lake County. It runs east from its junction with Highway 93 for 3.1 miles before splitting into Jocko Canyon Road and Blodgett Lane. Jocko Road is 22' wide, and paved with asphalt that is chip sealed. The speed limit along its length is 55 MPH. Figure 3.3 shows the extent of the road discussed in this section. Figure 3.6 shows a cross-section of the road.

Lacking a shoulder, the road transitions directly into a 9' wide ditch on the north side of the road, and a 9' wide irrigation canal on the south side (please note, these figures are estimates; a survey would be required to obtain actual dimensions). The irrigation canal runs for 2.64 miles until it feeds into a larger canal. The presence of ditches and irrigation canals directly adjacent to the road makes adding walking and biking facilities challenging. Other important features are utility lines that run the length of the road, as well as fences. Private fences, found on many properties next to the road, may further complicate trail design because they would have to be moved to accommodate a trail.



Fig. 3.2: The irrigation canal located on the south side of Jocko Road make trail options difficult there.

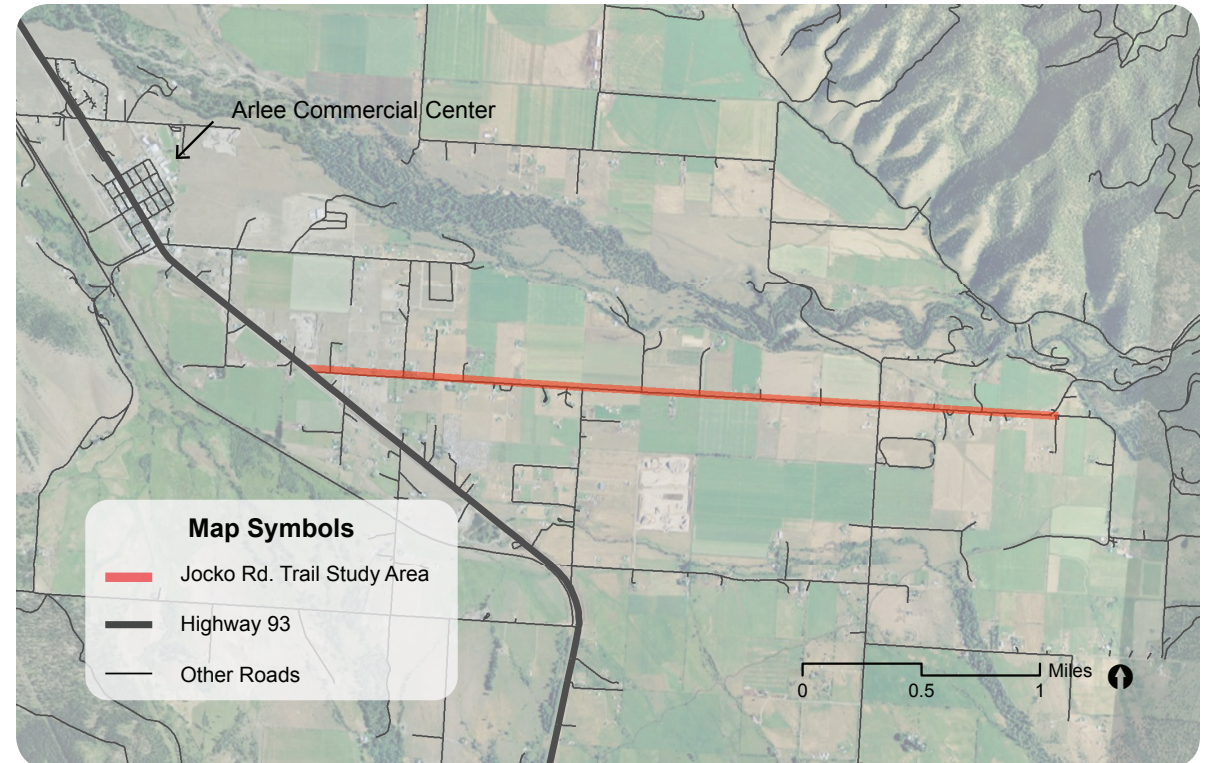


Fig. 3.3: The red line on this map shows the extent of Jocko Rd. (secondary highway 559) that comprises the study area for this section of the report.

Right-of-Way Issues

An easement is the right to use another person's property for a specific purpose. The most common type of easement is used for traveling over another person's land, and is known as a right-of-way (Garner 2009). According to the Montana Department of Transportation (MDT) Preconstruction Engineer Shane Stack, the right-of-way along Jocko Road is created through either an express easement which is established through a "deed, grant, or other written instrument" (RealEstateLawyers.com), or it is owned "fee simple" by the county. An express easement is a written contract that should specify the easement location, its dimensions, the purpose(s) for which that easement may be used, and who may use it. Existing easements may have to be renegotiated to include trail use. If the county owns the right-of-way, then renegotiations will not be required. Regardless, Mr. Stack indicated that because this is a county maintained road, the uses allowed within the right-of-way fall under the jurisdiction of Lake County.

It should be mentioned that in researching this right-of-way, there was dispute between Lake County and MDT officials about which entity has power over Jocko Road. Further investigation is needed to verify the specifics of the right-of-way. The JVTC can pick up this task by contacting the following individuals:

- Contacts: Larry Ehls (Lake County Road Supervisor)
— 406-882-7206
- Jean Crow (Right of Way Acquisitions MDT)
— 406-523-5852
- Shane Mintz (MDT)
— 406-444-6071
- Shane Stack (MDT Preconstruction Engineer)
— 406-523-5830
- Phillip Inman (CTEP Committee Member)
— 406-444-6118

Survey documents describing the right-of-way along Jocko Road were graciously provided through the Lake County Plat Room under the guidance of Larry Ehle. See Appendix VI for these documents. Survey documents indicate that the majority of Jocko Road has a 60' right of way. This 60' right-of-way extends east on Jocko Road until it narrows to 40' just before Grey Wolf Drive. Proceeding east from Grey Wolf Drive, the right-of-way expands to 62' before narrowing again to 54' before the junction with Jocko Canyon Road. The exact location of where the right-of-way narrows from the survey documents provided is difficult to discern; further investigation and surveying may be required.

It is unclear whether the current right-of-way along Jocko Road could accommodate additional walking and biking infrastructure. Where the right of way narrows to 40', it is unlikely that additional biking and walking facilities could be accommodated. Before engaging in further trail planning along Jocko Road, it would be advisable to consult legal council. JVTC has already established a working relationship with Five Valleys Land Trust, which is equipped to negotiate these legal issues. If the existing right of way along Jocko Road would not accommodate trails, other arrangements are possible.

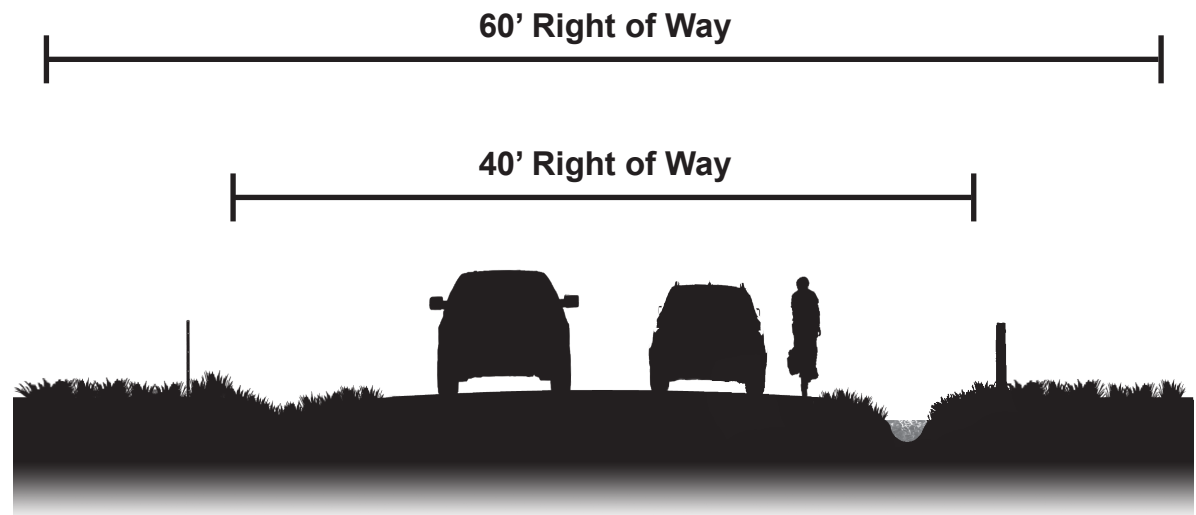


Fig. 3.4: This graphic shows a 60' right of way and a 40' ight of way compared to the existing conditions along Jocko Rd. Notice the ditch and irrigation canal directly adjacent to the road.

The changing legal landscape increasingly requires more formalized trail agreements in place of the historically practiced “handshake agreements” (Massachusetts Department of Conservation and Recreation 2007). The Massachusetts Department of Conservation and Recreation (2007) provides some examples of what legal arrangements can be sought; however, Montana State law may differ.

- An **‘Informal Agreement’** is a verbal transaction between a landowner and a trail group that wishes to access their land. It has less legal weight, and cannot stipulate conditions of use or management agreements.
- A **‘Trail License’** is a written agreement between an owner and a trail group that permits trail access. It is superior to a verbal agreement; however, it does not carry over to future landowners. It can stipulate conditions of use and management agreements.
- A **‘Trail Easement’** is a perpetual written agreement that allows public access to a landowner’s property. An easement can be very specific in the types of uses and access that it allows.

It is important to note that the best alternative for trail creation along Jocko Road would be to use the existing right-of-way to negotiate the creation of the trail. The other measures listed above would require negotiations with each landowner that the trail would pass through, potentially stalling the trail development process.

For a separate component of this Master’s project, Robert Pell, a project manager for trail development on the Lummi Reservation in Washington State, offered his perspective on negotiating trail agreements. The Lummi Nation overcame ownership issues in the planning of their Hawkson Trail by connecting with landowners and by publishing updates in their local newspaper the “Squall Call.” Robert Pell stated: “there were a lot of personal conversations we had with the landowners; we found out their stories and they had a lot of personal connections with deaths and lack of personal safety along...roads.” These personal connections with landowners helped pave the way for trails development on the Lummi Reservation. This is a model that could be applied to the Jocko Valley.

Design Alternatives

Two design alternatives were developed based on the constraints identified in the preceding sections. The primary physical constraints identified were the ditch and irrigation canal on the north and south sides of the road, fences, and the utility poles that run the length of the road. A 60’ right-of-way was assumed for the purposes of this preliminary design; a satisfactory design solution does not seem feasible within the area provided by a 40’ right-of-way, which is the narrowest portion of the right-of-way along the road. It is likely that a 60’ right-of-way would have to be negotiated for the length of the road before trail development could begin. It may be possible to widen the road shoulder within the 40’ right-of-way; however, doing so would not accommodate the necessary drainage.

The two options presented here consist of (1) providing paved road shoulders, and (2) creating a separate biking and walking facility. Both alternatives offer advantages and disadvantages. No preferred option is delineated here. Further consultation with design professionals and community involvement would be required before settling on a design alternative. Design guidelines were adopted from the Oregon Department of Transportation’s Bicycle and Pedestrian Plan (1995) and used to inform these designs. This resource was recommended by the American Trails non-profit organization (American Trails 2011). Figures 3.6 and 3.8 show the existing conditions of the road next to the proposed designs.

Shoulder Bikeway

The Oregon Department of Transportation recommends adding paved shoulders to rural roads with high bicycle use; pedestrians can also use these expanded shoulders. Paved shoulders are appropriate on low-volume rural roads because motorists can safely pass cyclists and pedestrians without encountering oncoming traffic, or reduced likelihood of oncoming traffic. Shoulder bikeways are distinct from “bike lanes” because a portion of the road is not officially designated for preferential use by cyclists. A 4’ shoulder would provide adequate room for cyclists to avoid debris at the edge of the shoulder and minimize conflict with motorists.

The existing aggregate beneath the shoulder along the south edge of the road is likely sufficient to support a bike shoulder. This subgrade aggregate could be retained and then surfaced with 4” of asphalt concrete (ODOT 1995). The vehicle lanes of Jocko Road would have to be repositioned to the north and regraded so that the road crown, or the highest point of pavement, was located at the center of the road. The shoulder on the north edge of the road could then be added, but would not require as thick a layer of aggregate and asphalt cement as the vehicle travel lanes of the road. The ditch along the north edge of the road would have to be filled and compacted to accommodate the additional road plus shoulder width (30’). A new ditch would have to be dug on the north side of the road to allow for the drainage of road runoff. Moving this ditch may prove problematic, because private fences would also have to be relocated.

One potential strategy for negotiating these additional facilities with the county would be to lobby for these improvements to be constructed at the same time as other road maintenance. If these facilities are built in conjunction with other road improvements, their cost may be minimized. The strongest negotiating point seems to be that the lack of any shoulders along the road and the presence of both an irrigation canal and a ditch along both edges make the road clearly unsafe for pedestrians and cyclists; it may be possible to lobby for these changes based on these facts alone.



Fig. 3.5: A shoulder bikeway outside of Boulder, Colorado (photo credit: Let Ideas Compete).

Fig. 3.6:

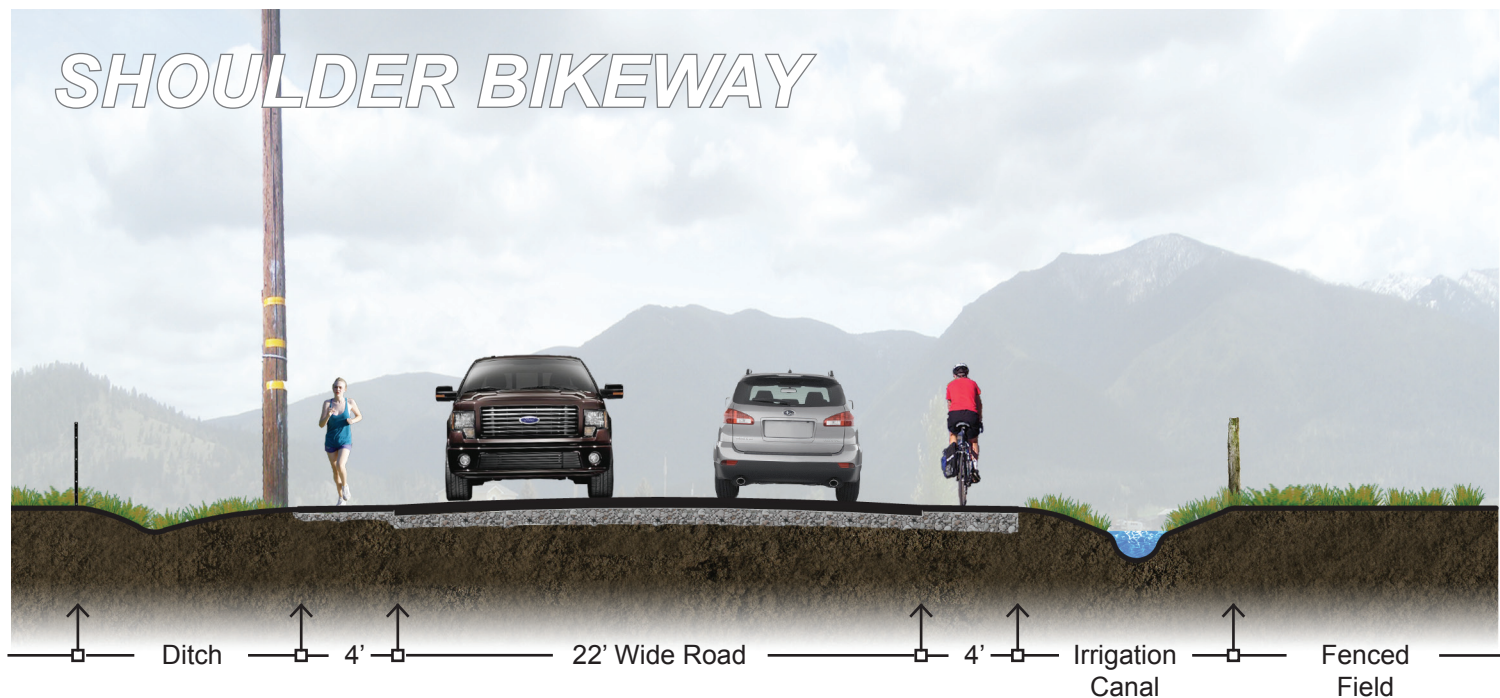
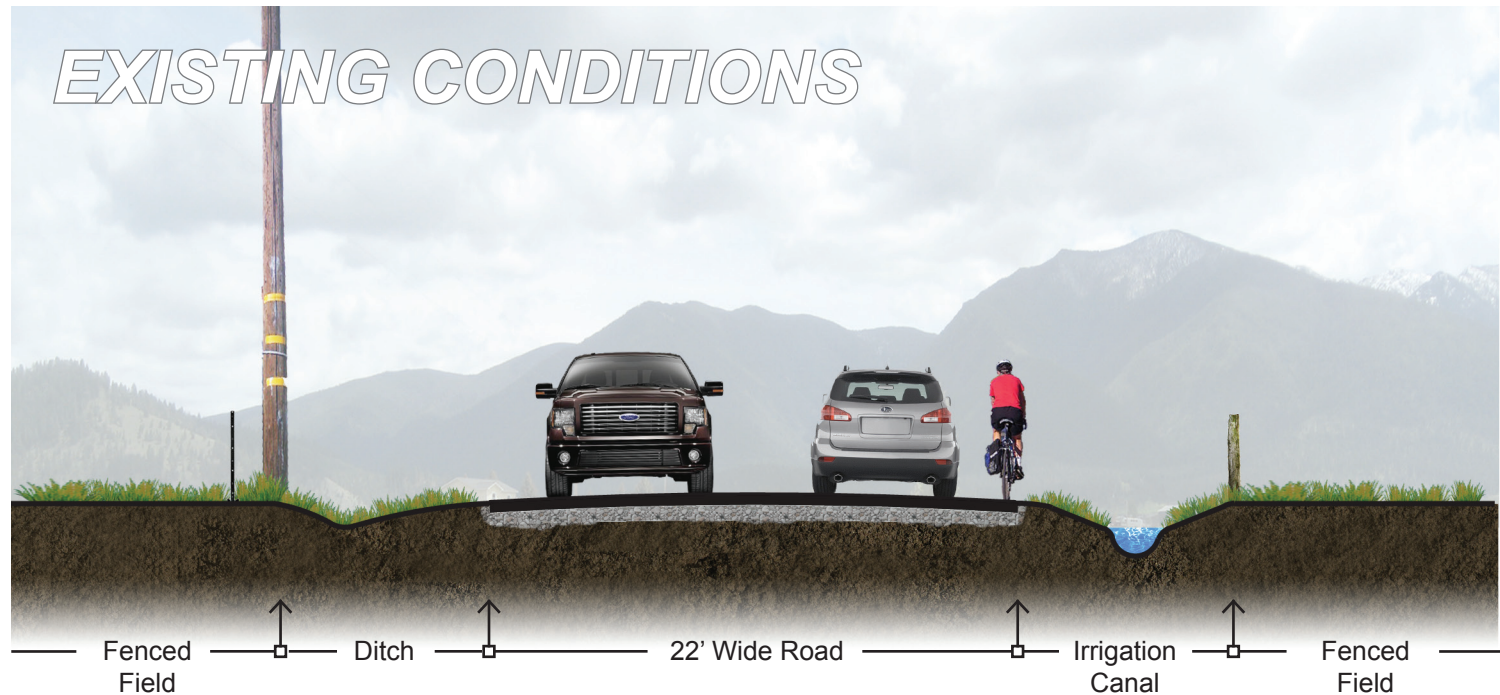
These illustrations demonstrate the existing conditions along Jocko Road looking east (above) and a proposed expanded 4' shoulder (below) on both the north and south sides of the road. This design would require a 60' right of way.

Pros:

- Shoulder bikeways are the recommended facility for rural roads with high bike traffic (ODOT 1995)
- Bikes would move with traffic which is thought to be safer (ODOT 1995)
- Would improve safety from the current situation without shoulders

Cons:

- Would not be as appealing to inexperienced cyclists
- Perhaps not appealing for recreational walking
- Requires extensive road engineering
- Ditch and fences along the north side of the road would have to be moved



Separate Multi-use Path

For this design, an 8' wide path was aligned along the north side of Jocko Road on the far side of the existing ditch. While there are many benefits to multi-use paths, there are also some reasons they are not appropriate for all situations. This section discusses these reasons, while also providing design recommendations.

Multi-use paths were first designed to provide off-street bikeways; however, it was soon discovered that primarily pedestrians, joggers, skaters, and even equestrians used these paths. Therefore, the design of these facilities evolved to accommodate a range of different users. Multi-use paths are best suited to areas that have a continuous separation from traffic, particularly along rivers, or rail-to-trail conversions. These scenic settings attract users, and because of their separation from traffic, provide a safe environment for beginning cyclists who are fearful of traffic (ODOT 1995).

The Oregon Department of Transportation (1995) does not recommend locating multi-use paths along roadways, because some bicycle traffic will move counter to the direction of motor vehicle traffic, causing a variety of conflicts. Where paths end, cyclists will continue to ride against traffic, which has been proven to cause accidents. Also, motorists often will not notice path users at intersections and driveways. Because of these safety considerations, the convention in the US is to discourage separate paths, and promote on-street facilities. Lusk et al. (2010) recently challenged this convention, finding that more bikers used separate paths; there was a 72% lower frequency of crashes on these paths. Another study found that bicycle commuters were willing to increase their travel time by up to 20 minutes to avoid unmarked on-street biking to use a separate bike path (Tilahun et al. 2007). Also, the safety concerns presented in the ODOT Bike and Pedestrian Plan may pertain more to high traffic urban areas.

Because this design uses a separate path, no alterations to the existing Jocko Road are required, minimizing road reengineering activities. Creating a separate path would require pushing all the way to the edge of the 60' right-of-way on the north side of the road. As a result, private fences would have to be moved further than in the previous design. A typical path is constructed on 2-4" of asphalt concrete on top of 4-6" of aggregate. The subgrade would have to be compacted prior to path construction (ODOT 1995).

The promotion of a completely separate biking and walking facility could not be negotiated as an upgrade to the existing Jocko Road. This design may also require more involvement with the adjacent landowners, because it would require moving existing fences further. A separate path may be more appealing to the public, because it conforms to peoples' traditional concepts of what a trail is, and could support a wider variety of uses.



Fig. 3.7: Photo showing a multi-use path along a roadway. (photo credit: Alex Pope)

Fig. 3.8:

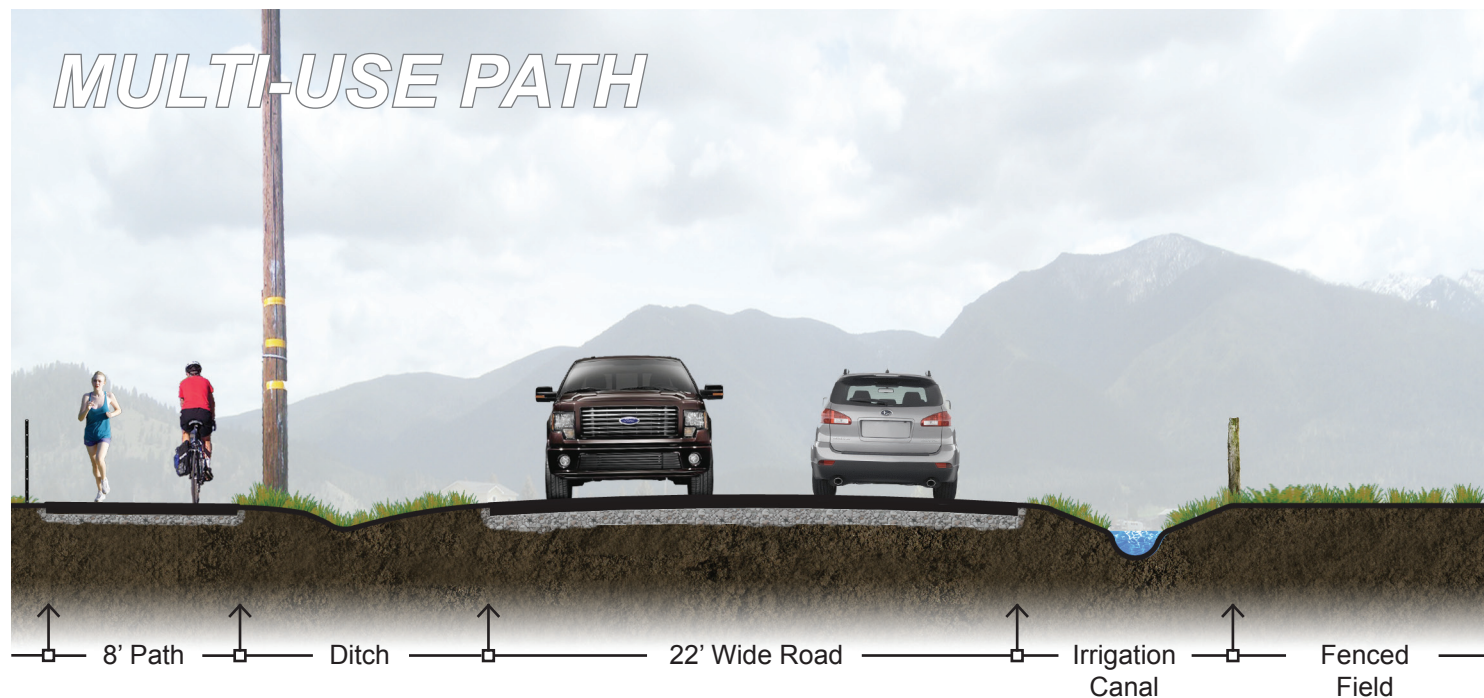
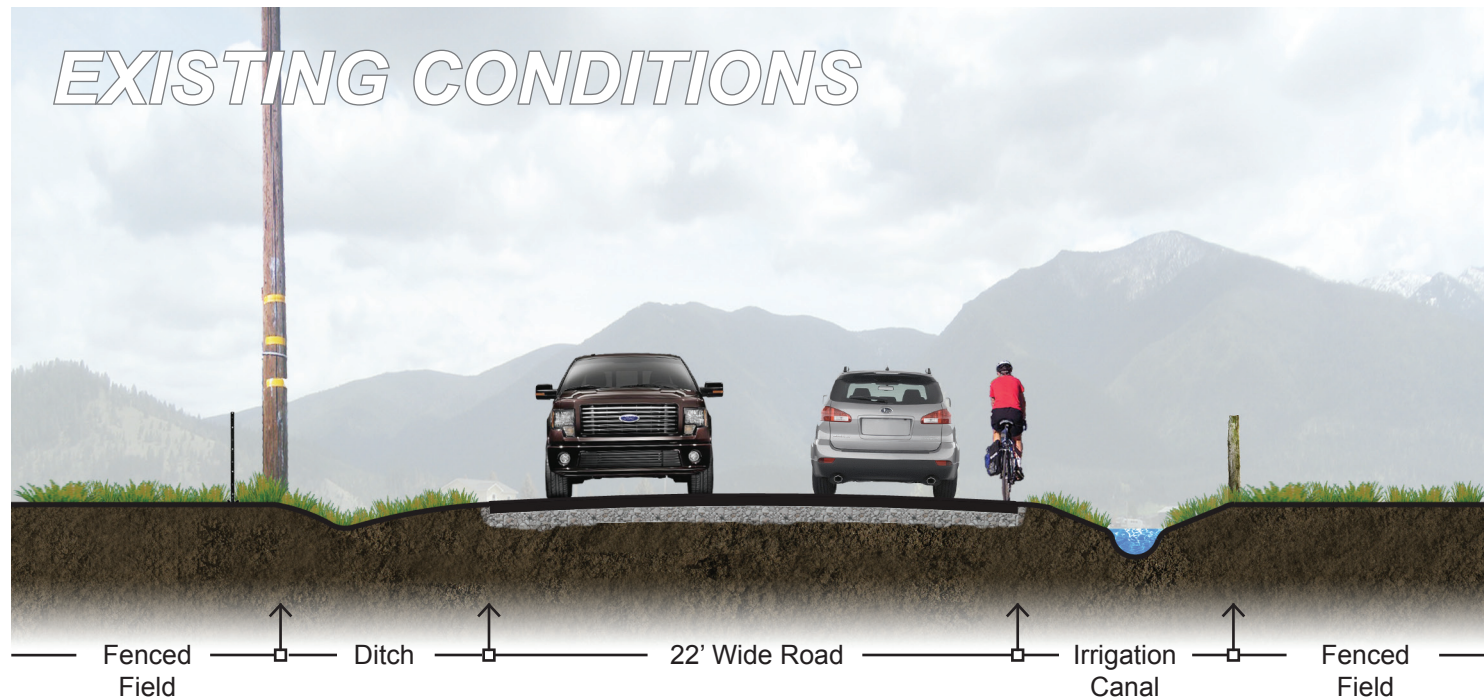
These illustrations demonstrate the existing conditions along Jocko Road looking east (above) and a proposed 8' multi-use path (below). This design would require a 60' right of way.

Pros:

- May attract a wider variety of uses including in-line skaters, joggers, cyclists, and even equestrians
- Would be more appealing to inexperienced cyclists
- Does not require altering Jocko Road and associated ditch and irrigation canal

Cons:

- Ideally, multi-use paths are not located along roads for aesthetic and safety reasons (ODOT 1995)
- According to the Oregon Department of Transportation, multi-use paths are not recommended for rural roads (ODOT 1995)
- Requires moving fences further than in the previous design



Community Value of Rural Trails: Jocko Road Context

This section provides an overview of the potential values and challenges for non-motorized trails in rural areas. Inferences are made from existing literature, and then applied to the case of Jocko Road. The arguments for the creation of non-motorized trails in rural areas can be organized under two main themes. First, rural areas have higher rates of obesity and other lifestyle-related disease, and trails have been suggested as one low-cost method for promoting health. Second, rural communities tend to be bisected by federal and state highways, where fast-moving traffic and the lack of bicycling and walking facilities create safety issues. The argument against non-motorized trails in rural areas stems from the very nature of these communities, where low population densities and dispersed destinations make walking and cycling an impractical mode of transportation (Pucher and Renne 2004).

Reasons for Non-motorized Trails in Rural Areas

As compared to their urban counterparts, rural residents have higher rates of obesity, and have the highest rates of inactivity in the United States (Patterson 2004). Rural children in particular have high rates of obesity; in 2003, 31.5% of rural children between the ages of 10-17 years old were considered overweight or obese (SCRHRC 2007); nationally, the rate of childhood obesity tripled between 1980 and 2000 (Ogden et al 2002). This alarming trend can be attributed to a lack of physical activity. In 2003, 25.4% of rural children failed to participate in moderate or vigorous physical activity for at least 20 minutes, three or more days a week (SCRHRC 2007). The question is: why are rural residents less healthy than urban residents? Boehmer et al. (2006) found causal relationships between the physical environment of rural areas and high rates of obesity. Several indicators related to obesity included: the distance to recreational facilities, unpleasant environments for physical activity, fear of crime or traffic, and few non-residential destinations. They go on to recommend that decision makers pay particular attention to the built environment in rural areas, “namely the absence of sidewalks or shoulders, safety from traffic, access to trails for walking or biking, and distance to recreational facilities.” Another study in rural Missouri found that the creation of walking trails promoted physical activity, and that trails were particularly important for promoting active lifestyles for women, those of lower socio-economic status, and for the elderly (Brownson et al. 2000). Both of these studies make strong arguments for improving bicycle and pedestrian access along Jocko Road.

The second argument for the creation of trails in rural areas involves pedestrian and cyclist safety. Perceived safety can inhibit physical activity and fast-moving traffic makes people feel unsafe (CDCAP 1996, Boehmer et al 2006). Boehmer et al (2006) found that lower levels of perceived safety are common in rural areas, and are attributed to fewer and poorer quality sidewalks and trails and higher traffic speeds on rural roads. Typically, federal and state roads run directly through the commercial centers of rural towns, areas where the most attractive destinations are (MBF 2009). Therefore, if rural residents want to walk or bike to town, they are confronted with high-speed traffic, and have few or no safe biking or pedestrian options; this applies to Arlee. Jocko Road carries high-speed traffic, and is an important connection to the downtown area, particularly if the planned non-motorized trail is constructed along Highway 93.

Challenges to Non-motorized Trails in Rural Areas

Trails are undoubtedly important; nonetheless, there are several barriers to non-motorized travel in the rural context. According to Oregon’s Department of Transportation’s Bicycle and Pedestrian Plan (1995), “pedestrian activity in rural areas is limited because travel distances tend to be great.” An analysis of the 2001 National Household Travel Survey came to the same conclusion, finding that in rural areas auto-dependence is higher and trip distances are too long for walking and biking (Pucher and Renne 2004). This study found that nearly everyone in rural areas relies almost exclusively on cars for transport (Pucher and Renne 2004). The study also found that walking accounted for half the number of trips in rural areas as it did in urban areas; in rural areas most bicycling and walking trips were for recreation, rather than transit.

The prevalence of walking and biking is correlated with four main factors: population density, the connectivity of travel routes, a high mix of land uses, and the presence/continuity of sidewalks and bike paths (Saelens, Sallis, and Frank 2003). Measuring the Jocko Valley against these criteria does not suggest that it is an easy place to walk or bike. The Jocko Valley has a low population density, requiring long traveling distances between destinations. The connectivity of transportation routes is low because routes often require traversing north and south to reach destinations. Urban areas offer a high mix of land use; for example, one city block might contain residential, office, commercial, and public space next to each other; this facilitates walking and biking as a practical form of transit. This is not the case in rural areas like the Jocko Valley. The JVTC can attest to the lack of biking and walking facilities in the area, and it is this final criterion that the

community has the greatest ability to influence. The question is whether safe walking and biking facilities will overcome the other three factors described above.

Distance seems to be the key factor people consider before choosing to walk or bike to their destination. In rural areas, average walking distances are 0.7 miles, and average biking distances are 1.5 miles (Pucher and Renne 2004). If destinations are further than these distances, it is less likely people will use non-motorized transit. One study in Ireland surveyed over 4,000 adolescents, asking why they did or did not walk or bike to school (Nelson et al 2007). They identified 2.5 miles as the distance over which adolescents would not walk or bike. 57% of adolescents did not walk or bike to school because it was too far. Similarly, 17% said that it would take too long, compared with 1.7% that were concerned with traffic danger, and 0.4% that felt there were not enough paths for walking or biking. Distance is an important factor to consider when planning trails. How many Jocko Valley residents would use trail to commute to town or school?

If this 2.5-mile threshold is applied to Jocko Road (see figure 3.9), one can estimate of the number of children that would use the trail to walk or bike to school. This estimate uses 2000 census data for track number 9407 (U.S. Census Bureau 2000), and observations from aerial photographs.

38 households [observed adjacent to Jocko Road within 2.5 miles of schools] x .721 [proportion of households that are families] x .292 [proportion of families that had children between 6 and 18] x 3.01 [average number of people per family] = 8 children

This rough calculation yields an estimate of 8 children between the ages of 6 and 18 that would be willing to use the trail to commute to school. Using the same technique to estimate all the potential users that would be willing to walk to town using a trail along Jocko Road (2.62 people per household with 38 household observed within 2.5 miles of town) yields approximately 100 potential users. Age is not taken into account for this calculation.

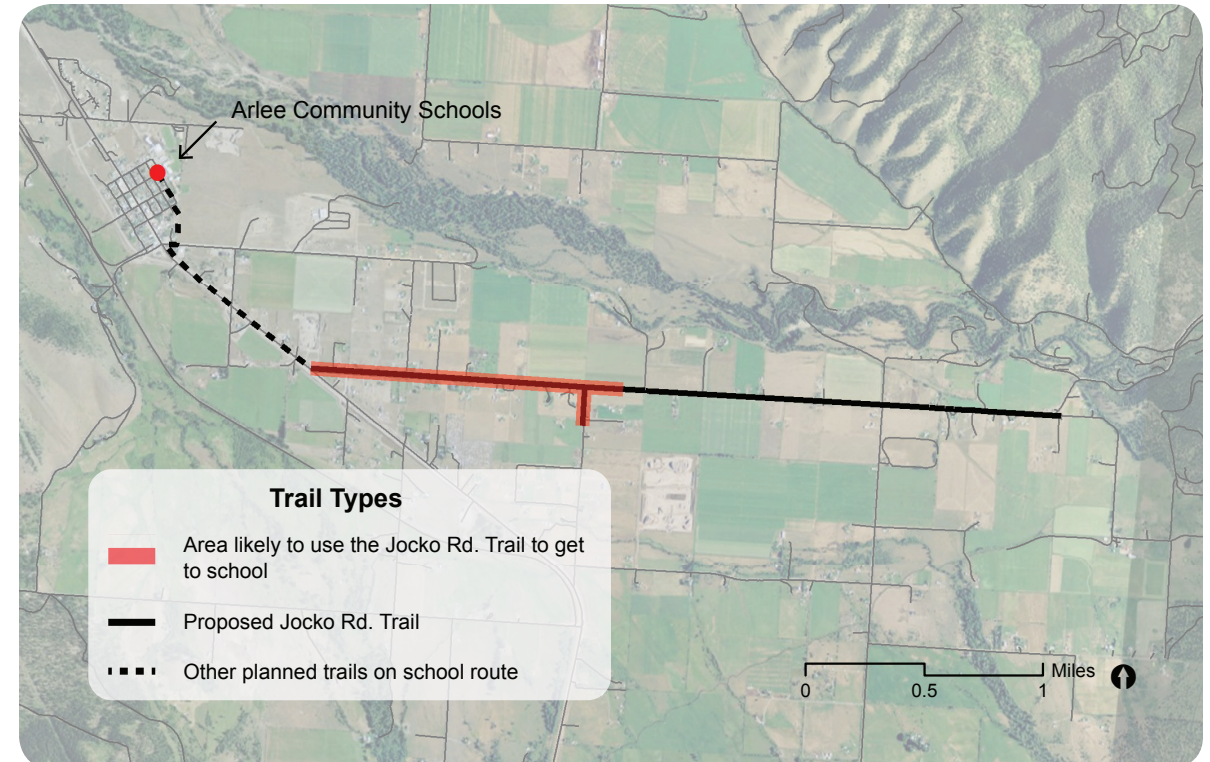


Fig. 3.9: Nelson et al. (2007) found that adolescents were willing to walk to school if they were within 2.5 miles of their school. This map shows what portion of Jocko Road is within this 2.5 mile threshold.

Trail Aesthetics and Community Value

Trail aesthetics and user preference is a final aspect to consider before proceeding with trail planning along Jocko Road and other county roads in the Jocko Valley. Understanding potential trail users' preferences for landscapes can help decision makers understand what types of trail environments are inviting, and support the actual use of a trail (Chom and Shafer 2009). Research presented in this section will help answer the question: would the residents of the Jocko Valley find a trail along Jocko Road an appealing place to recreate and travel?

Research into environmental psychology has helped identify what types of outdoor environments people find appealing. In their book "With People in Mind" Kaplan, Kaplan, and Ryan (1998) identify high preference landscapes as being both understandable, and promoting a sense of exploration. In their research, people overwhelmingly preferred settings that were easy to navigate, and also provided a sense of mystery and complexity. A winding, easy-to-navigate trail through diverse habitats would be ideal, according to the authors' criteria. Conversely, many people had a low preference for landscapes that consisted of "large expanses of undifferentiated landcover," such as farmlands and marshes, or were characterized by dense vegetation and obstructed views. A trail along Jocko Road would certainly be easy to navigate, yet it is unlikely that it would create a sense of mystery or exploration. Similarly, while the trail would provide open views of spectacular scenery, the immediate setting could be described as "large expanses of undifferentiated landcover." Within the urban context, Nassar (1998) found that survey respondents preferred landscapes with "desirable vegetation, openness and views." Respondents disliked landscapes with "poles, wires, poor maintenance, and a lack of coherent style." Again, a trail along Jocko Road would provide "openness and views," but would suffer from having "poles and wires" due to the adjacent utility corridor.

Research specific to non-motorized transport and aesthetic preference provides more critical insights. A survey of 2,873 users of 13 separate greenway trails in the Chicago area discovered the following about trail user preference (Gobster 1995). In terms of the trail surroundings, the most important attribute was "scenic beauty." Other important trail environment characteristics mentioned were "nature," "trees," "water bodies," and "hills and rolling topography." Survey results showed that the most important trail specific characteristic was a "smooth trail surface." Other important trail characteristics mentioned were "good

maintenance", "personal safety," "being away from cars and traffic," "peace and quiet," and "closeness to home." Another study that investigated aesthetic preferences for trail environments found that scenes that depicted trails next to roadways "were not well liked" among survey respondents and scored low in terms of "naturalness" and "distinctiveness": factors that were found to be important in terms of trail preference (Chom and Shafer 2009). Other research investigating runners' preferences found that roads and associated traffic reduced the enjoyment of joggers, as opposed to more "park-like" settings (Bodin and Hartig 2003). Chom and Shafer (2009) recommend that trails be created that provide visual access to bodies of water, based on the positive aesthetic that water provides trail users (Burmil et al. 1999). It cannot be denied that a trail along a roadway does not provide the most desirable setting for recreation.

Research into trail preference by ORV users provides additional insight. Snyder et al. (2008) found that riders had a strong preference for trails with scenic overlooks and vistas. ORV riders also showed specific preference for forest landscapes, followed by meadows, and finally agricultural land. This study also identified loop trails as being preferable to linear alignments. In terms of cycling, research has found that cyclists prefer landscapes that are neither monotonous in terms of landscape, nor physical effort. Both recreational and commuting cyclists seem to prefer routes with moderate hills (Sener, Eluru, and Bhat 2009 and Stinson and Bhat 2003). Cyclists also showed a higher preference for smooth paved trails over crushed stone paths. In terms of surface type, walkers were less preferential about trail surface, while equestrians preferred crushed stone surfaces (Gobster 1995).

In light of the research discussed here, it is not convincing that trails along roadways offer the most appealing environment for biking and walking. A trail along Jocko Road would certainly provide utility and safety to pedestrians and cyclists; however, it is unlikely that a trail there would attract users because of its aesthetic value, which must be considered before proceeding with further trails planning.

Community Research and Jocko Road

Some insights about Jocko Road could be gleaned from community activities discussed at the beginning of this booklet. The cognitive mapping activity revealed that 19.25% of the students' maps included Jocko Road, suggesting

that the road has a significant presence among the youth in the area. The post-it activity, however, produced very few comments that were specific to Jocko Road. This may indicate that few students consider the road neither a desirable, nor a dangerous destination. These results are not conclusive, but do provide a glimpse into the needs of the student community.

Conclusions

The intent of the research described above is to provide perspective about trails along rural county roads, and Jocko Road in particular. After reviewing the literature, it is clear that there is a great need in rural areas to provide opportunities for exercise and active living. Trails may be one low-cost opportunity for combating the high rates of obesity and related lifestyle diseases. Likewise, creating safe walking and biking environments is important in rural areas because of the lack of existing walking and biking facilities, and because of the high-speed traffic characteristic of these areas. The current situation along Jocko Road is not safe for walking and biking; the lack of shoulders and immediately adjacent ditches and irrigation canals make this so. A safer walking and biking environment should be pursued.

The question is: considering the limited financial and human resources available to the JVTC, is creating a trail along the Jocko Road a priority? The answer to this question is less clear. The National Household Travel Survey has shown that, for practical reasons of trip length, nearly everyone in rural areas uses a personal automobile for transit, and that most non-motorized trips in rural areas are for recreational purposes. Assuming that people are not likely to commute by walking or biking in the Jocko Valley, it is important to ask whether a trail along Jocko Road would be used for recreation purposes. The broader setting of the Jocko Valley is a strikingly beautiful place, but the immediate surroundings of Jocko Road has less aesthetic appeal. It does not provide a sense of mystery, close proximity of interesting vegetation, nor visual access to water. It also does not offer a trail loop or diverse terrain. Therefore, the research about trail preference does not suggest that people would travel out of their way to recreate along Jocko Road.

If the JVTC decides that the creation of trails for recreation rather than as a mode of transit is a priority, then there may be areas of higher importance for trails development in the Valley. First, there is an opportunity to team with the CSKT Natural Resources Department to help develop their proposed trail system within the Jocko River Restoration Area. Also, there is already a system of nature trails at the State Fish Hatchery that could be promoted, maintained, and improved upon. These two areas could be key links for creating a greenway trail that runs along the southern bench of the Jocko River. Creating a greenway trail along the Jocko River that was sensitive to its ecology and maintained the privacy of nearby residents would be no small task. If it was created, then it could have far-reaching effects in terms of protecting the river corridor from development, and providing public access to this fantastic natural asset. Arlee is a growing community, and if the population continues to increase in the West, the Jocko Valley could become much more densely populated. A greenway trail along the Jocko River bench could help conserve this amazing natural feature for all.

The promotion of trails along irrigation canals within the Valley is another opportunity that has been discussed by the JVTC. Jocko Valley residents already use canal roads for recreation. They provide an aesthetically pleasing walking environment, and nearby access to nature. Creating legitimate walking trails along canals has been achieved in the past, and could be pursued by the JVTC. Irrigation canal trails have been successful in Denver and Grand Junction, Colorado, as well as in Phoenix, Arizona (Grand Junction Urban Trails Committee 1997). Creating trails along irrigation canals can be contentious for several reasons, including liability concerns, interference with canal operation and maintenance, vandalism, safety, and loss of privacy for adjacent landowners. The Grand Junction Urban Trails Committee (1997) argues that these concerns can be surmounted with careful agreements between private landowners, irrigation companies, and local governments. For an in-depth discussion of trails along irrigation canals please see Carelson (2000) *Utilizing Irrigation Canals in Northern Utah for Recreational Trail Use: An Evaluation of Issues and Concerns*, a Master's Thesis available online at americantrails.org.

Other research has stated that the creation of walking trails is often not enough to promote active lifestyles in a community. Brownson et al. 2005 investigated the use of walking trails in rural communities in Missouri; surveys discovered

that few residents knew about existing walking trails (24.5%) and even fewer residents used these trails (8%). Trail development must be combined with social and behavioral interventions to get people out and walking (Brownson et al. 2005). The organization of walking and biking events within the Jocko Valley is one way that the JVTC could start making an immediate impact.

Creating community trails in the Jocko Valley is a valuable pursuit, one that the JVTC should be proud to have started. There are many forms in which trails could be pursued, and the JVTC has already been successful in moving these efforts forward. Before the JVTC commits to a single strategy for creating trails in their community, further thought and community involvement is recommended so that resources are spent in a manner that provide the most community benefit.



Fig. 3.10: A view of the Jocko River taken near the baseball fields in Arlee. Trail development along the river bench would provide visual access to the river offering a better aesthetic experience than a trail along Jocko Road.

Trail Border Plantings

The Jocko Valley Trails Committee may wish to consider ways to maximize user satisfaction for community trails in Arlee. According to the results of the planning team's community survey, Arlee residents would like to see benches, trash cans, and trail signs located along local trails. In addition to such practical features, a well-planned vegetated strip of land adjacent to trails may contribute to feelings of safety, discourage access to trails at locations other than trailheads and intersections, and create a sense of place for the trail.

Two planting options are provided in the following sections to visually enhance the experience of trail users. The first design option uses intense colors from a palette of native herbaceous perennial plants to call attention to the line of the trail across the landscape. This planting border is designed to be visible from a distance, meaning people walking on the trail can see the direction of the trail in the distance, while people in cars will also notice the highlighted trail. The second option makes use of softer colors and textures meant to blend with the surrounding landscape, but also to create visual detail apparent to those walking on the trail.

These designs take cues from the style of Gertrude Jekyll, a British planting designer in the late 1800s and early 1900s. The flowing pattern of plants may be implemented on any scale, repeated adjacent to itself many times over. Using the same plants consistently along the trail allows pedestrians to easily identify an official community trail. Seasonal changes in the pattern of plants in bloom and showing fall color create interest year round.

Following the planting options are lists of plants that may be used in trail border plantings. This list should be useful in the future as trails are developed across the Jocko Valley. These plants were selected from species native to the Flathead Valley for their pleasing seasonal visual characteristics and usefulness for screening views, providing shade, and adding color or texture. While most of the plants listed here will thrive in full sun and dry conditions, as much of the Jocko Valley is flat and open, a number of options are provided for areas with varying site conditions.

Bright Trail Border

Fig. 4.1: Bright Border planting plan

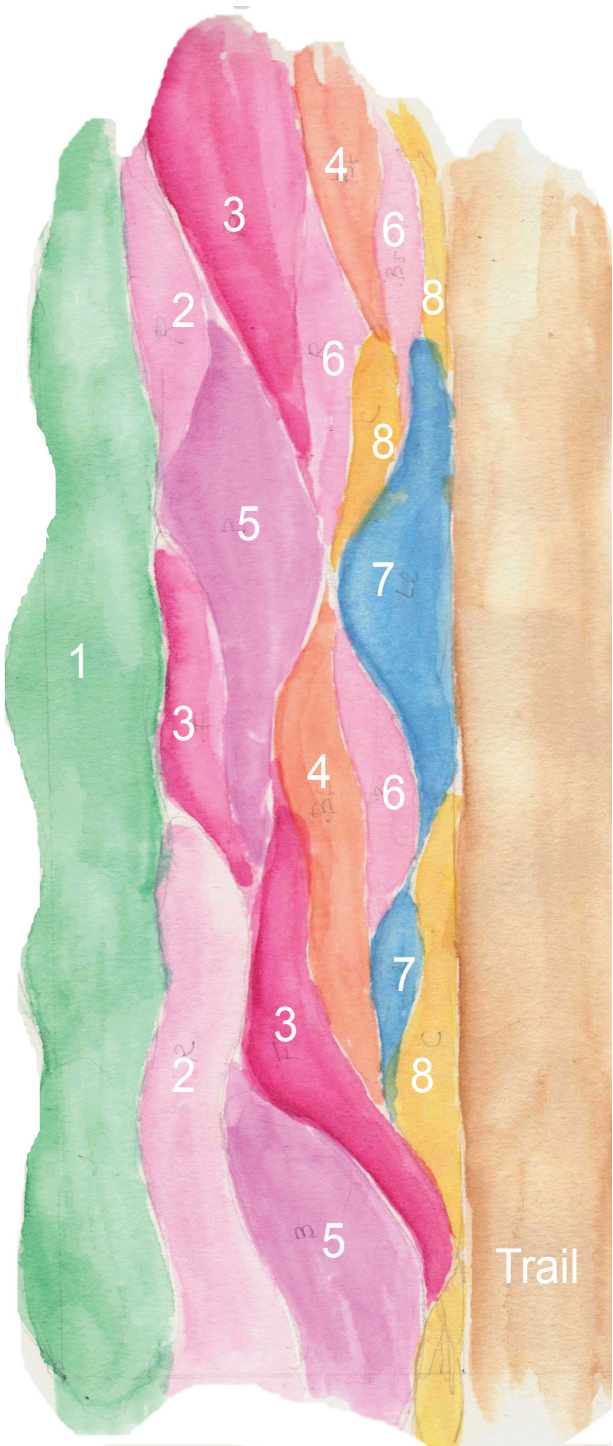


Figure 4.2: Photos of Bright Border plants.

ID	Common Name	Scientific Name	Color	Bloom	Height
1	Common Juniper	<i>Juniperus communis</i>	blue-green	n/a	5'
2	Prairie Rose	<i>Rosa arkansana</i>	deep pink	Jn-Aug	4'
3	Fireweed	<i>Chamerion angustifolium</i>	bright pink	mid JI-Aug	4'
4	Blanket Flower	<i>Gaillardia aristata</i>	yellow, orange	Jn-S	2'
5	Bee Balm	<i>Monarda fistulosa</i>	purple-pink	Jn-JI	3'
6	Blazing Star	<i>Liatris punctata</i>	light purple	Aug-S	18"
7	Little Larkspur	<i>Delphinium bicolor</i>	deep blue	M-Jn	12"

The “Bright Trail Border” design demonstrates one possible group of plants used to create a barrier on one side of a trail, as well as an attractive amenity. Bright colors highlight the location of the trail from a distance.

Planting a thick row of Common Juniper will help prevent people from leaving or accessing the trail from points other than trailheads and trail intersections. A lower 3-5' variety will serve this function, but taller cultivars may be used to increase visual screening where homes or businesses are near the trail. These functions are maintained year-round by the evergreen shrub.

At least two of the bright wildflowers shown here are in bloom at all times from May through September. By massing together large clumps of like flowers, this design emphasizes strong colors. The massed flowers are ranged by height with the shortest near the trail. All the flowers in this design are native to the Flathead Valley area, thrive in dry soils and full sun.

This design creates a joyful and lively experience for trail users of all ages.

Soft Trail Border

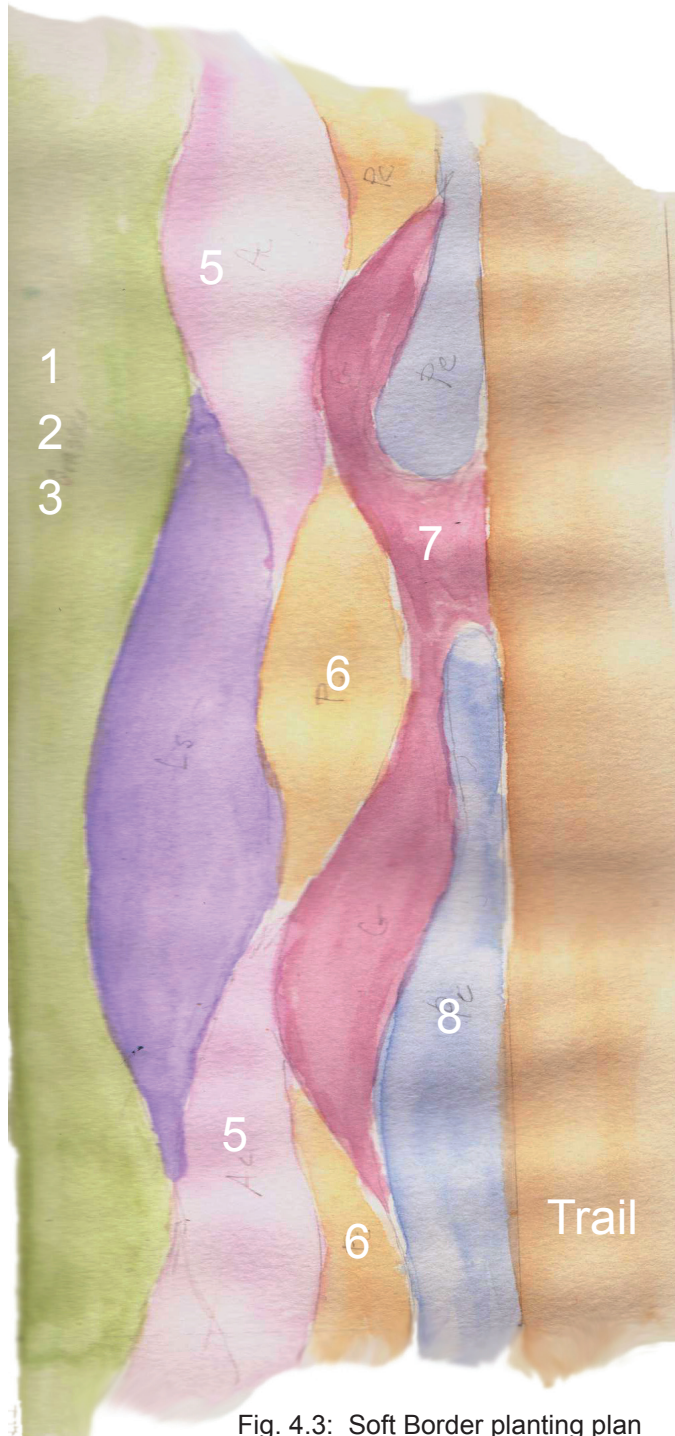


Fig. 4.3: Soft Border planting plan

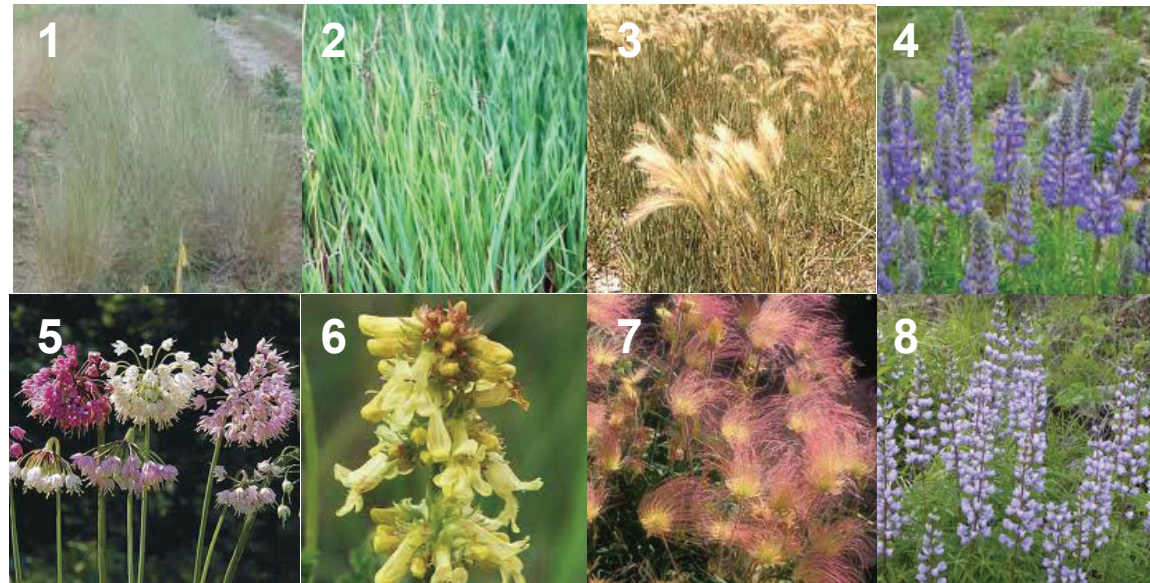


Figure 4.4: Photos of Soft Border plants

ID	Common Name	Scientific Name	Color	Bloom	Height
1	Slender Wheatgrass	<i>Elymus trachycaulus</i>	med. green	M-Aug	5'
2	Sweetgrass	<i>Hierochloe odorata</i>	med. green	M-Jl	4'
3	Bottlebrush Squirreltail	<i>Elymus elymoides</i>	bright pink	M-Jl	4'
4	Silky Lupine	<i>Lupinus sericeus</i>	blue, purple	Jn-Aug	2'
5	Nodding Onion	<i>Allium cernuum</i>	purple-pink	Jn-Jl	3'
6	Yellow Penstemon	<i>Penstemon confertus</i>	light yellow	Jl	18"
7	Prairie Smoke	<i>Delphinium bicolor</i>	pink, purple	A-M	12"
8	Fuzzytongue Penstemon	<i>Penstemon eriantherus</i>	violet	M-Jn	15"

The “Soft Trail Border” design demonstrates plants used to define the trail experience, and gently blend with the surrounding landscape.

Tall grasses ranging from 4-5’ create a backdrop for wildflowers and attract birds. Placed away from the trail, the grasses clearly delineate where the human-modified area of the trail ends and the rest of the landscape begins.

The wildflowers in this design are massed and arranged according to height, with smaller plants nearest the trail. The soft colors and textures of this group of plants will blend with the broader landscape, while simultaneously showing trail users that the trail is a special place. With blooms present May through August, this edge design welcomes visitors to track seasonal changes. All plants in this selection are native to the Flathead Valley, and thrive in dry soil and full sun.

This design encourages a peaceful atmosphere, attention to detail, and feelings of safety by marking the trail as a human space without contrasting with surroundings by using soft and textured plants.

Grasses



Fig.4.5: Idaho Fescue



Fig. 4.6: Foxtail Barley

This list of **native Flathead Valley grasses** provides bunch- and sod-forming options for trail edge design. All grasses are **bunchgrasses**, unless noted as **sod-forming** in the table below.

The tallest grasses are best placed at a distance from the trail edge to **define** the end of the **trail space**. Placed directly adjacent to a trail, tall grasses may droop over the trail surface, narrowing it and reducing feelings of safety and visibility.

Medium height grasses may be used ornamentally, in the same way as an herbaceous perennial. Generally, bunchgrasses look best **massed together**. Sod-forming grasses may be planted at a distance from one another, and will fill in over time.

Common Name	Scientific Name	Height	Moisture	Soil*	Light	Tolerances	Notes
Sandberg's Bluegrass	<i>Poa sandbergii</i>	24"	dry	S, L	full sun	drought	Bunchgrass
Bottlebrush squirreltail	<i>Elymus elymoides</i>	18"	dry		full sun	thin soil	Easily establishes on disturbed sites
Idaho Fescue	<i>Festuca idahoensis</i>	24"	dry	L, C	full sun		Blue-green leaves
Prairie junegrass	<i>Koeleria macrantha</i>	18"	dry	S, L	full sun	drought	Fluffy seed heads; establishes on disturbed sites
Pinegrass	<i>Calamagrostis rubescens</i>	12"	dry to moist		part-full shade		Soft foliage, sod under conifer trees
Sweetgrass	<i>Hierochloa odorata</i>	24"	wet	L, C	part shade		Sweet smell, ceremonial, sod-former
Alpine Timothy	<i>Phleum alpinum</i>	12"	moist		full sun		
Slender Wheatgrass	<i>Elymus trachycaulus</i>	36"	dry to moist	S,L,C	part-full sun	saline	Fast cover, non-aggressive; perennial 3-4 yrs.
Great Basin Wildrye	<i>Leymus cinereus</i>	6'	dry to moist	L,C	full sun	short floods	Wildlife cover, erosion control
Foxtail Barley	<i>Hordeum jubatum</i>	1-2'	wet	S,L,C	full sun	wet soil	Nodding, bristly seed heads

* Soil symbols refer to (L) loam, (C) clay, and (S) sand.

Herbaceous Perennials

Common Name	Scientific Name	Height	Moisture	Soil	Light	Flower	Notes/Tolerances
Nodding Onion	<i>Allium cernuum</i>	24"	moist	L,C	part-full sun	White, Pink	Edible leaves and bulb
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	28"	dry	L	part-full sun	Pink	Delicate flowers
Yellow Columbine	<i>Aquilegia flavescens</i>	15"	moist	L	part-full shade	Yellow	Delicate leaves
Harebell	<i>Campanula rotundifolia</i>	24"	dry-moist	S,L	part-full sun	Blue, White	
Fireweed	<i>Chamerion angustifolium</i>	4'	dry-moist	L	full sun	Pink	Willow-like leaves
Little Larkspue	<i>Delphinium bicolor</i>	12"	dry-moist	L	full sun	Purple	
Purple Coneflower	<i>Echinacea angustifolia</i>	1-2'	dry	S,L,C	full sun	Purple	Blooms August-September, drought tol.
Yellow Bell	<i>Fritillaria pudica</i>	5"	dry	L	part-full sun	Yellow	Green, grass-like leaves
Blanket Flower	<i>Gaillardia aristata</i>	2'	dry-moist	S,L	full sun	Red, orange	Showy flowers
Prairie Smoke	<i>Geum triflorum</i>	8"	dry-moist	L	full sun	Pink, Yellow	
Perennial Prairie Sunflower	<i>Helianthus maximiliani</i>	1-6'	dry	S,L	full sun	Yellow	Blooms July-September, flowers best in sandier drier soils, drought tolerant
Roundleaf Alumroot	<i>Heuchera cylindrica</i>	16"	dry-moist	S, L	part-full sun		Basal leaves rocky soil
Wild Hollyhock	<i>Illiamna rivularis</i>	6'	dry-moist	S,L,C	full sun	Pink	Showy flowers, maple-shaped leaves
Bitterroot	<i>Lewisia rediviva</i>	3"	dry	S	full sun	White, pink	Showy flowers, gravelly soil
Blazing Star	<i>Liatris punctata</i>	18"	dry	S,L	full sun	Purple	Dark green leaves
Lewis's Blue Flax	<i>Linum lewisii</i>	3'	dry-moist	S,L	part-full sun	Light blue	
Silky Lupine	<i>Lupinus sericeus</i>	30"	dry	S,L	part-full sun	Blue	Silvery green leaves
Bee Balm	<i>Monarda fistulosa</i>	3'	dry-moist	L	part-full sun	Light purple	Fragrant, edible dark green flowers
Yellow Penstemon	<i>Penstemon confertus</i>	20"	dry-moist		full sun	White, Yellow	gravelly soil
Fuzzytongue Penstemon	<i>Penstemon eriantherus</i>	6"	dry	S	full sun	Light blue	Green, grey leaves, gravelly soil
Canada Goldenrod	<i>Solidago canadensis</i>	3'	moist	S,L	part-full sun	Yellow	

Groundcovers



Fig. 4.6: Kinnikinnick



Fig. 4.8: Creeping Oregon Grape



Fig. 4.7: Bunchberry

Groundcovers may be useful to **prevent erosion** and, in the case of the taller plants, to cover areas where people may otherwise be tempted to leave the trail. They also ensure that the soil **retains moisture**.

Evergreen groundcovers create **visual interest** year round, often with fine flowers during the spring or summer, green leaves through fall and winter, and forms that hold their shape under snowcover.

Low groundcovers may be placed at the **edges of a trail** to define the space, even where there is no other planting design.

Common Name	Scientific Name	Height	Moisture	Soil	Light	Flower	Aesthetic traits	Notes/Tolerances
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	6"	dry-moist		part-full sun	White, Pink	Evergreen leaves	medium-course soil
Creeping Oregon Grape	<i>Berberis repens</i>	12"	dry		full sun	Yellow	Green to red in fall	medium-course soil
Bunchberry	<i>Cornus canadensis</i>	6"	moist	S,L	part-full sun	White	Showy leaves	
Sulfur Buckwheat	<i>Eriogonum umbellatum</i>	12"	dry-moist		part-full sun	Cream, Yellow	Basal leaves	medium-course soil
Wild Strawberry	<i>Fragaria virginiana</i>	5"	dry-moist		part-full sun	White	Green to red in fall	poor soil
Creeping Juniper	<i>Juniperus horizontalis</i>	12"	dry	S	part-full sun		Evergreen leaves	rocky soil
Twinflower	<i>Linnaea borealis</i>	6"	moist	L	part-full shade	Pink	Evergreen leaves	
Grouse whortleberry	<i>Vaccinium scoparium</i>	12"	moist		part-full sun	Pink	Red leaves in fall	acidic soil

Shrubs



Fig. 4.8: Golden Currant



Fig. 4.9: Rabbitbrush

These native Flathead Valley shrubs are useful for **screening** homes or businesses near a trail, creating **light shade**, attracting birds, and maintaining visual interest throughout the year. Many of these shrubs flower in the spring, and have **brightly colored fruit**.

Shrubs should not be placed directly adjacent to a trail where branches may overgrow it. They are best used to define space at a little distance from the trail.

Common Name	Scientific Name	Height	Moisture	Soil	Light	Flower	Notes/Tolerances
Rocky Mountain Maple	<i>Acer glabrum</i>	30'	moist	S,L	part-full shade		Red and green stems in fall
Western Serviceberry	<i>Amelanchier alnifolia</i>	15'	moist	S,L	part-full sun	White	Deep green; yellow and red in fall
Rabbitbrush	<i>Chrysothamnus nauseosa</i>	2-4'	dry	S,L,C	full sun	Yellow	Blooms August-October
Red-osier Dogwood	<i>Cornus sericea</i>	10'	moist	L,C	part-full sun	White	Red to Purple in fall with red stems
Black Hawthorn	<i>Crataegus douglasii</i>	20'	moist	S,L	part-full sun	White	Fall colors and thorns
Common Juniper	<i>Juniperus communis</i>	5'	dry	S,L	full sun	Evergreen	rocky soil
American Plum	<i>Prunus americana</i>	6-10'	moist	L	full sun	White	Blooms April-May, persistent fruit
Common Chokecherry	<i>Prunus virginiana</i>	15'	dry	S,L	part-full sun	White	Green to red in fall, tolerates some moisture
Golden Currant	<i>Ribes aureum</i>	3-6'	dry	S,L,C	full sun	Yellow	Yellow to red fruit
Prairie Rose	<i>Rosa arkansana</i>	4'	dry	L	full sun	Deep pink	Thorny leaves
Sandbar Willow	<i>Salix exigua</i>	13'	moist-wet	S,L	part-full sun	Dioecious	Tolerates alluvial soil
Canada Buffaloberry	<i>Shephardia canadensis</i>	6'	moist	S,L	part-full sun	Brown, Yellow	Green leaves with rusty dots; dioecious
Sitka Mountain-ash	<i>Sorbus sitchensis</i>	15'	moist	L,C	part sun	White	Fall color, tolerates rich soil
White Spirea	<i>Spiraea betulifolia</i>	1.5'	moist	S,L	part-full sun	Light green	
Common Snowberry	<i>Symphoricarpos albus</i>	4'	dry-moist	S,L	part-full sun	Pink, White	Tolerates gravelly, well drained soil



Fig. 4.9: Paper Birch



Fig. 4.10: Western Larch

The following native Flathead Valley trees may be useful for designating **trail heads**, creating areas of **shade** in otherwise open stretches, and defining resting areas with benches or scenic views. Many of these trees have more **specific soil needs** that other plants listed here, and care must be taken that they are sited appropriately to ensure longevity and growth.

Both evergreen and deciduous trees provide strong forms year round. Deciduous trees may be placed strategically to add **fall color** to a landscape. Consider the **texture and color** provided by bark in placing trees near trails.

Common Name	Scientific Name	Height	Moisture	Soil	Light	Notes/Tolerances
Paper Birch	<i>Betula papyrifera</i>	45'	moist	S,L,C	full sun	Green to yellow leaves in fall
Rocky Mountain Juniper	<i>Juniperus scopulorum</i>	20'	dry	S,C	full sun	Evergreen
Western Larch	<i>Larix occidentalis</i>	165'	dry	S,L	full sun	Yellow leaves, tolerates gravelly soil
Engelmann Spruce	<i>Picea engelmannii</i>	165'	moist	L	part sun	Evergreen
Lodgepole Pine	<i>Pinus contorta</i>	82'	dry-moist	S,L	part sun	Evergreen, prefers cool climate, well drained soil
White Pine	<i>Pinus monticola</i>	165'	moist	S,C,L	full-part sun	Evergreen, prefers acidic soil
Ponderosa Pine	<i>Pinus ponderosa</i>	115'	dry	S,C	full sun	Evergreen, well drained, alkaline soil
Black Cottonwood	<i>Populus balsamifera</i>	120'	moist	S,L,C	full sun	Green to yellow leaves in fall
Quaking Aspen	<i>Populus tremuloides</i>	40'	moist	L,C	part-full sun	Green to yellow leaves in fall
Douglas Fir	<i>Pseudotsuga menziesii</i>	175'	dry-moist		full sun	Evergreen, prefers medium course soil

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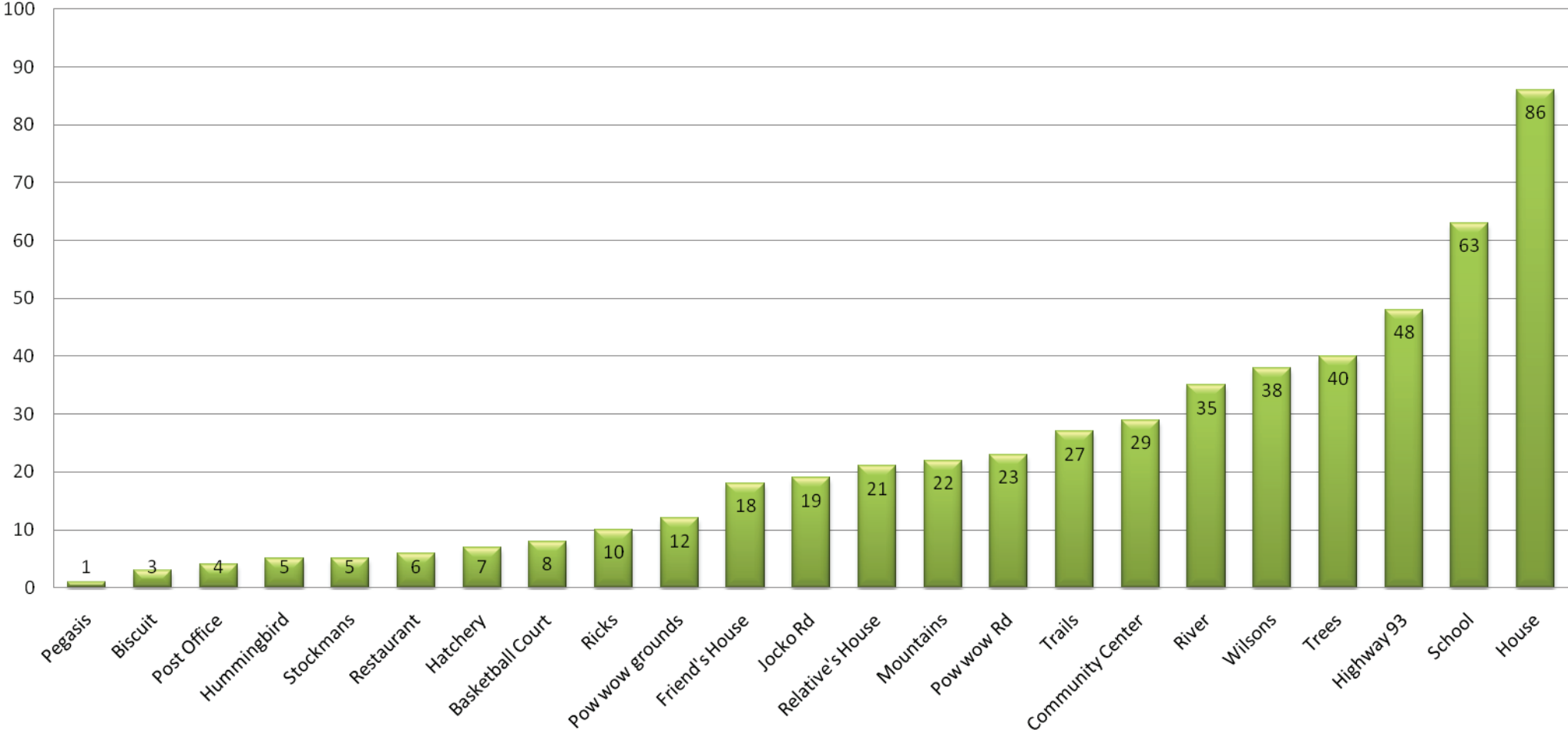
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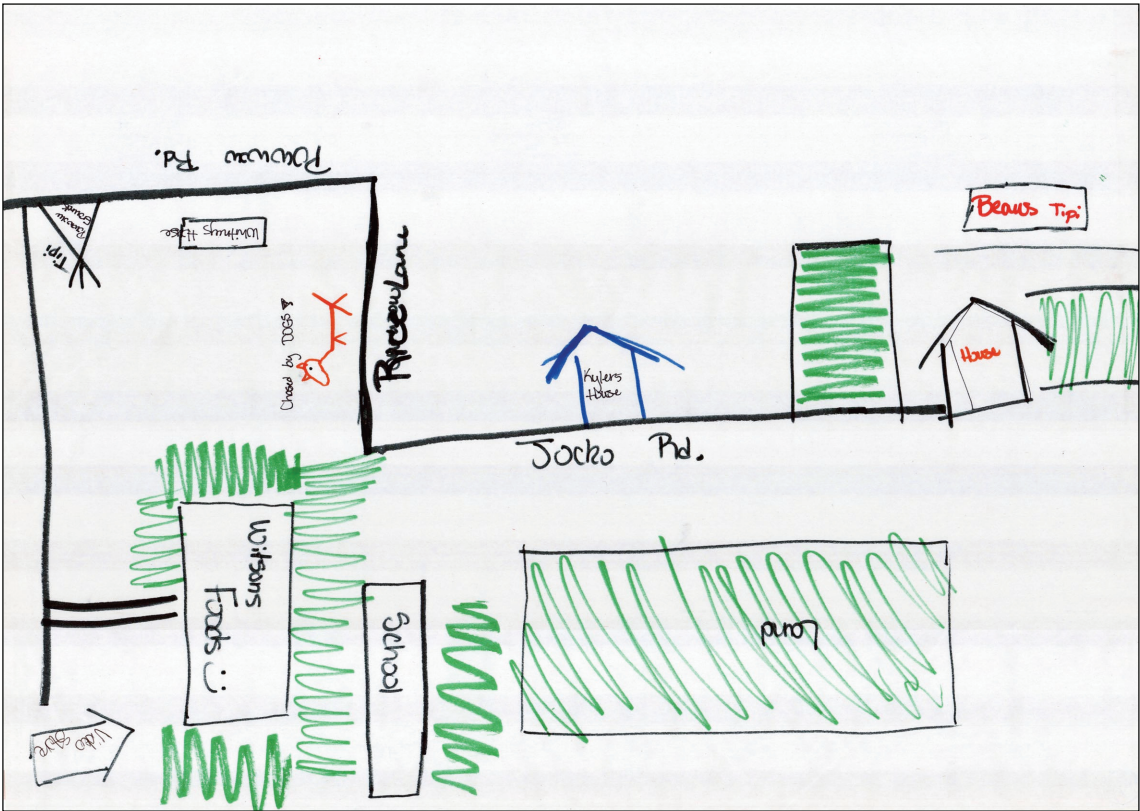
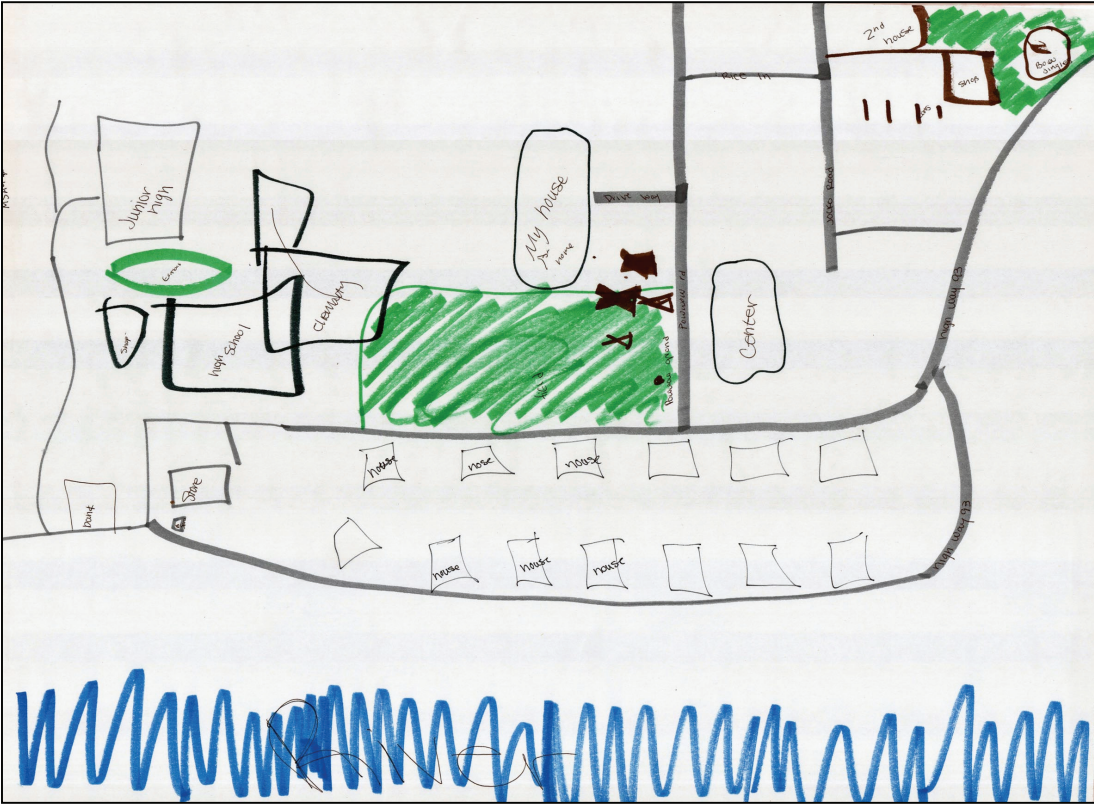
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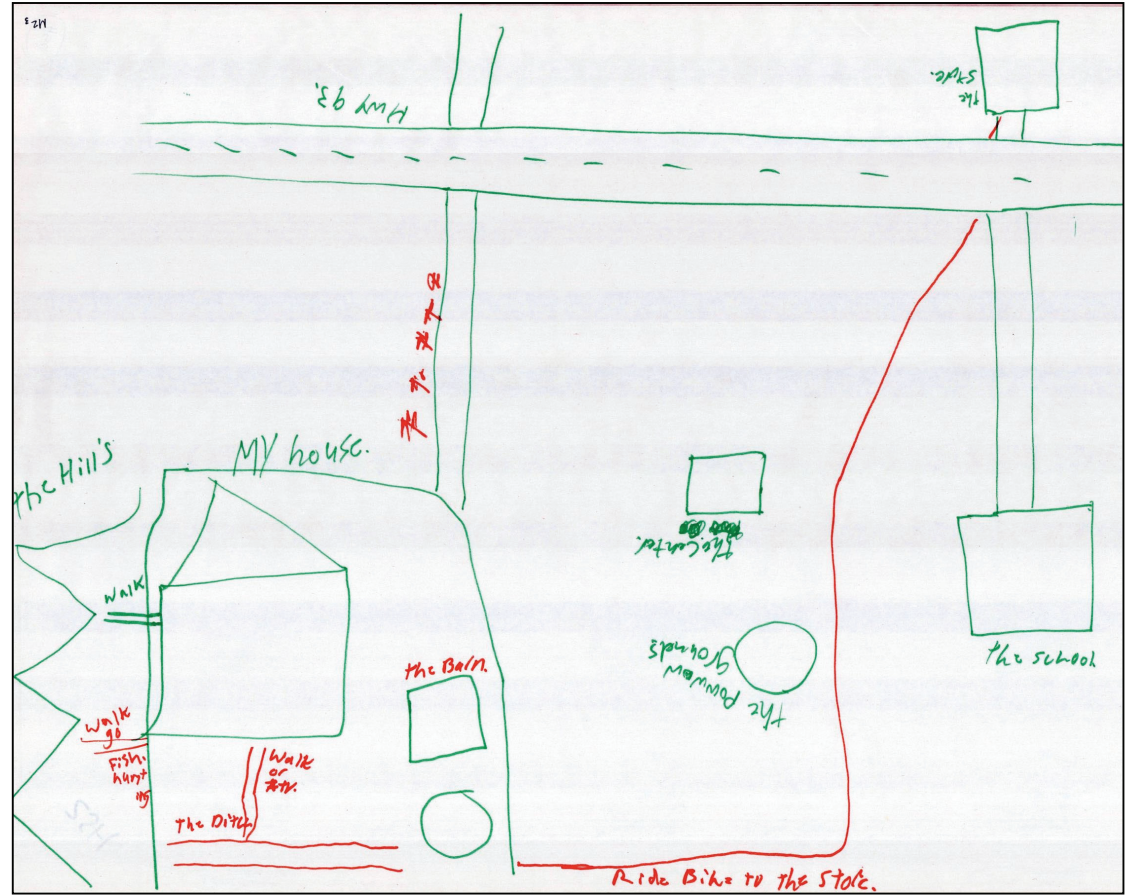
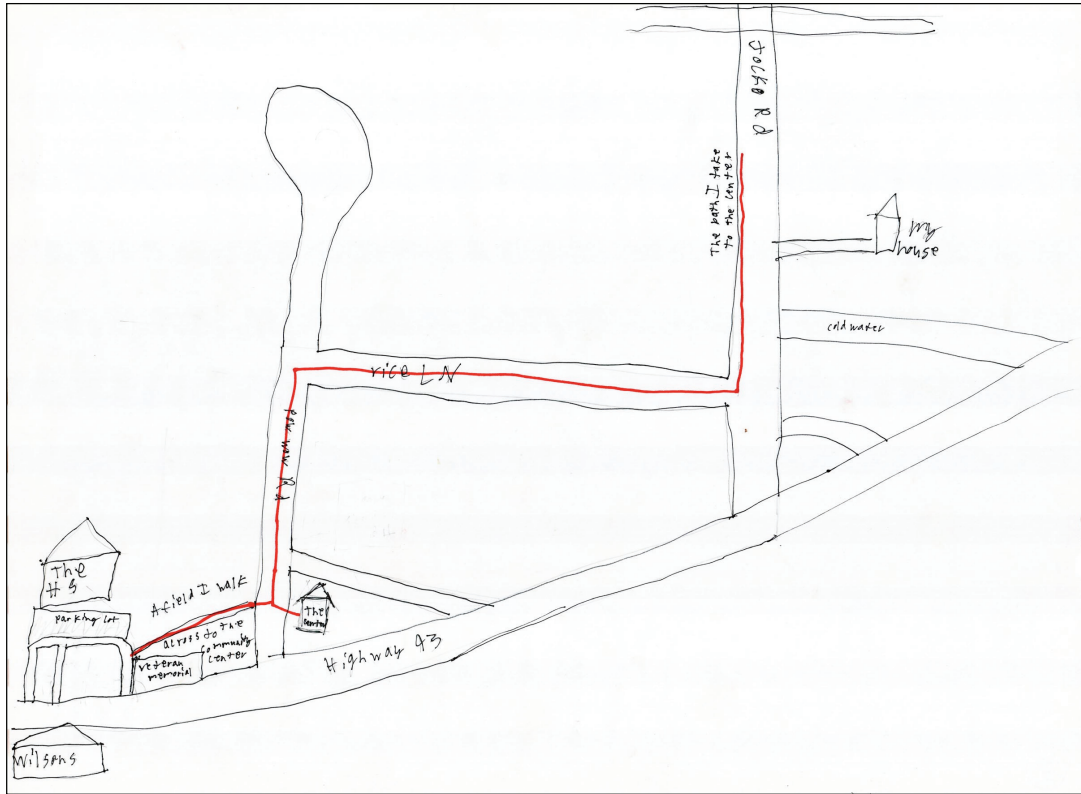
Appendix I: Results from the cognitive mapping activity showing the percent of students' cognitive maps representing the following areas and features in the Jocko Valley

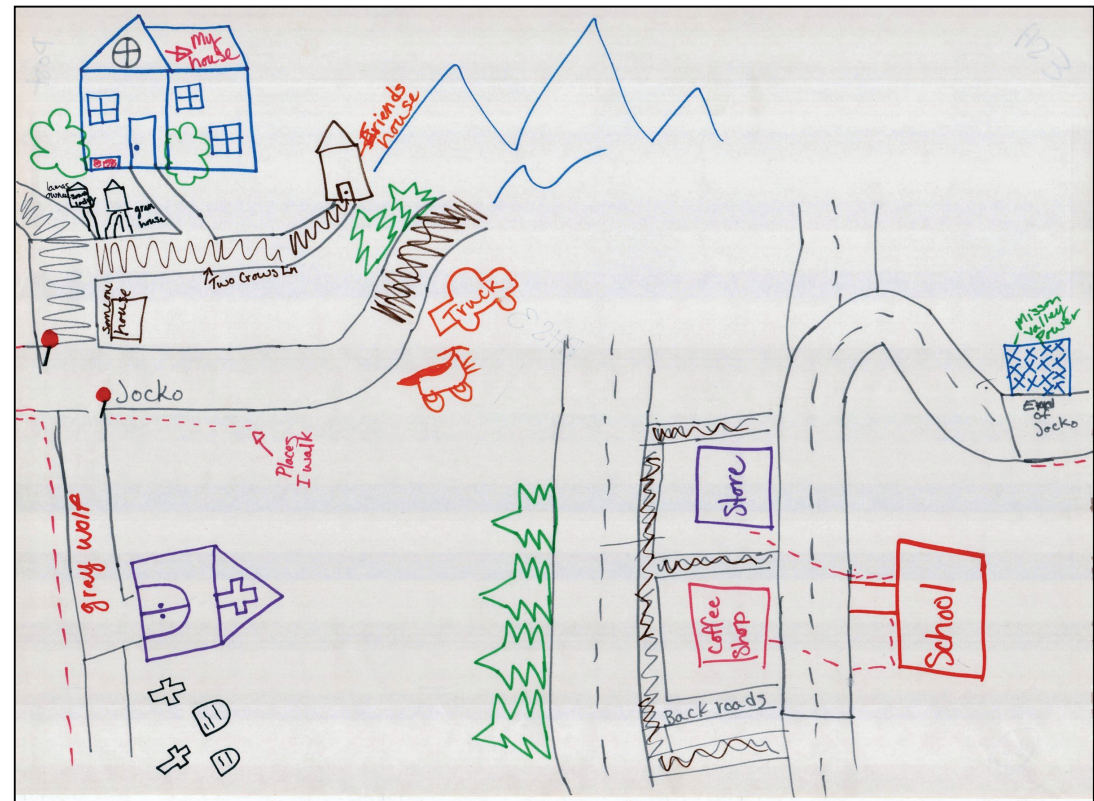
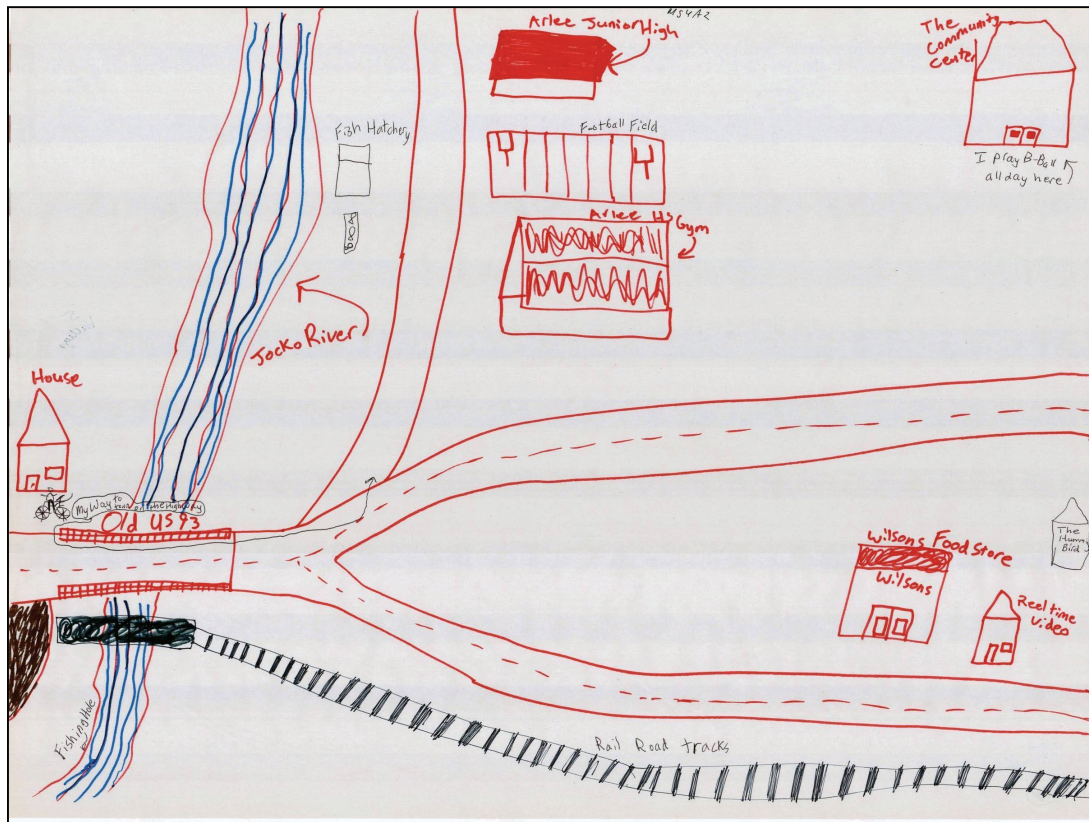
Percent of maps with feature

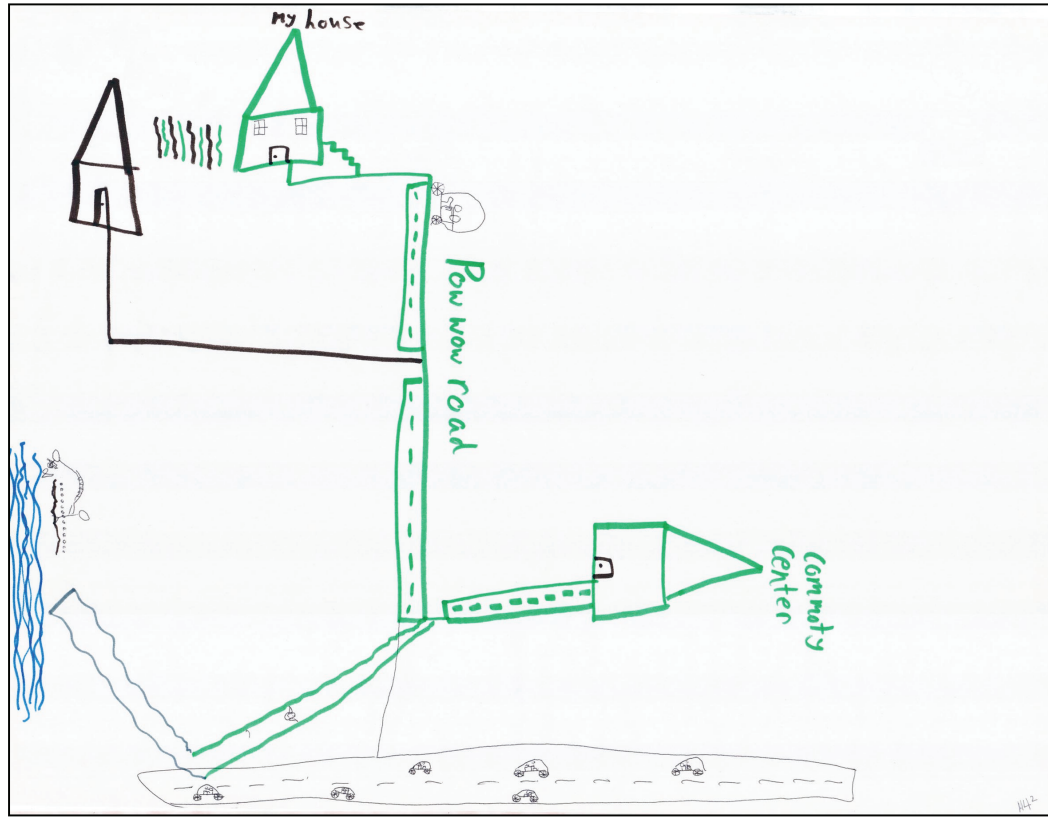
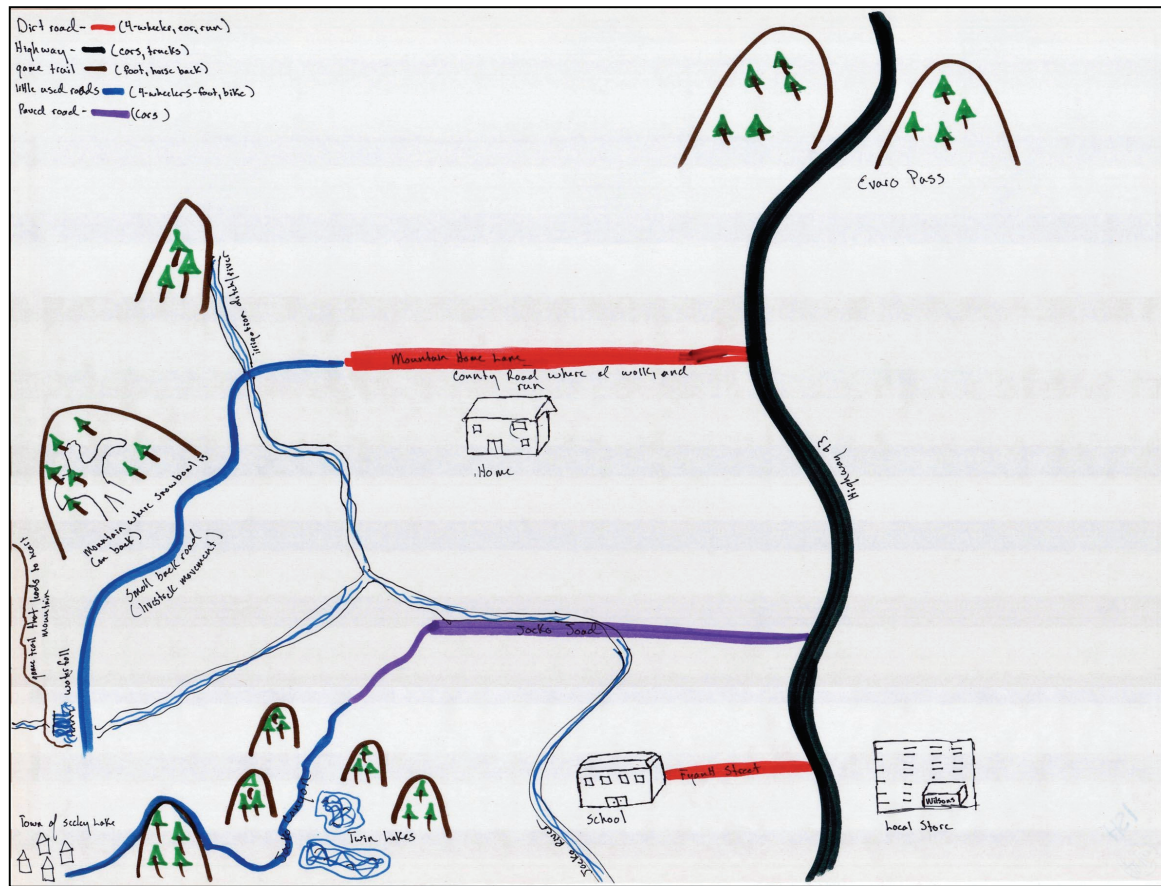


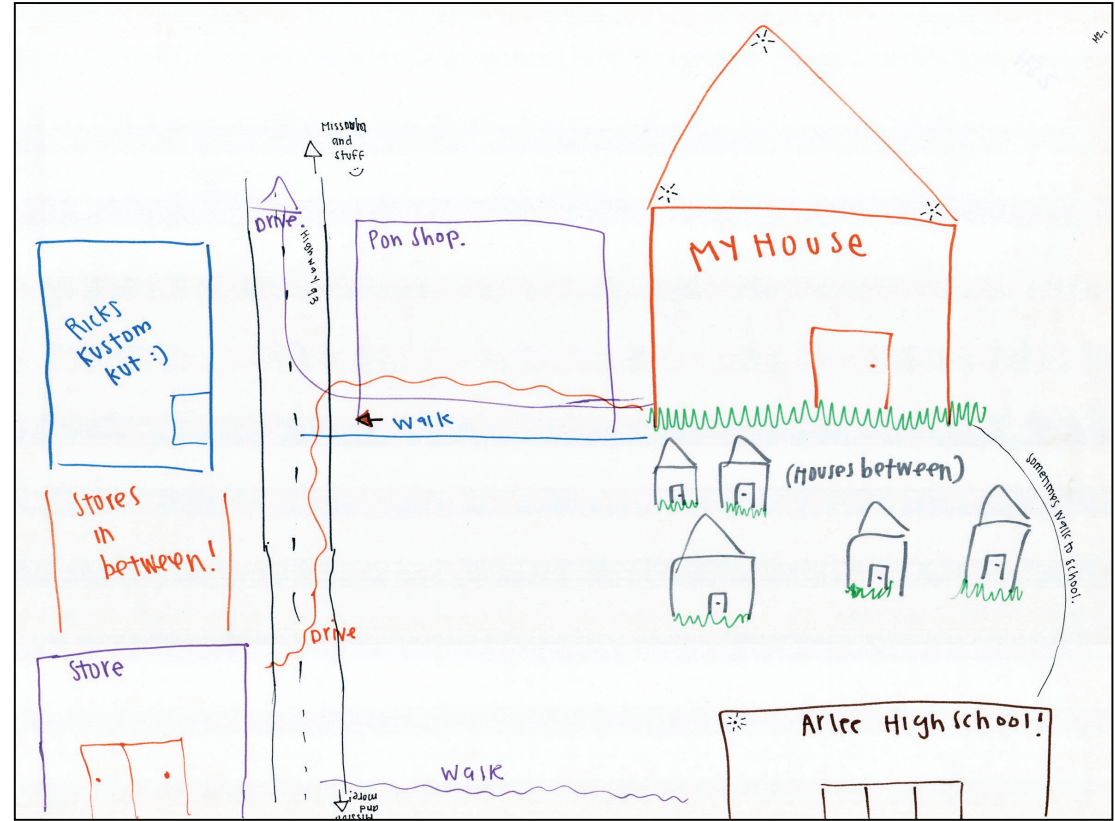
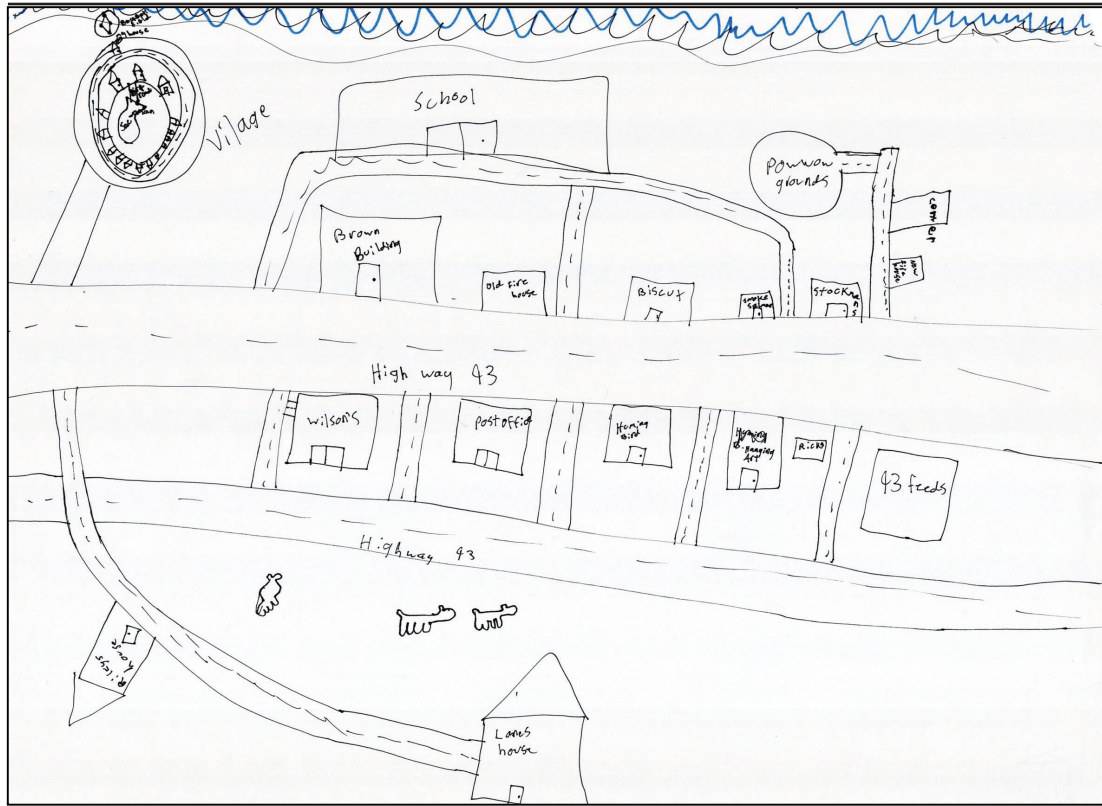
Appendix II: Selected copies of students' cognitive maps











Appendix III: Comments written on post-its during the post-it mapping activity. Some post-it comments were not included in this list because they were illegible, or did not reference a particular activity or place (i.e. “right here” or “this place”).

Green Post-its: "Where I feel safe"

<i>Outdoor activities</i>	<i>Natural features</i>	<i>Other</i>		<i>Trails/walking</i>
I like riding horses in these mountains	Creek/river canal	Basketball gym	Heartview	Walking
I like Doney rd because I could ride there	River by house	School (2)	Football field (2)	Fun trail to walk on
I would like to be able to ride a bike into town	Mountains (2)	Tracks/courts good (3)	Rick's	Trails
Where I ride my four wheeler	Saddle Mountain	The Biscuit	Wilson's (5)	Nature trail (2)
Another camping spot	River by house	Jr High Courts	Community Center (5)	Good trail by my house little circle
A place we go camping	Park	Pow wow grounds	Lookout tower	
Where I ride my bike (2)	The river/fish hatchery	Behind apple trees	S Couture Lp	
Where I hunt (2)	The river	My house (8)	Jocko Rd	
Where I fish	Pow wow river	Friend's house (3)	Relative's house (1)	
Fishing Finley Creek	Fish Hatchery (3)	Along Jocko Rd to Rice Ln	Softball field	
Biking		Library		
Where I walk				

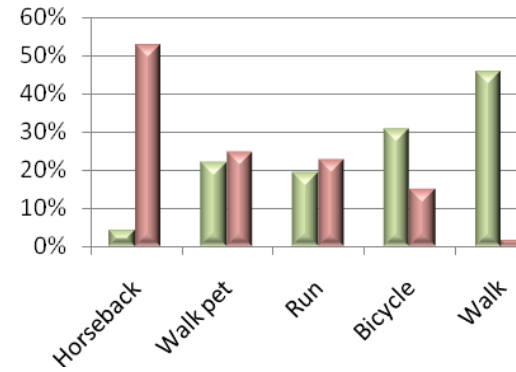
Red Post-its: "Where I do not feel safe"

Highway 93	Drinking/drugs	Other		Animals
Highway 93 outside of town by Tapit Rd	Dangerous drunks no night walking Indian Village	Village	Finley Creek	Finley Creek I always run into bears off map
Maybe too many cars	Meth shack (2)	Playground	I wrecked sledding here	Bears coyotes
Along highway to dirty corner	Res bronx people drink here housing project	Don't like walking dog here	River cliffs	Dangerous bears and lots of other wild animals
Walking across canal	Drug dealer	Weirdo neighbors next to where I used to live	Fences	Too many bears
Walking on bridge		Friend's house	Trail to pow wow grounds	Friends house bears mountain lions
Highway 93 needs a trail		Deep into vegetation at night	B-ball court	Don't like this spot got stalked by mountain lion
Highway 93 (2)		Don't feel safe in neighborhood	Sander's Rd [name] and others	Four dogs I hate
Ppl not slowing down and ppl cross btwn PW & Hwy		Bad playground would not be safe at all	drive too fast Oxford Ln	Sackwoman mean dogs
Highway 93 no sidewalks		Pow wow Rd it feels too long	School	Vicious dogs bite people
Middle of highway			Barbed wire	
Crossing Highway 93			People coming around fast and kids playing	
Highway 93 in town				
Need trail here between highways				
Highway 93 by Lumpry outside ot town				

Appendix IV: Results from community survey showing community opinions regarding trail use, trail amenities, and community involvement.

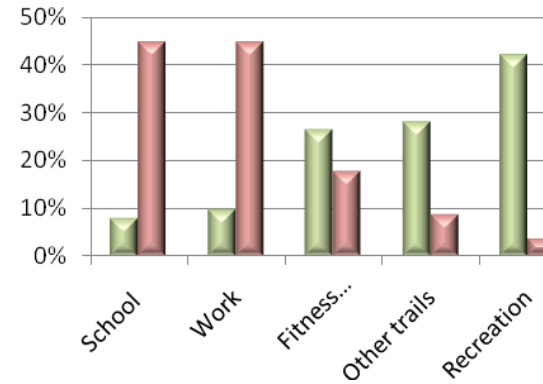
How often would you use a trail for the following activities:

	Walk	Horseback pet	Run	Bicycle	Walk
5 (Very Often)	4%	22%	19%	31%	46%
4	4%	16%	11%	19%	27%
3	4%	17%	15%	10%	16%
2	8%	5%	12%	11%	7%
1 (Never)	53%	25%	23%	15%	2%
Unsure	26%	16%	20%	14%	3%



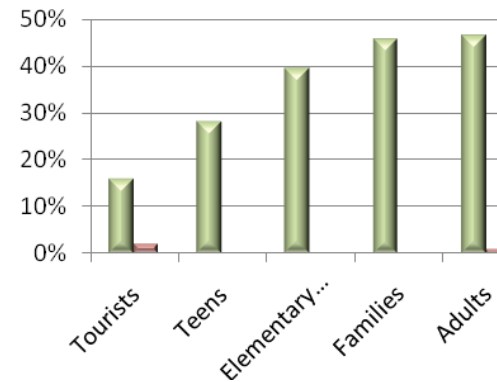
How often would you use a trail for the following purposes:

<i>To get to:</i>	School	Work	Fitness Center	Other trails	Recreation
5 (Very Often)	8%	10%	26%	28%	42%
4	4%	3%	16%	21%	25%
3	12%	9%	8%	9%	16%
2	6%	8%	9%	11%	9%
1 (Never)	45%	45%	18%	9%	4%
Unsure	25%	26%	24%	23%	5%



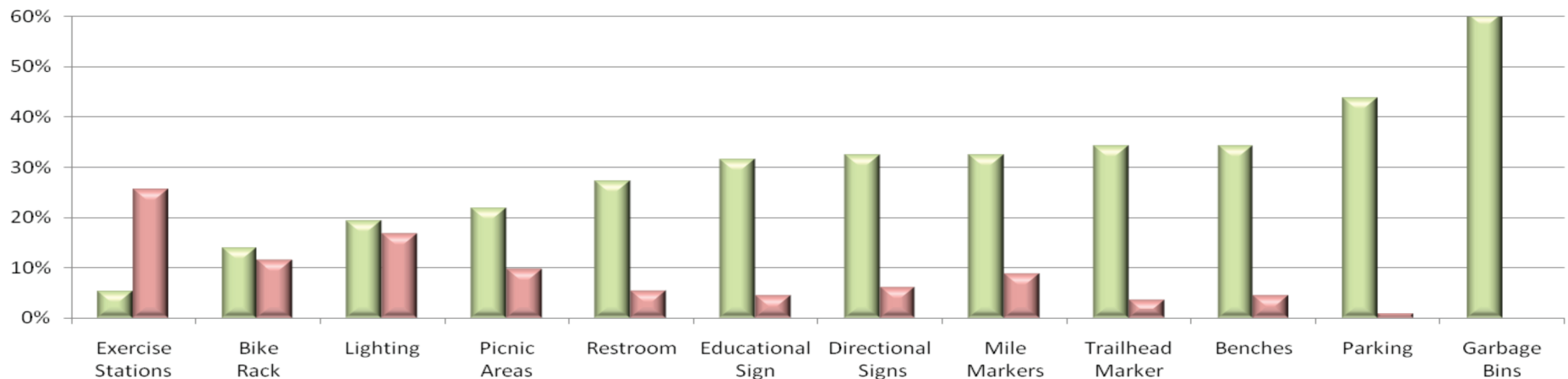
How often do you think these individuals would use the trail?

	Tourists	Teens	Elementary kids	Families	Adults
5 (Very Often)	16%	28%	39%	46%	46%
4	23%	28%	28%	32%	27%
3	30%	27%	15%	13%	17%
2	11%	6%	8%	4%	4%
1 (Never)	2%	0%	0%	0%	1%
Unsure	19%	11%	10%	6%	5%

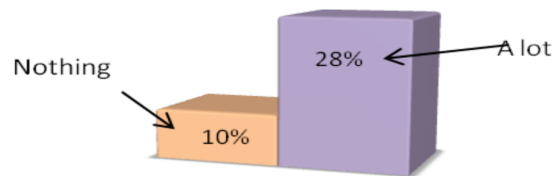


How important is it that trails include the following amenities?

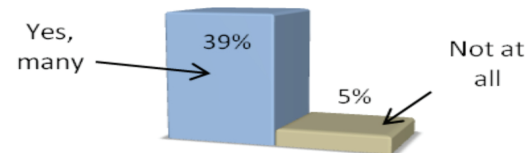
	Exercise Stations	Bike Rack	Lighting	Picnic Areas	Restroom	Educational Sign	Directional Signs	Mile Markers	Trailhead Marker	Benches	Parking	Garbage Bins
5 (Very Important)	5%	14%	19%	22%	27%	32%	32%	32%	34%	34%	44%	61%
4	15%	19%	19%	19%	19%	18%	19%	24%	27%	27%	27%	23%
3	20%	20%	16%	25%	23%	24%	25%	18%	17%	17%	11%	6%
2	18%	20%	14%	12%	13%	11%	9%	11%	6%	6%	7%	2%
1 (Not Important)	25%	11%	17%	10%	5%	4%	6%	9%	4%	4%	1%	0%
Unsure	17%	15%	15%	11%	12%	11%	9%	6%	12%	11%	10%	9%



How much have you heard about the Jocko Valley community trail system?



To what extent do you feel the community has been given opportunities for involvement in the trail planning process?

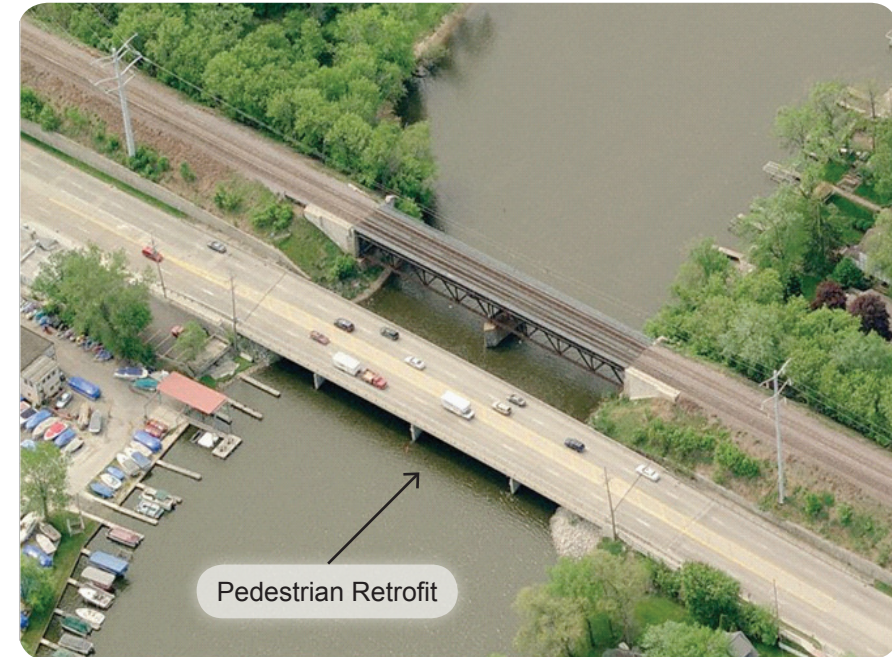


Appendix V: Pedestrian Routing Design Precedents

Pedestrian Retrofit

Building bridges with pedestrian and bicycle facilities as part of the design is the preferred method, and can avoid costly retrofitting. In addition to the high costs of bridge retrofits, some bridges may not be able to support the weight of additional pedestrian facilities (LAB 2010). That stated, there are several examples of bridges that have been retrofitted to accommodate pedestrians; two have been provided.

- The Tower Bridge pedestrian retrofit in Sacramento, CA was able to overcome structural limitations by using a lightweight decking material called FRP, rather than concrete (LAB 2010).
- In 2007, the Illinois Department of Transportation was forced to retrofit the Highway 14 Bridge that crosses the Fox River in Cary, Illinois with a side path for bicyclists and pedestrians. The retrofit cost \$882,000, and was the result of a wrongful-death suit filed by the parents of a 17-year-old who was killed biking across this bridge, which was the only crossing structure in Cary (Seskin 2010).



Northwest Highway 14 Bridge with pedestrian retrofit in Cary, Illinois
(Source: Bing Maps)



Tower Bridge retrofit in Sacramento, California
(Source: Rodrigo Marquez)

Separated Pedestrian Bridges

There are a number of examples that illustrate the use of separate pedestrian bridges that parallel automobile bridges. The Meeker St. Bridge in Kent, Washington, and a newly constructed pedestrian bridge along Highway 1 in Santa Cruz, California are shown here. The bridge in Santa Cruz provides a critical link between existing pedestrian/biking trails where Highway 1 becomes a limited access highway and pedestrians are not allowed.



Meeker St Bridge in Kent, Washington (Source: Bing Maps)



Meeker St. Bridge in Kent, WA (photo credit: Joe Mable)



Pedestrian bridges adjacent to Highway 1 in Santa Cruz, CA (Source: Google Maps)

On-deck Bike Lanes with Concrete Barrier

Many major highway bridges include on-deck bike lanes protected by concrete barriers. In the examples shown here, tall railings make bicycling in the lane safe. Below, an aerial view of the I-90 bridge over Lake Washington in Seattle, WA shows a wide bike lane joining with lanes of traffic on the bridge. Two bridges across the Minnesota River in Mendota Heights, MN carry cyclists in a separate lane adjacent to vehicle traffic.



Mendota Bridge, Mendota Heights, MN (Photo: sdate.wordpress.com)



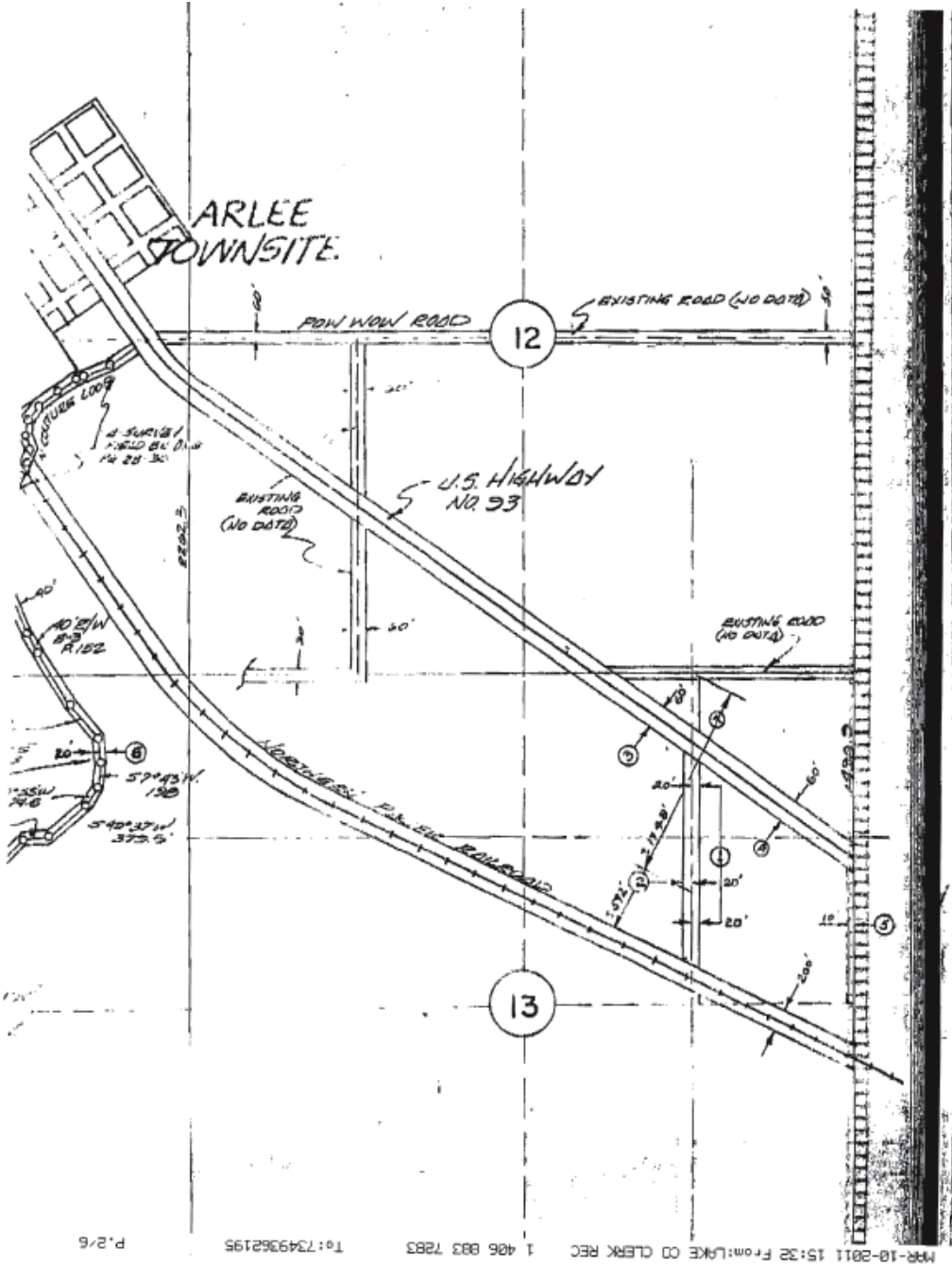
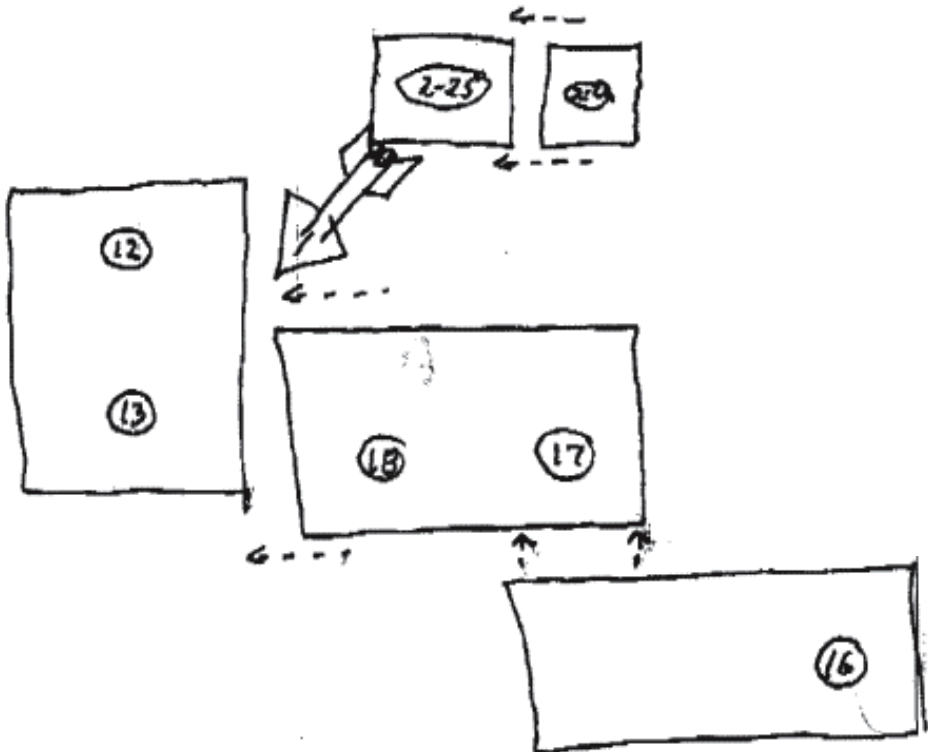
I-90 bridge over Lake Washington, Seattle, WA. (Large photo: Bing Maps, copyright Microsoft 2011. Inset: flickr.com)



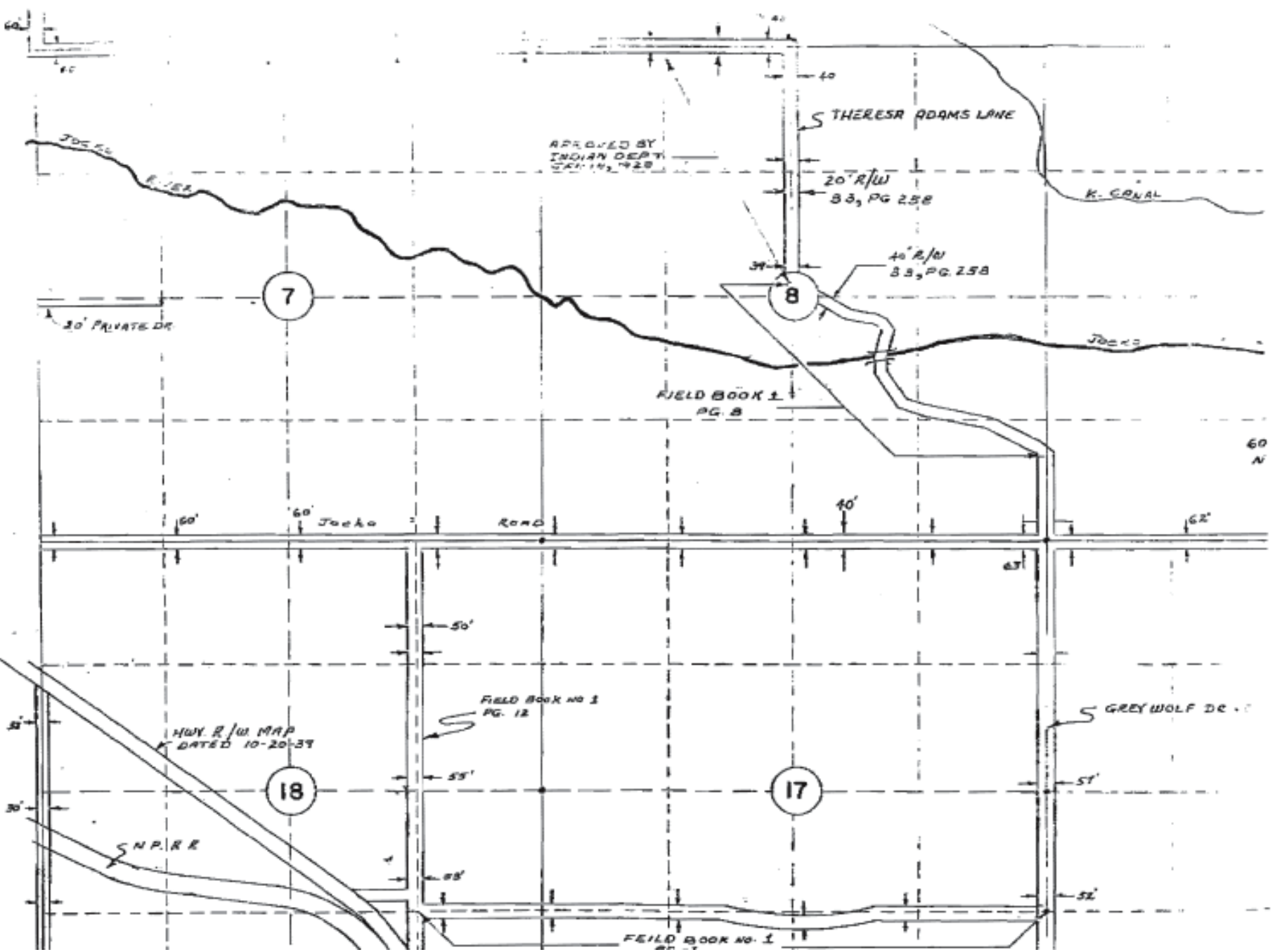
I-494 Bridge, Mendota Heights, MN (Photo: epicski.com)

Appendix VI: Jocko Road Right of Way Documents Provided by the Lake County Plat Room

FOR: NICK DEYO
(248) 535-1729



P. 3/6
To: T349362195
1 406 883 7283
2-10-2011 15:32 From: LAKE OD CLERK REC

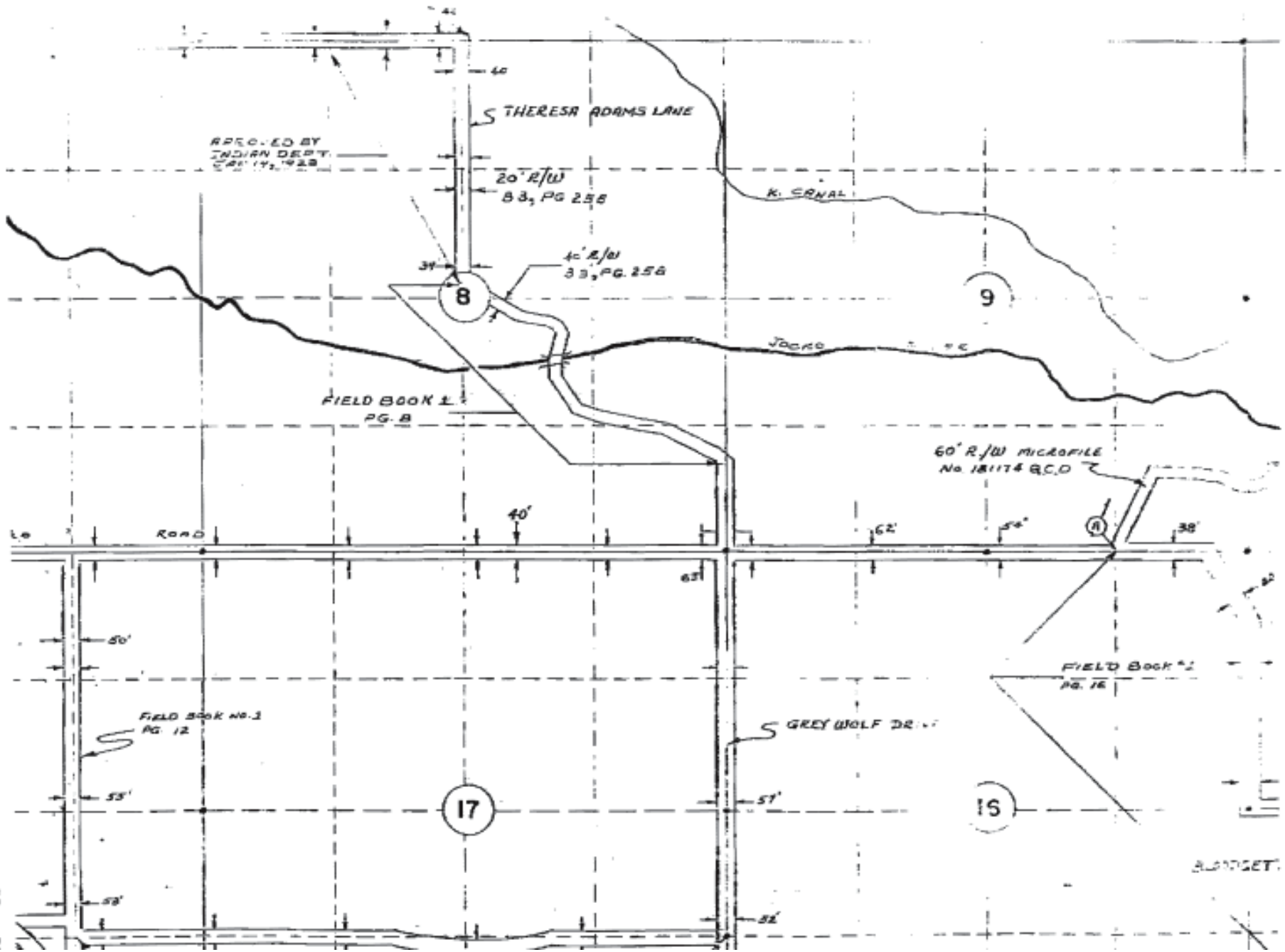


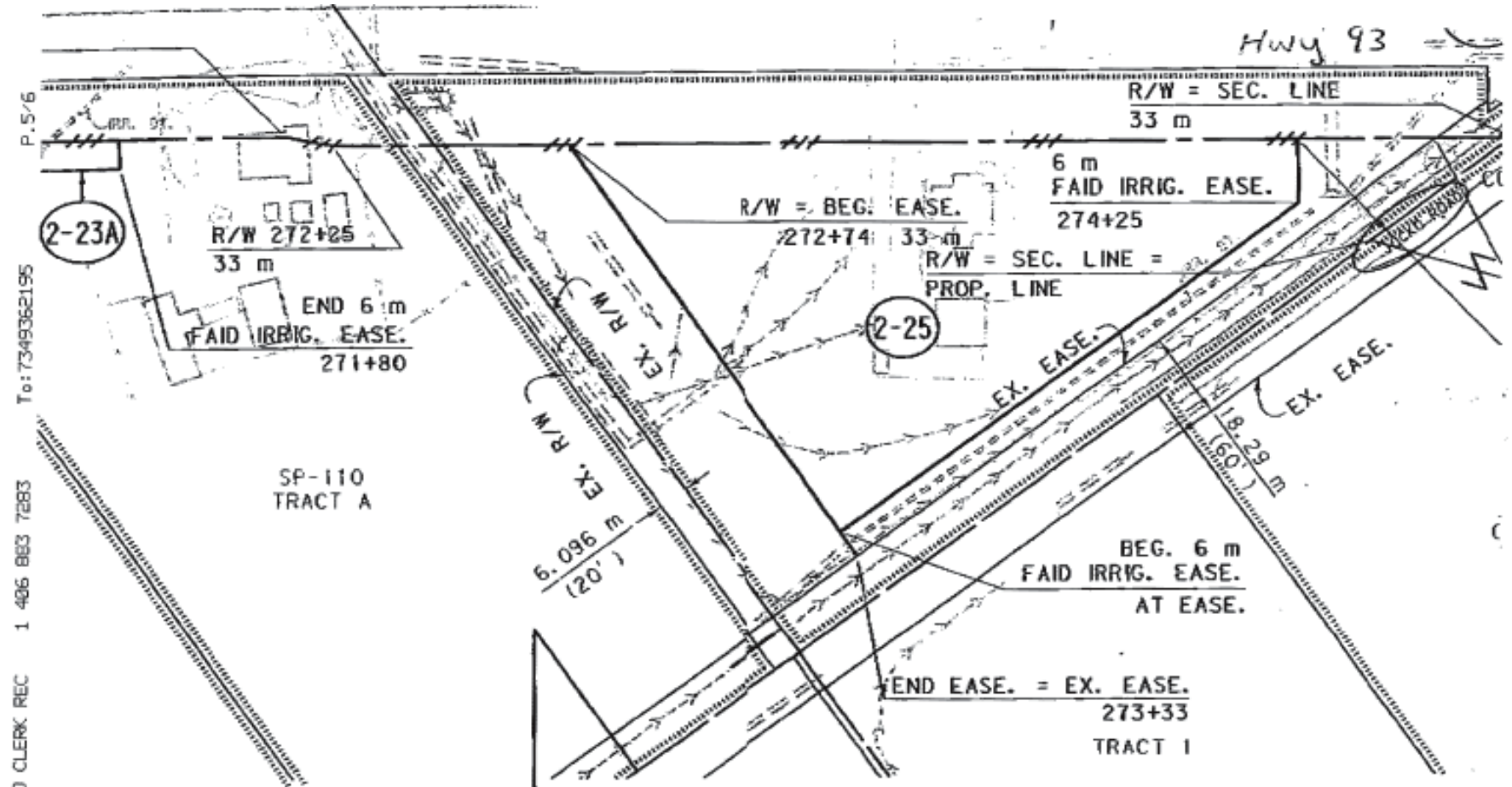
P.4/6

To: 7349362195

1 406 883 7283

0-2011 15:32 From: LAKE CO CLERK REC





MAR-10-2011 15:33 From: LAKE CO CLERK REC 1 406 863 7283 To: 7349362195 P. 5/6

75+15.77 IS N 86° 42' 08" W
 FROM THE NORTHEAST CORNER SEC. 13.
 (mm ALUM. CAP)

MAP REVISED	12-10-04	02-02-05	2-25-05.
	8-8-05	1-4-06	12-3-07

- NOTES:
1. ALL MEASUREMENTS ARE METRIC
 2. THE PROPOSED R/W LINE WHERE TRANSITION IS USED IS A CHORD CONCENTRIC CURVE.
 3. THE ENGLISH AREAS ARE FOR PURPOSES ONLY.
 4. ALL STATIONS AND OFFSETS ARE IN REFERENCE TO THE R/W BOUNDARY

Right of Way ID. — Sheet 15 — Project # 1744-418
 of 43



Jocko River Restoration Trails



A Project in Partial Fulfillment of a Master's Degree for the School of Natural Resources and Environment at the University of Michigan

Project Partners:

The Confederated Salish and Kootenai Tribes

The Jocko Valley Trails Committee*

The School of Natural Resources and Environment

*A Committee of the Arlee Community Development Corporation

Student Team:

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Robin Burke

Nicholas Deyo

Ann Kelley

Brittney Van Der Werff

Faculty Advisor:

Robert Grese, ASLA

Co-Advisor:

Donna Erickson

Acknowledgements

Our deep appreciation goes out to the JVTC including Gary Decker, Mary Stranahan, Elon Gilbert, Jack and Dale Duff, Pelah Hoyt, Susan Carney-Lammerding, Jerry McGahan, and Andrew Maluceli. A special thanks is deserved for Mary Stranahan who generously accommodated us at the Heart View Center for the month of May. Elon Gilbert's hospitality also must be recognized... his barn is the most luxurious we have ever stayed in. Jack and Dale Duff were also a great help, both for supporting our community activities, and for feeding five hungry Master's students.

Susan Carney-Lammerding, Brett Sproull, and the Arlee Community Schools were very gracious with their time and expertise when we performed our school activities. Sue's enthusiasm was infectious, and her students were well behaved and a joy to work with. We could not have organized and implemented the school activities without her assistance, suggestions, and support.

Germaine White has been an inspiration to us, starting from her warm welcome at the River Honoring Ceremony. We congratulate her on all of the incredible work she is doing on the Flathead Reservation; she is a true leader and steward of her Nation's resources.

We also want to extend our heartfelt thanks to Les Evarts and the Restoration Team. We learned a great deal during the tour of the Jocko River Restoration area; the volume and quality of their work on the Jocko River is a real model for other restoration projects. Gary Weiner of the Rivers, Trails and Conservation Assistance Program also provided important guidance.

Five Valleys Land Trust was generous with their time, facilities, and equipment. Pehla Hoyt and Ryan Chapin were particularly helpful and encouraging.

Of course, we would like to thank our adviser, Bob Grese, for his guidance through this project. He was always diligent in providing feedback on our work, and helped us overcome many obstacles along the way. Donna Erickson was also very influential in shaping this project in its early stages; her advice was invaluable. Stan Jones provided consultation on developing design activities with children. Nick Reo took valuable time away from his other projects and provided us with critical perspective on our writing.

Finally, we want to thank all of the friendly and informative people we spoke with during our reservation interviews. We learned a great deal from them, and we hope that our work will be useful to other hard working resource managers like them.

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Source: *The U-M Project Team*

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Source: *Robin Burke*

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Source: *Robin Burke*

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Source: *Robin Burke*

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Fig. 1: The Jocko River in fall

Introduction

This booklet outlines the 51 final recommendations of the University of Michigan's graduate Master's Project Team to develop a trail system within the Jocko Valley that meets the requirements and desires of the Confederated Salish and Kootenai Tribes (CSKT). Through site surveys, community workshops, and intensive analysis, the Project Team has developed three trail system Concepts, each meeting the CSKT's specifications in a different way.

Much was considered in the planning of these three Concepts, such as the Jocko Valley's overall context, the Jocko River Restoration history, and the social context of the area. Additionally, the physical features of the area were inventoried and considered during the planning process. These features include: land ownership, habitat types, terrain, restoration features, flooding potential, and photo points to denote areas of particular aesthetic or educational interest. These factors and the team's method of analysis are explained below. Each trail system Concept description is followed by an analysis section that more deliberately explains how these features influenced the design, and their results.

Educational aspects and features, targeted mainly for area schoolchildren, play a large role in each Concept, and were developed largely through community input and the desires of the CSKT. Much of the educational materials were developed using the CSKT's DVD entitled "Explore the River: Bull Trout, Tribal People and the Jocko River" to better align these materials with Salish cultural practices and values. While each Concept reflects different types of educational nodes, each stresses the

importance of the river, the restoration, and CSKT cultural values.

Following the Concept descriptions and analyses is more information that will help inform the decision making process regarding the proposed trail systems. The section entitled "Cues to Care" offers information regarding the appearance of a landscape; CSKT decision makers should consider this element of landscape planning as they consider the trails. 'Cues to care' elements have been incorporated in each design to promote the appearance of a healthy, but cared for, natural area. The section entitled "Additional Information on Bridge Design" offers a rationale for the Project Team's bridge design choices intended to better inform decision makers. "Additional Information about Road to Trails Conversion" accomplishes this as well.

Below is an overview of the trail design Concepts presented in this document. While each Concept is cohesive and may be implemented as shown, elements may be drawn from multiple designs and combined or modified.

Overview of Concepts

Concept 1 is the trail system that most closely reflects the recommendations of the CSKT; the main trail utilizes the construction road, and the educational nodes are the least intrusive into the trail user's experience. See page 21 for a more detailed description.

Concept 2 reflects a highly interactive trail system, with interactive and dominating educational nodes, and multiple trail loops that allow the visitor to experience many different types of habitat. Please see page 27 for a more detailed description.

Concept 3 is the most ecologically sensitive of all the options, utilizing but actively re-vegetating the existing construction road, while featuring moderate educational signage. Please see page 33 for a more detailed description.

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Goals

The overarching goal of this document is to provide the Confederated Salish and Kootenai Tribe (CSKT) with the information necessary to help them make important decisions regarding a trail system that will be used and cared for by their entire community. This document will offer design solutions and sample educational materials to help the CSKT and tribal elders provide opportunities to highlight the cultural and ecological significance of the Jocko River and its restoration.

To achieve these goals, the planning team has created a thorough inventory and analysis of the site to inform the design recommendations. These recommendations are provided through three design alternatives (Concept 1, 2, and 3) for trail networks that displaying a range of options for:

- Trail alignment and type
- Permanence
- Educational Opportunities
- River Crossings
- Parking

Additionally, the planning team has provided bridge options that best fit with their respective design Concepts.

Sample educational and promotional materials regarding the trail system and native trout restoration efforts, including signage and self-guided materials, have been included with each Concept. An accompanying analysis for each design has also been provided to compare and contrast design features, and provide further information needed for highly-informed decision making.

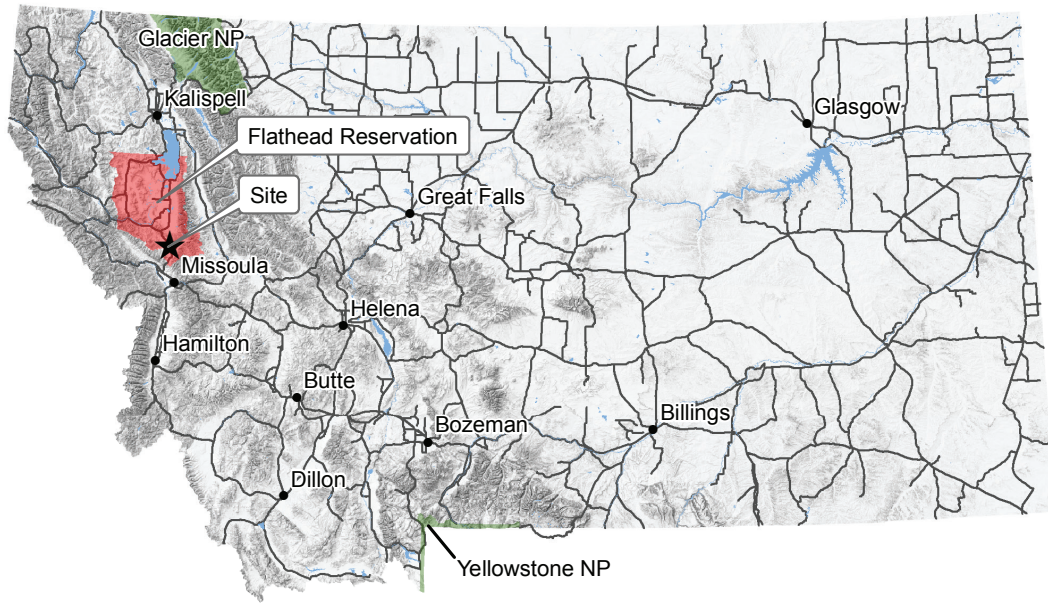


Fig. 2: Map of Montana showing the Flathead Reservation and the project study site

Context

The Demonstration Reach portion of the Jocko River Restoration area is located in Western Montana on the Flathead Indian Reservation. This 1.3 million acre reservation is the home of the Bitterroot Salish, the Pend d'Oreille, and Kootenai Tribes (CSKT Website, 2010), and has a total population of 26,172 (US Census, 2000). Of the total population on the reservation, 26.7% are considered American Indian, and 68.1% are classified as white (US Census, 2000).

The Lower Mainstem of the Jocko River stretches for 22 miles to its confluence with the Flathead River. The Jocko River has been severely impacted by channelization, unsustainable grazing practices, and unmitigated irrigation withdrawals; because of these impacts, the river has become the focus of the CSKT's bulltrout restoration efforts. The Demonstration Reach has already undergone initial restoration work, and is the focus of the trail design and interpretive recommendations outlined in this booklet. The Demonstration Reach is adjacent to the town of Arlee (population 600).

The Jocko River watershed is largely forested (75%), with significant agricultural

land used for both irrigated fields (5%) and rangeland (35%) (Evarts et al. 2007). Protected areas located within the watershed include the Mission Mountain Tribal Wilderness Area, and the Jocko Primitive Area; adjacent protected areas include the federally designated Rattlesnake Wilderness Area and the National Bison Range. For a more detailed look at land use in the watershed, see the map on page X. The Jocko River watershed is considered important both culturally and ecologically by the tribes (Evarts et al. 2007); and, given the context of the Demonstration Reach area, there exist significant opportunities to provide access to the Jocko River and educate residents about the ecological significance of the area.



Fig. 3: Flathead Reservation map showing local features and the project site



Fig. 4: The Jocko River

The Jocko Valley in Pictures

This series of photos, taken by the project team in May, 2011, is representative of the views, landscapes and natural features in the Jocko Valley. Prominent visual features include the Jocko River, Jocko Hollow, open fields and views to Mountains.



Fig. 5: Valley view



Fig. 6: Fish hatchery along Oxford Road



Fig. 7: Jocko Hollow



Fig. 8: Log vein in the Jocko River



Fig. 9: The Jocko River before restoration (left) and after re-engineering and restoration (right)

Jocko Restoration History

The Jocko River Restoration project was begun by the CSKT after receiving monetary compensation from the Atlantic Richfield Company (ARCO) for natural resource damages to the Upper Clark Fork River Basin. The area was selected for restoration because of its similarities to parts of the Upper Clark Fork which was damaged by ARCO. The reach of the Jocko River downstream of Arlee was particularly affected by human disturbances in the form of development, agriculture and livestock grazing. In order to reestablish habitat for bull trout and western cutthroat trout and to improve the health of the watershed, the CSKT identified 22 miles of the Jocko River to undergo environmental assessment and protection, followed by passive and active restoration.

A series of human-driven physical changes made over time have dramatically changed natural processes such as floods, movement of fish, riverbank erosion and channel migration, and changes in groundwater levels. Among the changes that have affected these processes are the withdrawal of water for irrigation, construction of levees, clearing of riparian vegetation, bridge construction, and development of

residential and commercial buildings within the river's floodplain.

By combining a review of scientific literature regarding restoration strategies and techniques with field experience of those on the restoration team, the CSKT established key strategies based on the concepts of ecological flows, ecological function, healthy river structure, a comprehensive ecosystem approach, and passive and active restoration. Strategies differed for streams connected to the historic floodplain but without appropriate physical features, and streams that are no longer connected to the historic floodplain. A few strategies included reactivating abandoned meanders, enhancing riparian and aquatic habitat, reconstructing streams at the elevation of the original floodplain, and stabilizing existing banks or channels. The most appropriate strategies for a given area were identified based what actions would most likely alter current conditions to the desired future condition. Such conditions include restoring a hydrologic system, restoring native riparian wetland plant communities, increasing connectivity among habitats, preserving key populations of fish and plants, suppressing non-native fish populations, and "creating opportunities for solitude, for travel...and for areas to harvest and gather traditional foods" (Jocko River Master Plan, 2008).

While passive restoration projects were given priority, the Jocko River Restoration Demonstration Reach is an area where considerable active restoration took place. The path of the river here was reengineered to match the elevation of the original floodplain, mimic a natural hydrograph, and incorporate alternating pools and riffles. Active steps to reestablish natural processes included grazing management, addition of microtopography, and planting native riparian plant communities. Monitoring of the area will provide useful data for the adaptive management of this area and others like it in the future.

It is the hope of the CSKT that the restored area will be accessible to Arlee residents and others in the broader community to facilitate the enjoyment of natural beauty and educate visitors about the stories of cultural history, degradation and restoration of the Jocko River.

For more information, see the Jocko River Master Plan, December, 2008 (prepared by the CSKT Fish, Wildlife, Conservation, and Wildland Recreation Program) on which this brief history is based. It is available at www.jockoriver.net.

Ecological Context Map: Jocko Watershed

Land Cover

- Open Water
- Rock and Ice
- Developed (Open Space)
- Developed (Low Intensity)
- Developed (Medium Intensity)
- Developed (High Intensity)
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Wetlands

Protected Areas

- Tribal Wilderness
- S. Fork of the Jocko Primitive Area

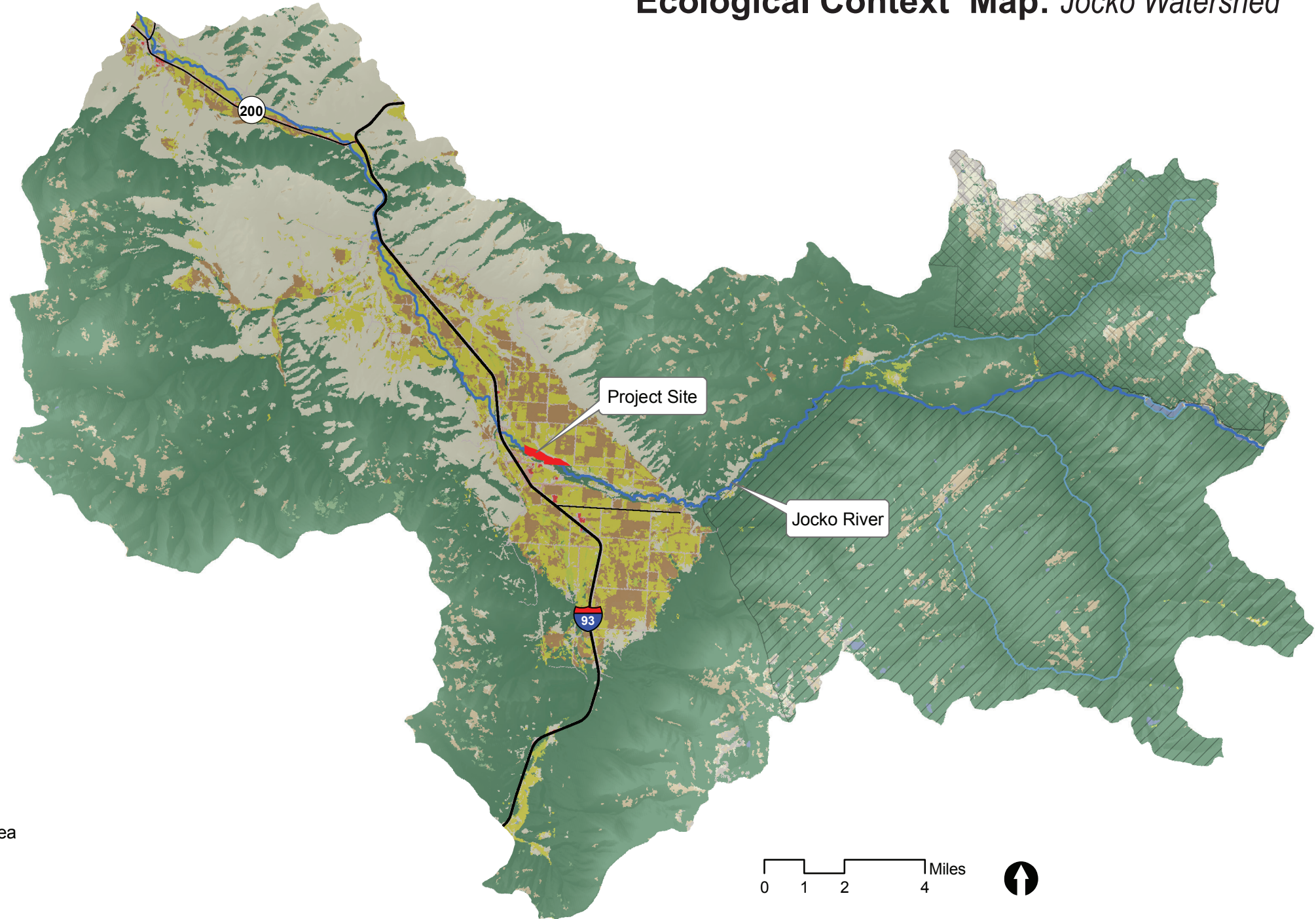


Fig. 10: Map of Jocko Watershed



Fig. 11: Jocko Valley Farmers Market, downtown Arlee

Social Context

Arlee is home to both members of the CSKT and non-tribal landholders. These groups make up a total population of 600, with each group accounting for roughly half the population. Despite their shared residency, often the cultural differences between the two groups leads to community fragmentation.

Although groups within the community are divided culturally, within the small town of Arlee, there are definite locations that serve as cultural centers and main transportation destinations for all members. From the Cognitive Mapping Activity in which 130 elementary, middle, and high school students from Arlee School and the Nkwusm Salish Language Institute participated, inferences were drawn about what businesses and locations students frequent within the town. Students were given blank sheets of paper and asked to draw a map of where they like to spend their time. Arlee School (present on 63% of students' maps), Wilson's Grocery Store (present on 38% of students' maps), and the Community Center (present on 29% of students' maps) were shown to be places drawn by the most students, suggesting the frequent use of these places by Arlee youth. 35 percent of students also drew the Jocko River. Other places mentioned by students included the hatchery, the Post Office, Rick's Restaurant, and the Hummingbird (candy store). 48 percent of students drew Highway 93 on their maps, which is not surprising, due to the Highway's significance in the town resulting from both

its central location in Arlee and its importance as a main transportation route.

Arlee School is located in close proximity to the proposed trails. This proximity is ideal, as the target audience of educational materials designed for the trail consists of middle and high school students. The trails will also be in easy walking distance from the Arlee Schools if the trails are used for student field trips. In addition to field trips for students, the proposed trails will allow all members of the community to come together in a shared natural space to enjoy the beauty of the Jocko River and the surrounding wilderness.



Fig. 12: Entrance to the Jocko River Trout Hatchery, Oxford Road, Arlee



Fig. 13: Gravel mound, Oxford Road, Arlee

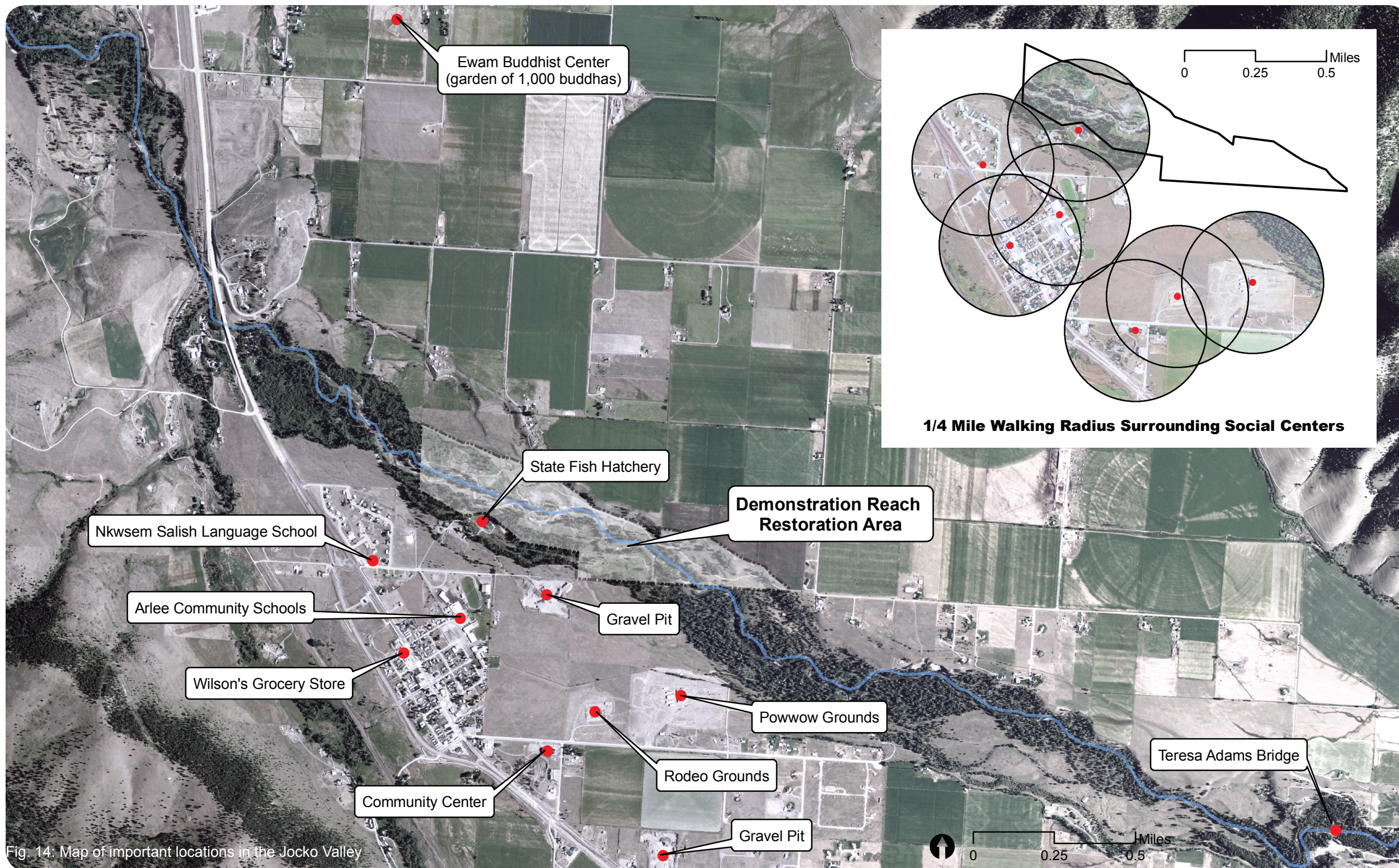


Fig. 14: Map of important locations in the Jocko Valley



Fig. 15: View of Arlee, Montana

Site Inventory: Overview

As a first step in working toward a set of design recommendations for trails in the restoration reach of the Jocko River, it was necessary to perform an inventory of natural features. By gathering information regarding land ownership, habitat types, terrain, restoration features and other physical data it was possible to map these features to inform future design in the restoration area. Data were gathered on the ground in Montana over several weeks (Robin Burke, Meredith Bohdan, Nicholas Deyo and Robert Grese, May 2010) by walking through large areas while taking careful notes on aerial photographs and recording data points and paths with a GPS unit. Visits to parts of the restoration area and adjacent land were also made in the company of members of the CSKT restoration team, neighboring land owner Jerry McGahan, and members of the Jocko Valley Trails committee, all of whom helped point out physical features and other concerns relevant to potential trail development in the Jocko River restoration reach. Other sources of data used to create the inventory maps here include the Jocko River Master Plan: A Guide to Ecological Restoration Activities in the Lower Main Stem Jocko River Corridor (CSKT Fish, Wildlife, Conservation, and Wildland Recreation Program, December 2008) and [source of GIS layers].

Data gathered on the ground, from existing GIS layers and other documents have been combined to create inventory maps. These maps were relied on heavily in the development of the three trail layout concepts presented in this document. While the inventory maps were created to inform the team's design work, they also may be utilized as a tool to help the CSKT evaluate the relevant trail design alternatives.

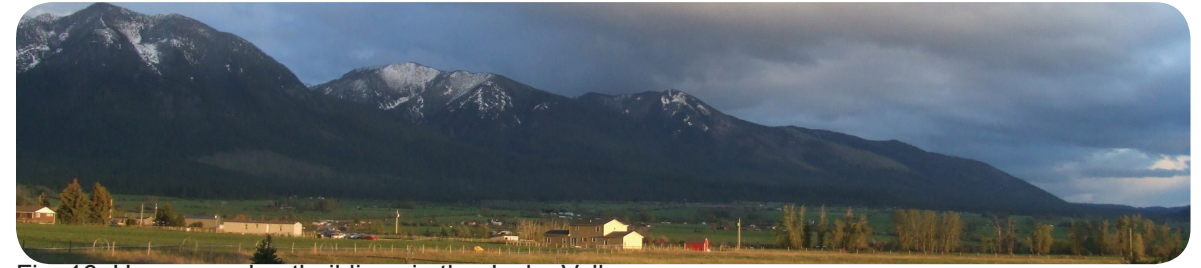


Fig. 16: Houses and outbuildings in the Jocko Valley

Land Ownership

Land ownership on the Flathead Reservation is a complicated matrix. Ownership types in the Jocko watershed as of 2002 include tribal, allotted, fee, federal, state land, and restricted trust lands (Evarts et al. 2007). Based on [ownership data from GIS] the map on the following page this map was created to place the Jocko River demonstration restoration reach in the context of the land ownership matrix in Arlee.

This map illustrates land owned by the Arlee Community Development Corporation, private landowners, the state of Montana and the CSKT. The Jocko River demonstration reach, where the CSKT has expressed interest in trails, is outlined in black. Local properties of importance to the community include the pow wow grounds, rodeo grounds, public school, and the fish hatchery. These properties represent areas for potential trail connections.

Other information of note is where land adjacent to the demonstration reach is held by private landowners. Private landowner Jerry McGahan has expressed a desire to cooperate with the implementation of a trail system. Other adjacent land owners and occupants may not be as cooperative. Therefore this map represents potential challenges and barriers to a trail system within (or extending outside of) the demonstration reach area that changes how the area or adjacent lands are currently used. Moving forward in the trail implementation process will require acquiring the support of adjacent residents, including private land owners, tribe members residing on allotted land, and the state fish hatchery.

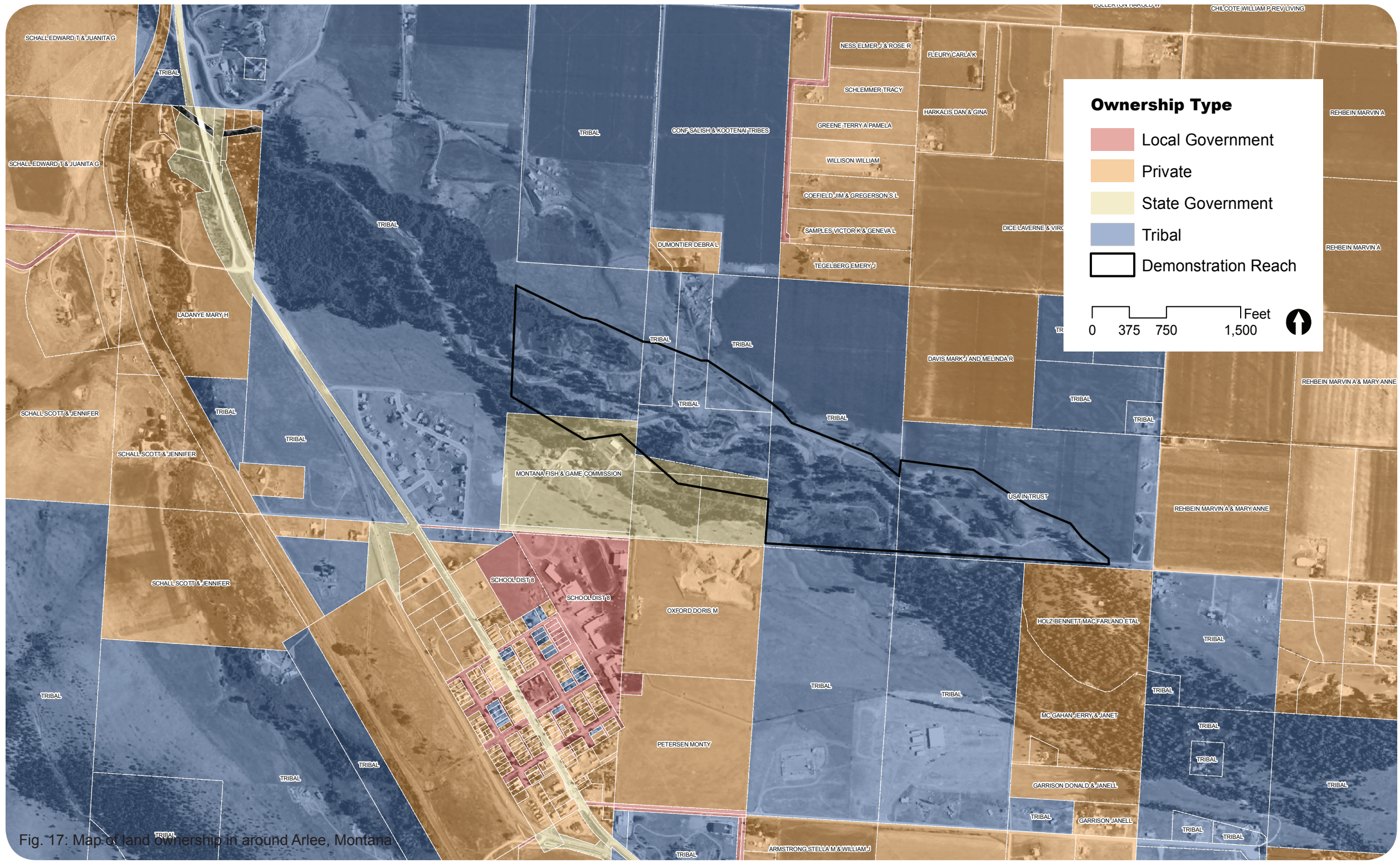


Fig. 17: Map of land ownership in around Arlee, Montana



Fig. 18: Trees and understory in Jocko Hollow

Inventory: Habitat

Riparian habitats like those found along the Jocko River support the greatest concentration of plants and animals in Montana (Montana Fish Wildlife and Parks 2005). Restoration efforts in the Demonstration Reach area focus both on aquatic as well as terrestrial habitats. Because trails and associated infrastructure would impact terrestrial habitats to a greater extent this analysis focuses on riparian and upland habitats.

In 2003 the CSKT conducted a habitat survey along the Jocko River that was delineated by the river's ecological floodplain (map, opposite). This survey was performed using protocols adapted from commonly referenced Classification and Management of Montana's Riparian and Wetland Sites (Hansen et al. 1995). The portion of the 2003 survey revealed a diversity of riparian and wetland habitats created by a variety of hydrologic influences along this stretch of river. Most notably, the Demonstration Reach area was characterized by mature black cottonwood (*Populus trichocarpa*) with red-osier dogwood (*Cornus stolonifera*) dominating the understory. Significant portions of the overstory in the Demonstration Reach floodplain forest were dominated by either ponderosa pine (*Pinus ponderosa*) or Douglas fir (*Pseudotsuga menziesii*). Observations of the mature cottonwood forests indicated that these habitats remained relatively undisturbed while ponderosa stands were more likely to have been logged (Evarts et al. 2007).

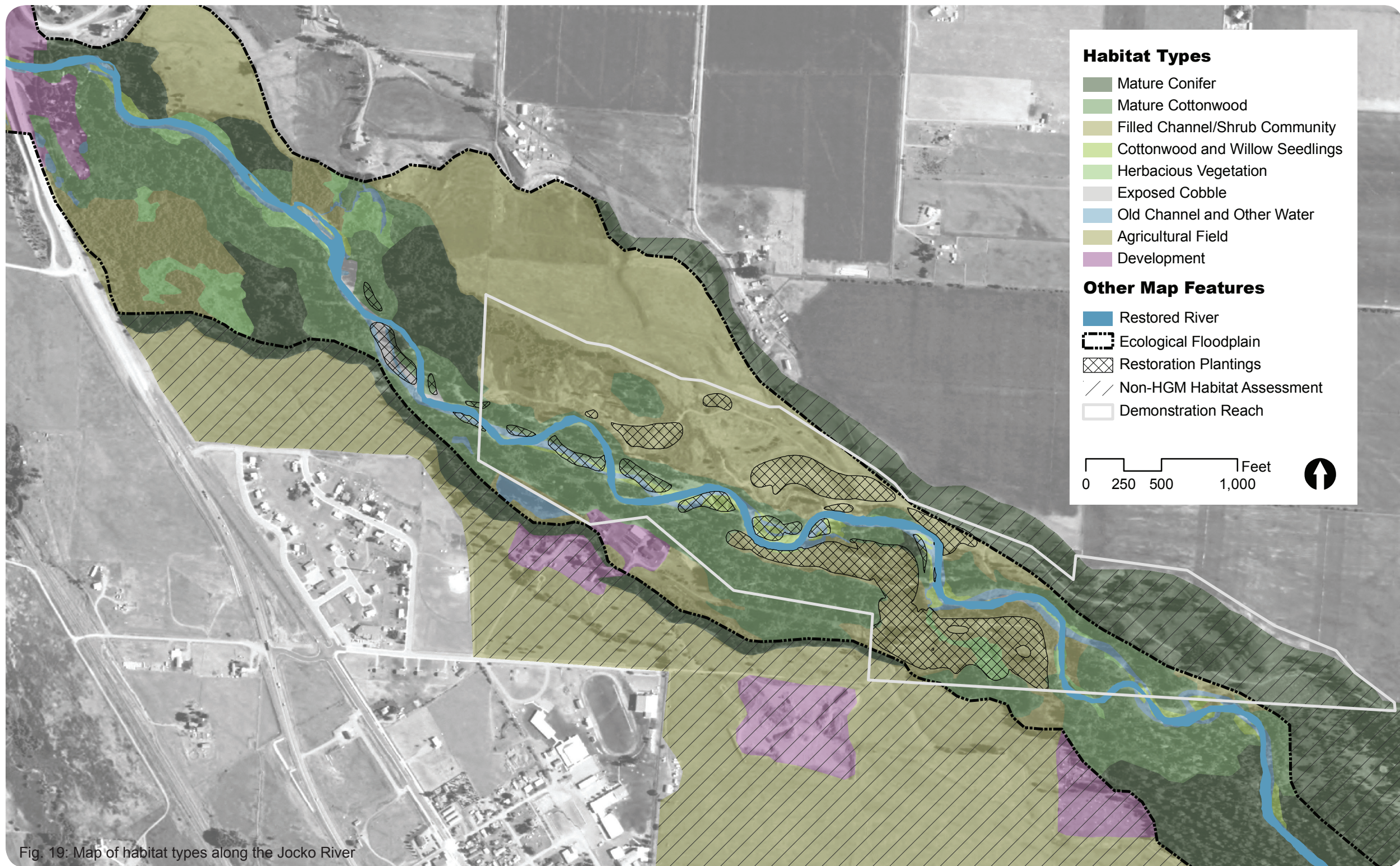
In addition to these mature riparian forests, areas where sediment had more recently been deposited by the river were dominated by willows and cottonwood seedlings or by other shrub communities; in areas of groundwater upwelling peat soils supported

bog birch/beaked sedge (*Betula glandulosa/Carex rostrata*) communities. The inventory map on page X identifies these habitats.

The project team conducted a brief investigation into the upland habitats to the north and south of the ecological floodplain surrounding the Demonstration Reach area, using the habitat-typing guide Forest Habitat Types of Montana (Pfister et al. 1975). Habitats to the south of the ecological floodplain were identified as being either ponderosa pine/snowberry (*Pinus ponderosa/Symphoricarpos albus*) or Douglas fir/snowberry (*Pseudotsuga menziesii / Symphoricarpos albus*) communities, while areas to the north of the ecological floodplain were identified as being communities either ponderosa pine/snowberry (*Pinus ponderosa/Symphoricarpos albus*) or ponderosa pine/Idaho fescue (*Pinus ponderosa/Festuca idahoensis*). At a first glance, it appeared that many of these areas were heavily impacted by invasive species.

Human disturbance has made a significant impact to the Jocko River and its habitats. The most notable impacts to riparian habitats have been the clearing and grading of land for agriculture and development, grazing, levee construction, and irrigation diversions. Less direct impacts include the introduction of invasive species and altering the hydrology of the river from water withdrawals elsewhere in the watershed (Evarts et al. 2007).

Restoration planting conducted during phase I and II of the Demonstration Reach Restoration Project were part of the efforts used to restore disturbed habitats along the Jocko River. In Demonstration Reach phase I restoration a total of 45,582 containerized herbaceous plants, shrubs, and trees were installed in floodplain, streambank and wetland planting areas. In phase II restoration work, over 135 acres were seeded in floodplain, river terrace, and upland seed mixes. These plantings have been identified and mapped using data from CSKT Department of Natural Resources reports (CSKT 2006 and CSKT 2009). These and other identified inventoried data helped guide the creation of trail development concepts. Conceptual trail alignments and other infrastructure were prioritized in areas that were disturbed or restored versus intact habitats. This was done in order to limit further disturbance along the Jocko River. For further discussion of this prioritization system see the section in this booklet titled 'Overlay Analysis' (page 19).



Habitat Types

- Mature Conifer
- Mature Cottonwood
- Filled Channel/Shrub Community
- Cottonwood and Willow Seedlings
- Herbaceous Vegetation
- Exposed Cobble
- Old Channel and Other Water
- Agricultural Field
- Development

Other Map Features

- Restored River
- ⋯ Ecological Floodplain
- ▨ Restoration Plantings
- ▧ Non-HGM Habitat Assessment
- Demonstration Reach

0 250 500 1,000 Feet

↑

Fig. 19: Map of habitat types along the Jocko River

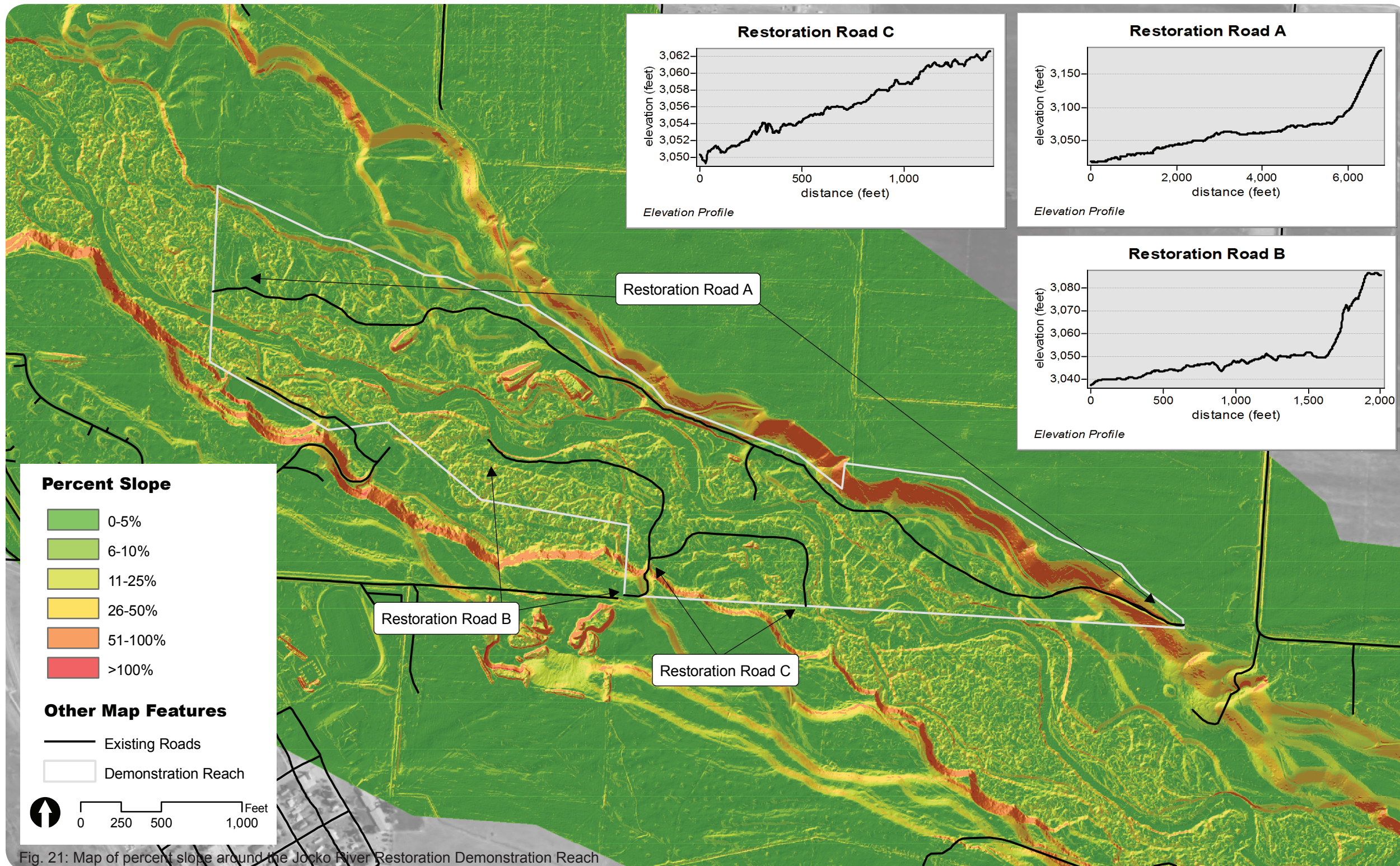


Fig. 20: Steep slopes, northern edge of the Jocko River Restoration Demonstration Reach

Inventory: Slopes

Steep slopes and terrain changes in the demonstration reach and surrounding areas are important factors in determining trail routing. Percent slope, shown here by color gradations, were mapped by transforming LIDAR data (from the CSKT Department of Natural Resources) with ArcGIS.

The Demonstration Reach area is located in the lowest part of the Jocko Valley, where the river has most recently incised the land. Areas of steep slopes represent natural terraces in the land, created by the river's historical movement within its floodplain. The steepest slopes bound the demonstration reach to the northeast and southwest, representing potential barriers to accessing the reach. Within the floodplain microtopography should be considered in routing trails. Much of the complexity of the terrain directly adjacent to the river in the demonstration reach was engineered for specific ecological purposes. Trail routing should take slope into consideration when determining who will use the trails (age, physical ability), how users will access the trails (only on foot, with bicycles, on horseback, with occasional vehicle access, with regular vehicle access), and when considering where trail construction would cause the least disturbance to existing terrain.



Percent Slope

- 0-5%
- 6-10%
- 11-25%
- 26-50%
- 51-100%
- >100%

Other Map Features

- Existing Roads
- Demonstration Reach

Scale

0 250 500 1,000 Feet

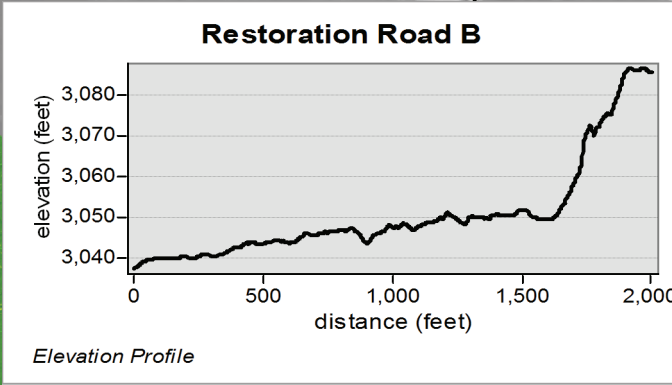
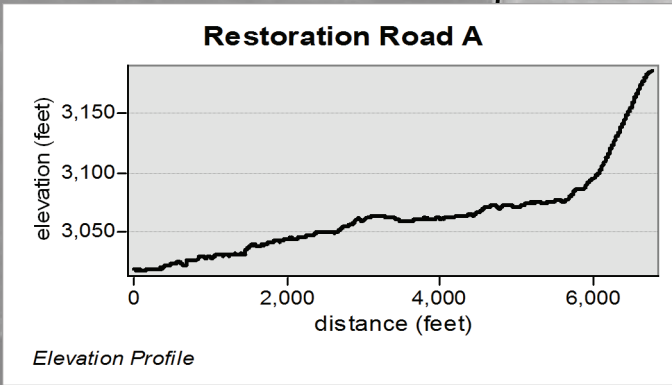
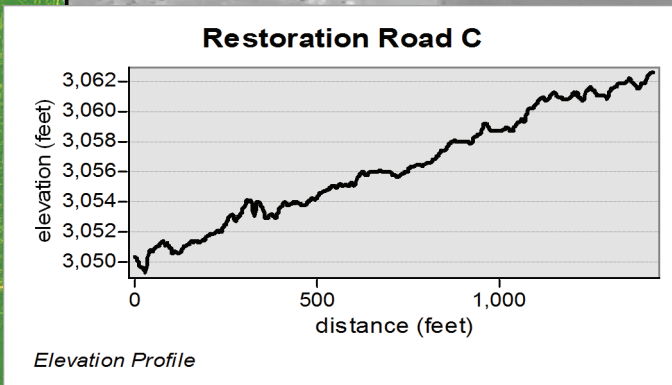


Fig. 21: Map of percent slope around the Jocko River Restoration Demonstration Reach

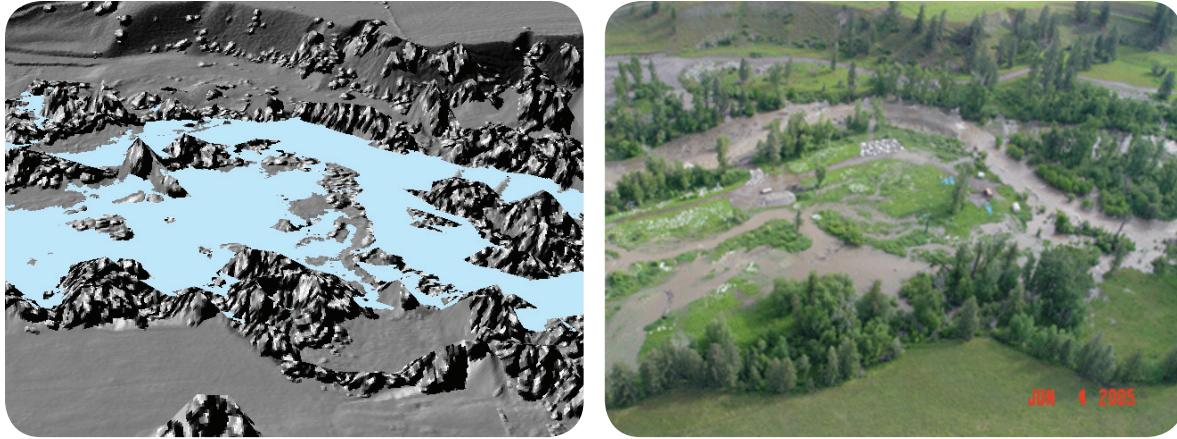


Fig. 22: Flooding of the Jocko River as modeled with GIS (left) as compared to the actual flooding in the same location (right) on June 4, 2005

an aerial photograph of the 2005 flooding to a 3D GIS model of the flooding showing the river at 2 ft. above bank full flows. See figure X.X. The major shortcoming of this analysis is that the Lidar data used in the model only depicts phase I restoration work. Nonetheless, it provides some guidance for designing facilities in the floodplain.

The following strategies were considered in the conceptual designs presented in this booklet. First, it is advisable to situate all permanent infrastructure such as kiosks, signs, seating areas, and permanent path structures outside of areas that are likely to flood. Where river access is desired, more ephemeral paths can be used to reduce maintenance costs. Those structures that must be situated in flood prone areas, such as bridges, signage, or trail markers, they are designed to withstand floods, be dispensable, or able to be transportable during flood events. It should be noted that these strategies were sometimes overlooked in the conceptual designs presented in this booklet. This was done in order to present a wide variety of trail system concepts, however, these weaknesses are highlighted in the design analysis.

Inventory: Flooding Potential

One of the most important goals of the Demonstration Reach Restoration Project to allow the Jocko River to access its floodplain. Flooding is an important ecological process that influences the morphology of rivers, which in turn create aquatic habitats that favor native trout species, cycle nutrients in riparian habitats, and recharge riparian groundwater flows (Trush and Leopold 2000). Within the Demonstration Reach area, the channel has been successfully engineered to access its floodplain as evidenced by the 25-year floods in 2005 (Jocko River Restoration Project Website n.d.). Flooding also poses challenges for siting trails and other associated infrastructure such as seating, kiosks, and signage in the floodplain that are important for recreational and educational use. Care should be taken in situating these types of facilities because: (1) destructive floods would jeopardized structures built in the floodplain and (2) such structures along the river may also constrain the natural movement of the channel.

This analysis uses an ArcGIS model developed by Dilts and Yang (2010) to calculate inundation levels based on height above river calculations. The results of this model can be seen on the opposing page. While the model is an oversimplification, it does give some indication of the areas in the floodplain that are likely to flood more frequently. One can get a general idea of the accuracy of the analysis by comparing

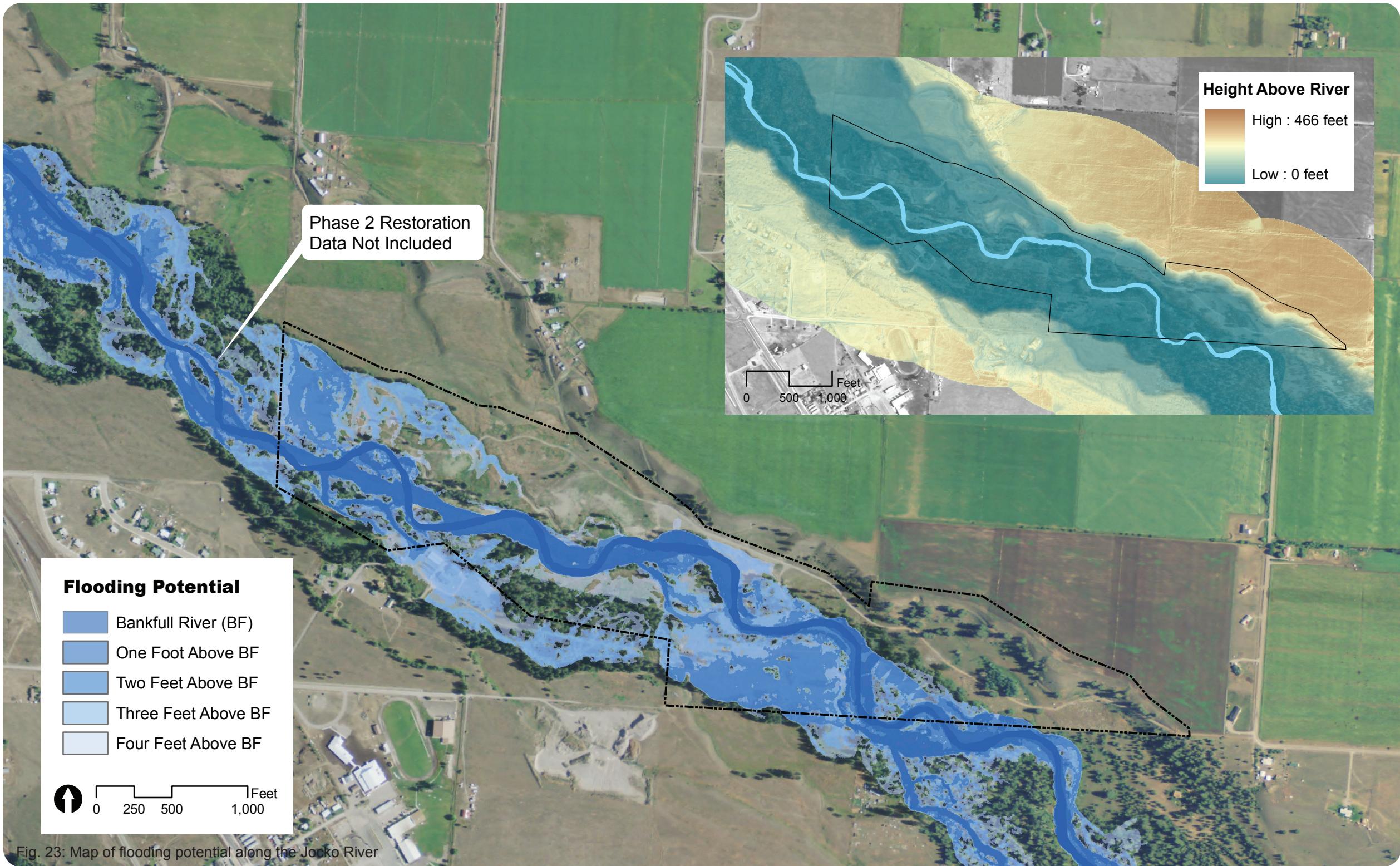


Fig. 23: Map of flooding potential along the Jocko River



Fig 24: Log vein feature after installation (left) and at a later time (right)

Inventory: Restoration Features

The location of physical features integral to the restoration of the Jocko River may be useful for locating trails. Where the goal of trails is education, overlook points or access spurs may be included in a trail system to provide students and educators with good views of key restoration tools and features. Based on maps in the Jocko River Master Plan (2008) this map shows the location of features fundamental to the restoration process, including replanted areas, engineered microtopography, engineered log jams, straight veins and riffle beds. It also shows, in some areas, the banks of the river before and after the restoration project. Additionally, this map displays points where good views of restoration features currently exist. The significance of the unique educational opportunities provided by these restoration features was considered when formulating the three design concepts presented later in this document. Views of and access to certain restoration features should be considered because of the potential opportunity for students (and scientists) to observe change in the engineered landscape over time. Photographs of the educational views shown on the map at right can be found in Appendix 1 on page 46.



Fig. 25: A straight vein redirects current to the center of the channel to prevent erosion.



Fig. 26: An engineered log jam slows erosion along riverbanks.



Fig. 27: A coir log is a bioengineering structure used for bank stabilization.

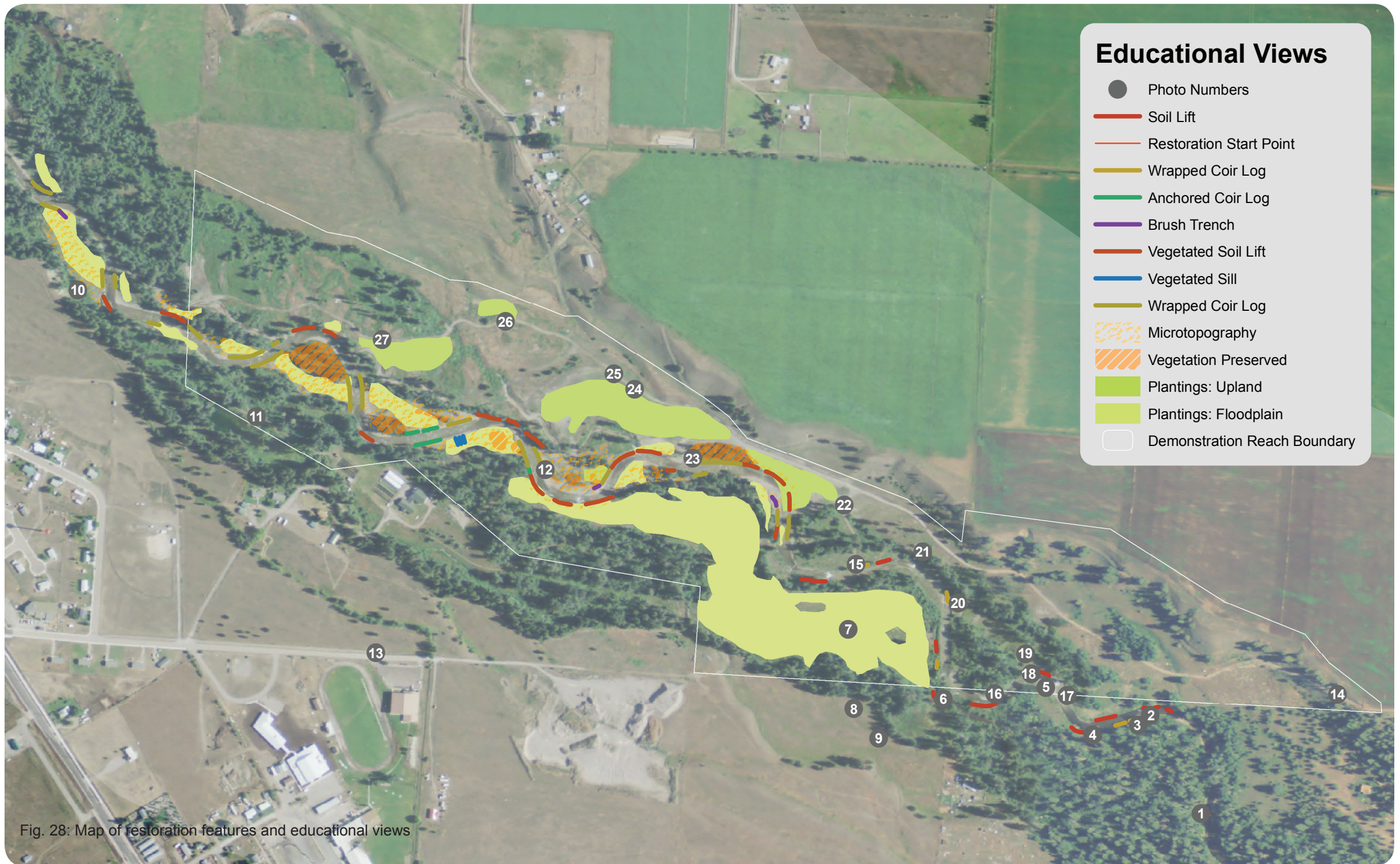


Fig. 28: Map of restoration features and educational views

Overlay Analysis

By reviewing the inventory and analysis sections presented previously in this booklet, one can understand the complexity of factors affecting the design of a trail system in the Demonstration Reach area. Because of this complexity, the design team created an analysis tool to help define the physical constraints to situating trails and associated infrastructure along the Jocko River. A GIS based overlay model analysis was employed to look at the combination of three factors: (1) flooding potential, (2) habitat sensitivity, and (3) steep slopes. These three considerations were each given numerical weights as follows:

Flooding Potential

- Areas predicted to flood at flow levels of one foot above bankfull were given a score of three
- Two feet above bankfull a score of two
- Three feet above bankfull a score of one

Habitat Sensitivity

- Habitat sensitivity was scored by giving areas defined as undisturbed a score of three (mature forests and other habitats that were not mapped as agriculture or development)
- Restored areas were given a score of two
- Agricultural areas were given a score of one
- Roads and disturbed gravel storage sites, and other developed areas were given a score of zero.

Steep Slopes

- Finally, scores were also assigned based on the suitability of slopes for development defined by ranges of percent slopes. Slopes between zero and five percent were given a score of zero, slopes between six and ten percent received a score of one, slopes between 11 and 25 percent were given a two, and steeper slopes received a score of three.

Maps were created based on these criteria and then combined so that higher scoring areas indicated that there were more constraints to development. While simplistic, this was a helpful tool when designing conceptual trail alignments and siting other conceptual facilities in the Demonstration Reach area.

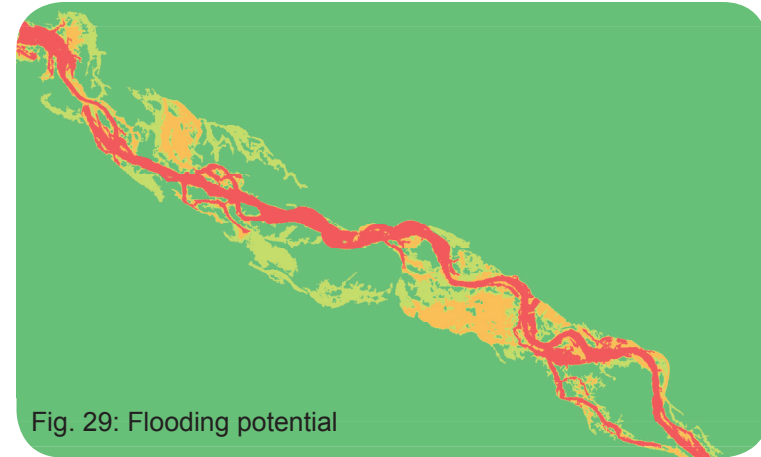


Fig. 29: Flooding potential

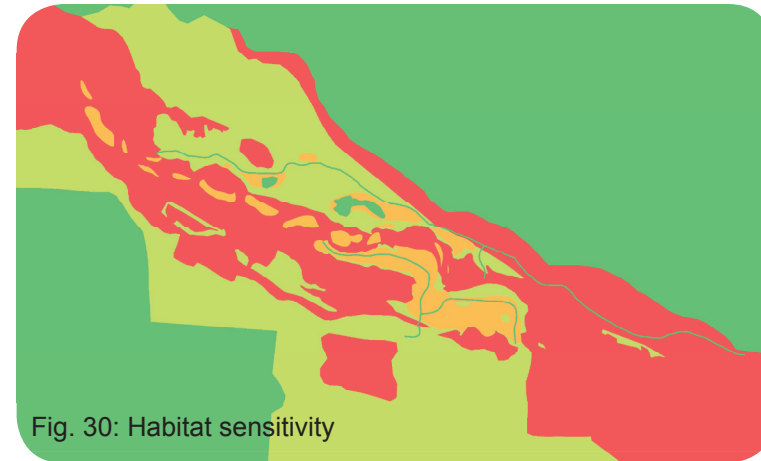


Fig. 30: Habitat sensitivity

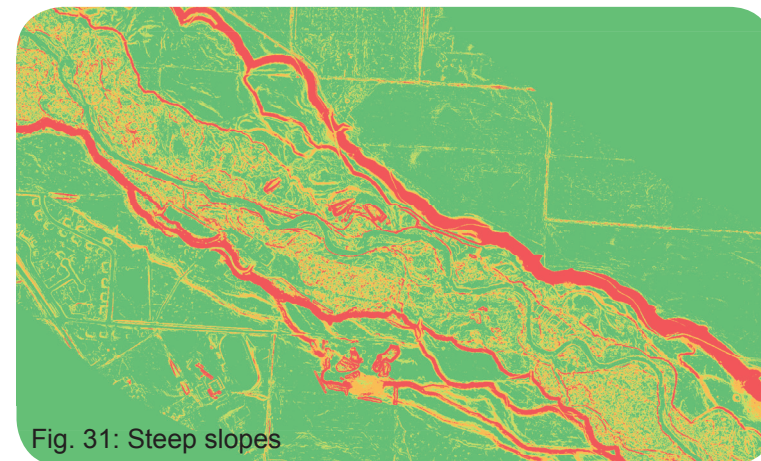


Fig. 31: Steep slopes

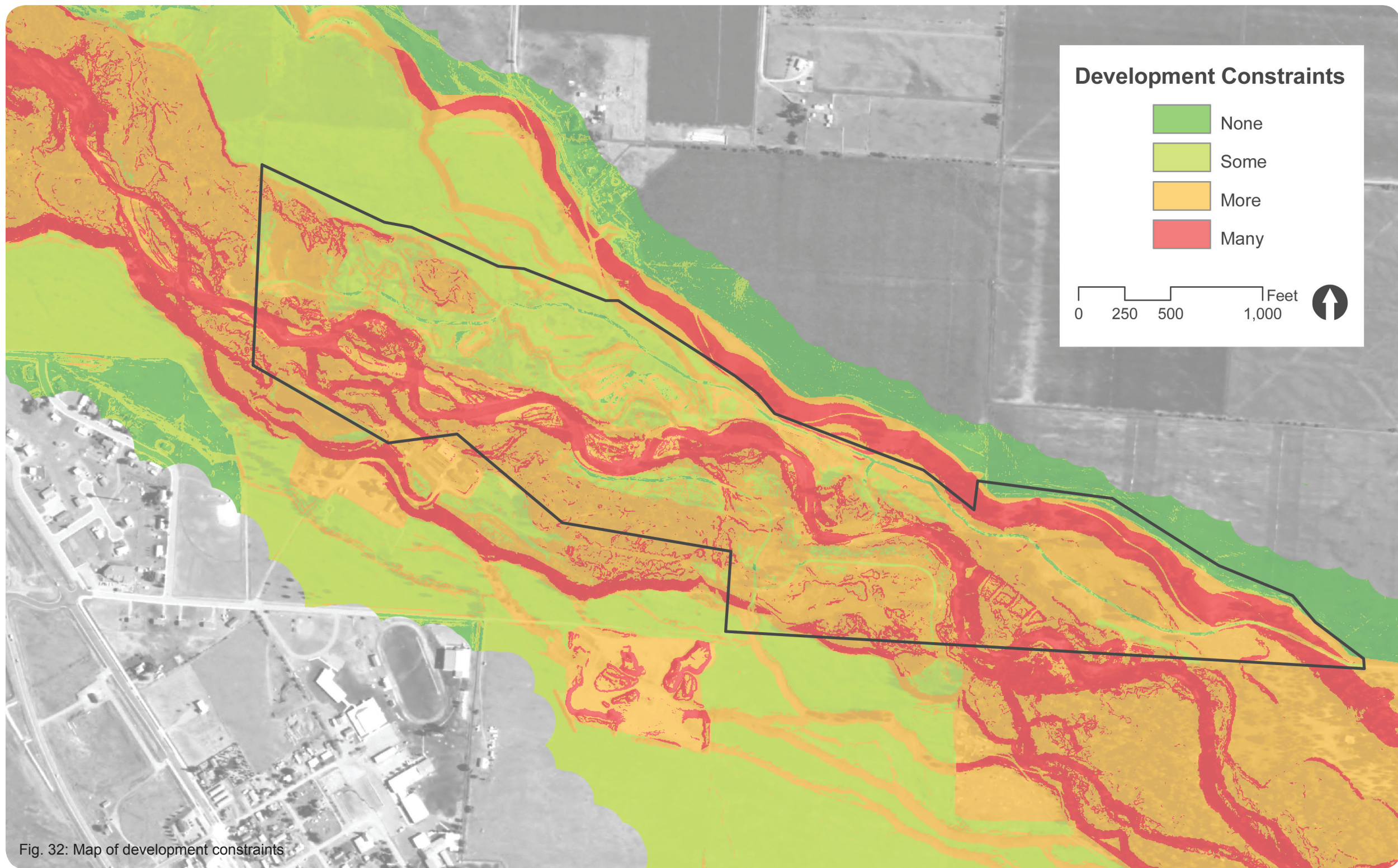


Fig. 32: Map of development constraints

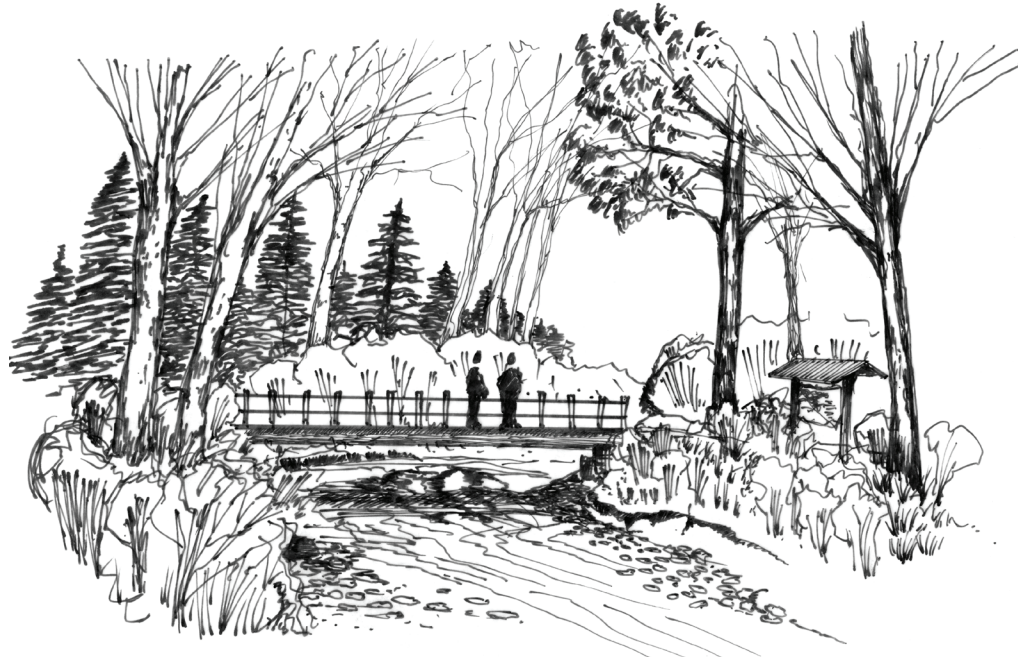


Fig. 33: Illustration of a multi-log stringer bridge across the Jocko River

Concept 1

Concept 1 was developed to conform most closely to the recommendations of Germaine White and the Confederated Salish and Kootenai Tribes restoration team. This Concept features 2.6 miles of dirt trail, much of which will utilize the existing roadway and be passively restored.

Arlee schoolchildren and teachers are intended to be the main users of this trail, as well as other area residents. The plan features few educational nodes to minimize intrusion into the visitor's experience; permanent stone cairns will exist as markers on the trail. Concept 1 does feature a prominent kiosk and seating area in the floodplain, providing a central meeting location for trail users.

The bridge design recommended in Concept 1 is a multi-log stringer bridge, pictured to the right. The construction could rely on local materials, but will constrain the river wherever it is placed; it may have to be put in a different location than pictured on the map at right.

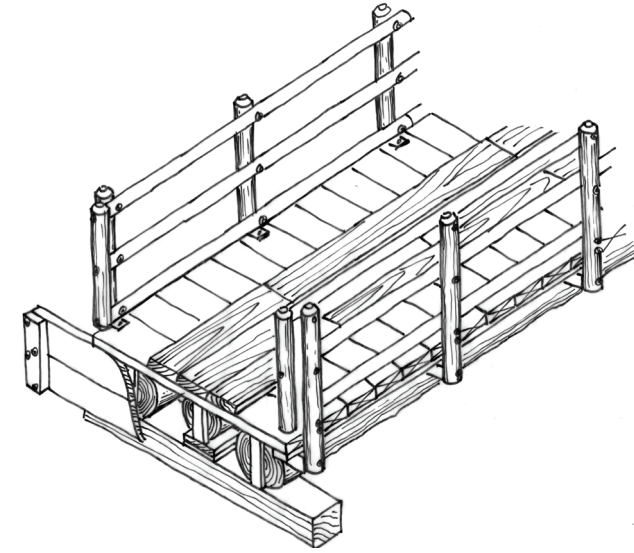


Fig. 34: Illustration of walking surface, rails and structure of a multiple-log stringer bridge.

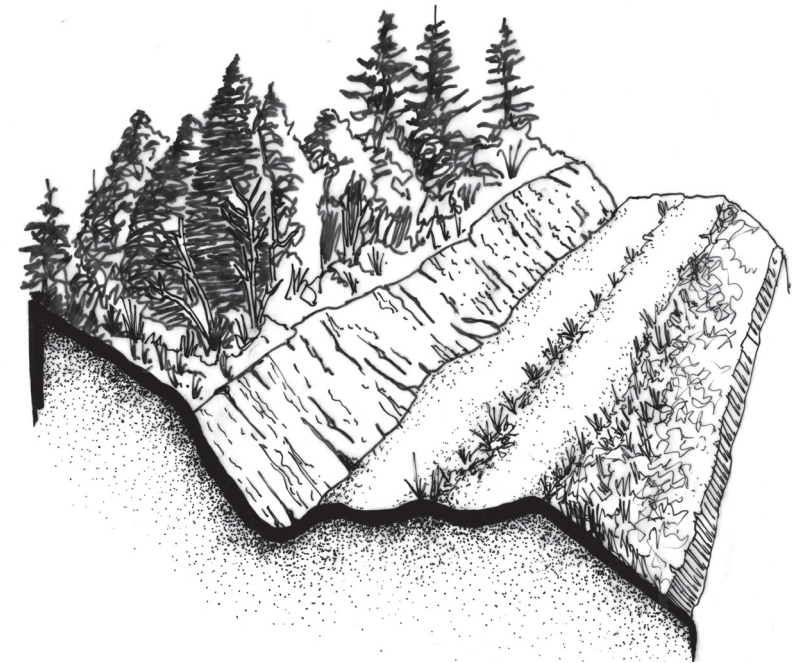


Fig. 35: The existing two-track dirt road in the restoration area may be used by pedestrians; this means no additional land needs to be disturbed for trail development.

Image withheld to maintain privacy of client.

Concept 1: Educational Nodes

To minimize intrusion into the visitor's experience, the trail will be marked by permanent stone cairns rather than traditional interpretative signage. These stone cairns will be strategically placed throughout the trail system, and will be marked with a small sign indicating a number (first in Salish, then English) correlated to a section of the educational pamphlet, which can be accessed at the entrance kiosk. Research suggests cairns like these were historically utilized by Kootenais, and may have been built to give good luck to travelers on a risky path (Shari 2003).



Fig. 37: Numbered rock cairns point out educational stopping points and correspond with pamphlets available at entrance kiosks.

Three separate pamphlets, available at the entrance kiosk, will be created for three different audiences: teachers guiding a group of students, adults, and younger children ages four through eight. The pamphlets will be tailored to each audience, and all pamphlets will display the trail logo on the front. Cairns along the trail will each be marked with a separate number that corresponds to its place on a trail map

contained within the pamphlet. The number will also correspond to a section within the pamphlet that will provide educational information relevant to the location of each cairn.

For example, a visitor who picked up an adult pamphlet will walk along the trail and approach a cairn along the river restoration area that is marked with the number six. This number will direct the visitor to the section marked with the number six within the pamphlet. This section may provide information regarding the restoration of the river, such as what the 1st and 2nd phases of the restoration included, and why the restoration was necessary. The section may also include before and after pictures of the site, and a link to the restoration website. The same number six cairn would correspond in the teacher's pamphlet to restoration-relevant information consistent with the level of material included the educational DVD, 'Explore the River: Bull

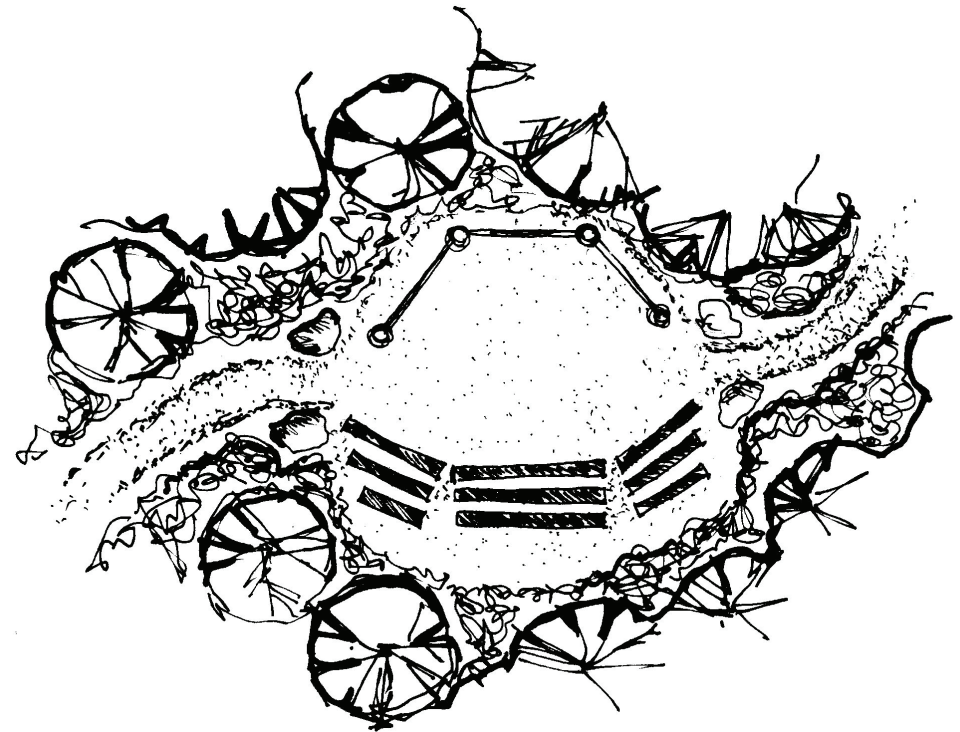


Fig. 38: This plan view shows three rows of seating facing a three-panel kiosk, surrounded by trees; this area serves as a central meeting point for educational groups touring the Demonstration Reach.

Trout, Tribal People and the Jocko River,' developed by the CSKT. The information in the pamphlet could compliment, refer to, and/or draw from the information provided by the DVD. The pamphlet should include activities for the teacher and students, such as measuring and recording the temperature of the water. The educational materials are designed to be interactive and engaging with the visitor.

The children's pamphlet will be simplified to engage younger children, and feature more visual information, such as photos and drawings. This pamphlet will focus more on the native wildlife of the area; information regarding food chains and life cycles will be displayed through graphics and simplified writing. Graphics from the bull trout storybook, 'Bull Trout's Gift', developed by the CSKT could be used for this pamphlet.

The cairn-pamphlet interpretation method is useful in order to preserve the natural feel of the trail, and ensure that the educational aspect of the trail is unobtrusive and minimally distracting. The pamphlets also allow the educational material to be tailored to three separate audiences, allowing each audience to learn in the way that is most effective for their age and interests.

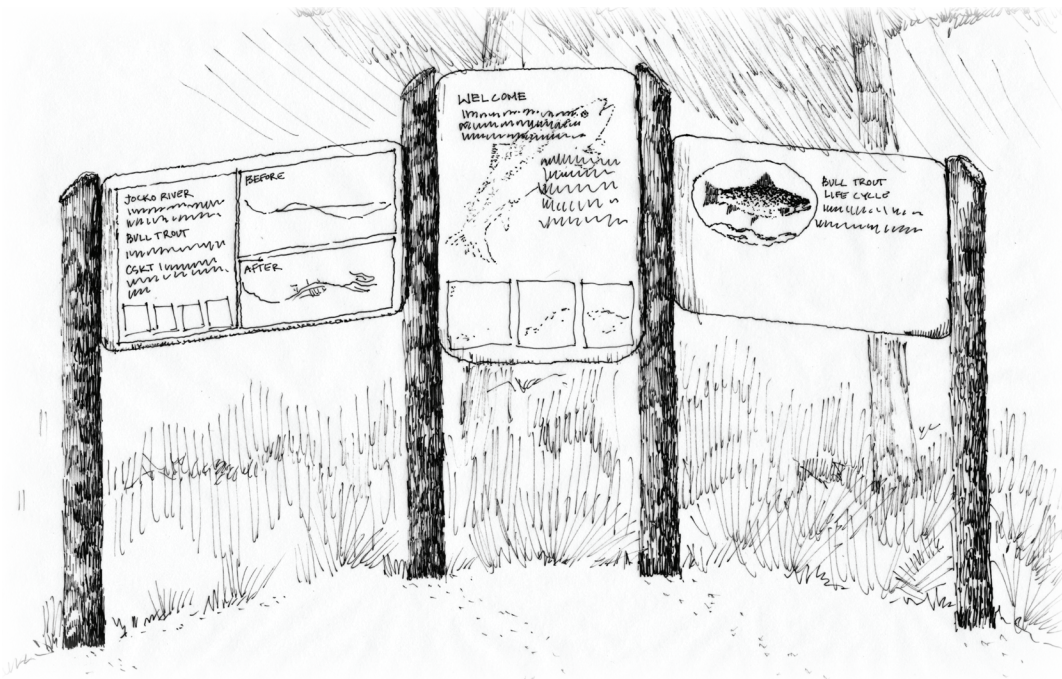


Fig. 39: Illustration of the three-panel kiosk which welcomes visiting students and teachers to the Demonstration Reach.

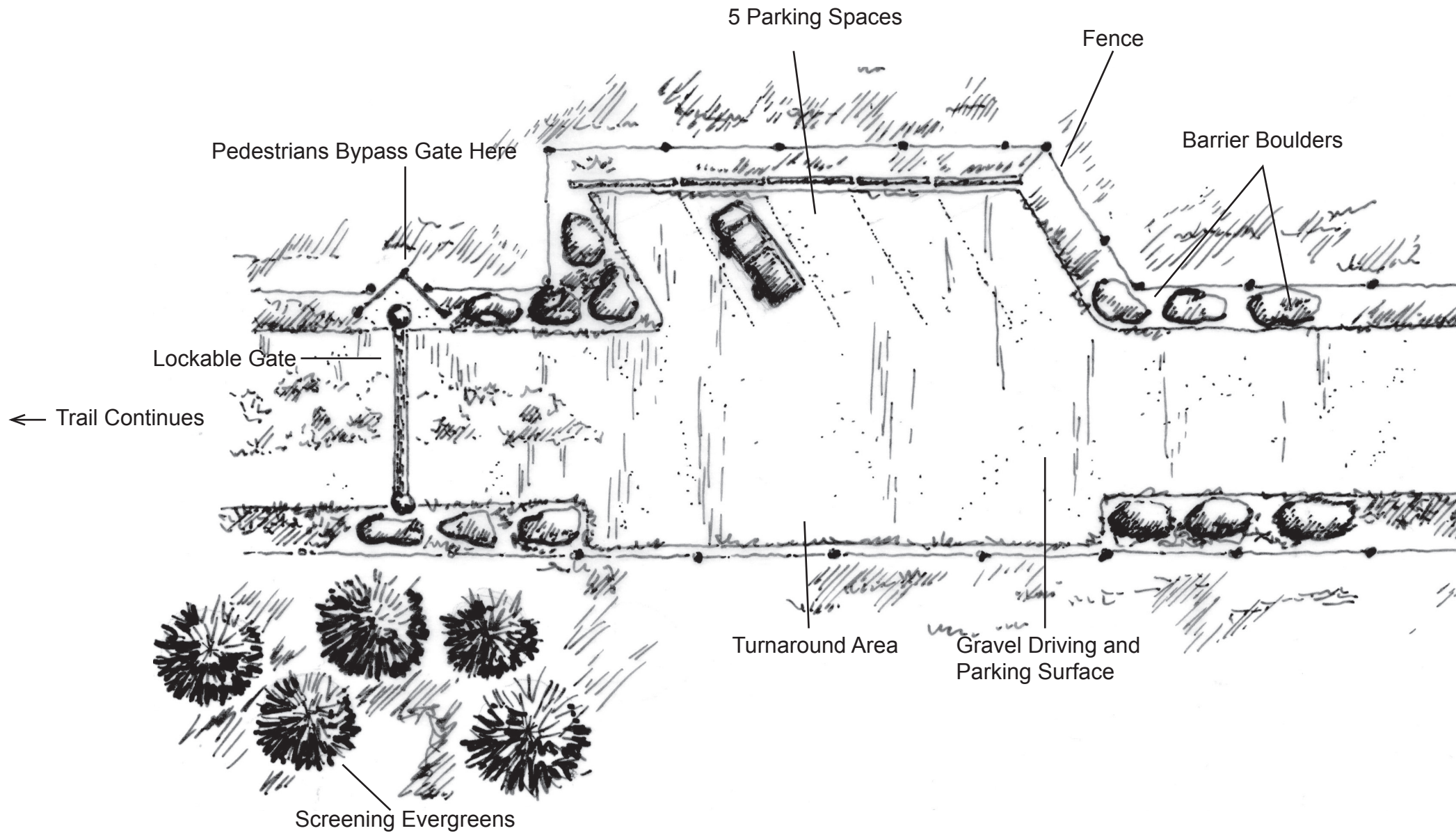


Fig. 40: Illustration of potential design for parking spaces and gate at the northeast corner of the Demonstration Reach

Concept 1: Analysis

The following is an analysis of Concept 1 that goes beyond the general descriptions provided above. Each concept includes such an analysis, which is designed to demonstrate favorable aspects of each Concept, but also bring the reader's attention to their drawbacks; the planning team believes this will help with overall decision-making regarding future trails development.

Overview

Concept 1 represents a trail system that is most aligned with the CSKT's stated desires. The main sections of the trail utilize the existing road, and signage is minimized apart from the entrance kiosk.

Trail Layout

The proposed trails simply stop at two points on the north side of the river, meaning there are no looping options in this design. This limits the variety of habitats and views the trail user will experience during visits, but simultaneously limits impact on areas of high ecological sensitivity. While the Oxford Road parking lot is meant to serve as the main entrance, limited parking is available north of the river at the east end of the proposed trail. No formal start or end is provided north of the river at the west end of the proposed trail. The connection is weak between the two sides of the river, and there are no connections to hatchery trails.

Maintenance and Ecological Considerations

Passive restoration is used to convert the road to a foot trail, which means that no additional work is required, minimizing maintenance and construction costs; trail users will simply walk on the existing road. Natural re-vegetation will occur, effectively narrowing the tire tracks, but foot-traffic will continue to compact the soil in the tracks and will help it remain clear of vegetation for some time. Vehicles may still be able to access the site for maintenance, or to increase accessibility for impaired trail users. Locked gates prevent over-use of these roads and limit vehicular access. No new land will be disturbed for the placement of trails, unless the proposed connection to Highway 93 is built (shown on map as continuing from the northwest corner of the demonstration reach). Concept 1 does not feature ephemeral trails that reach the river or provide close views of the restoration area; foot traffic is therefore minimized in ecologically sensitive areas. Parking is located on both sides of the river, which will require more maintenance.

Educational Features

The kiosk and seating areas are located in the floodplain, which means this area may not always be accessible when large flooding events occur. (For more information, reference the flooding analysis map on page 15). Because of this high flooding potential, permanent signs and seating here will require more maintenance or more frequent replacement than if built in a dry area, increasing costs; large, destructive floods will jeopardize structures built in the floodplain. This location does provide an excellent view of the river, and a central meeting point that is a part of the trail system - enhancing the educational potential of this kiosk location. This concept takes advantage of and frames views from the road through specific placement of educational nodes, as indicated on the map.

The overall costs of Concept 1 may be increased because of pamphlet printing, and increased maintenance costs associated with increased litter along the trail. To reduce these potential problems, small pamphlet-return boxes could be placed along the exit areas of the trail so pamphlets could be collected and reused. Additionally, the pamphlets could be laminated, which would discourage litter, but might encourage theft, and would certainly increase costs.

Bridge Options

Log stringer bridges are recommended in this Concept, as a more mobile bridge option which can be relocated as needed. However, these bridges can only span up to 45', meaning the locations may have to be modified from the location shown here. It should be noted that, wherever the bridge is built, it will thereby constrain the river, which will continue to meander and form its natural path.



Fig. 41: The most upstream point of restoration could be modified for use as a swimming hole accessible by a trail from the Arlee pow wow grounds.

Concept 2

Concept 2 is a highly interactive trail system that provides many opportunities for the visitor to experience the landscape through 8.4 miles of dirt, gravel and unimproved trail loops. These loops cut through a variety of areas and provide riverside access, close views of restoration areas, and detailed, highly visible educational signage. Riverside access is achieved through the use of ephemeral trails, and the trail system offers an overlook of the entire site from the upper trail. This trail system also provides the opportunity for an event area.

Concept 2 features three educational kiosks located in the floodplain. The only kiosk safe from flood waters is located along the proposed bench trail. Additional educational signage is located along trails in the floodplain as indicated on the map to the right.

Three bridge locations facilitate trail loops incorporating both sides of the river. Using a prefabricated steel truss bridge at the central location allows for emergency and maintenance vehicle access. Single or multiple-log stringer bridges could be used in the other two locations.



Fig. 42: A well-maintained gravel trail surface in select areas would allow safe footing for visitors of many ages and abilities.



Fig. 43: Ephemeral trails can be mowed into existing vegetation without the addition of a dirt or gravel trail surface. Flooding may render these trails temporarily inaccessible after storm events.

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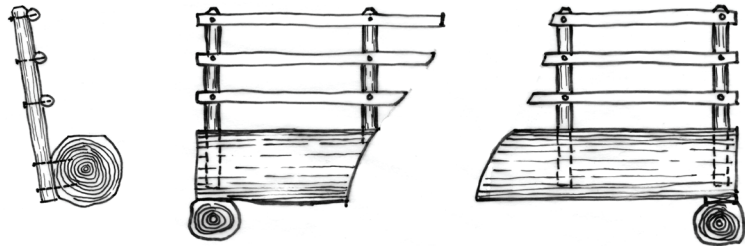
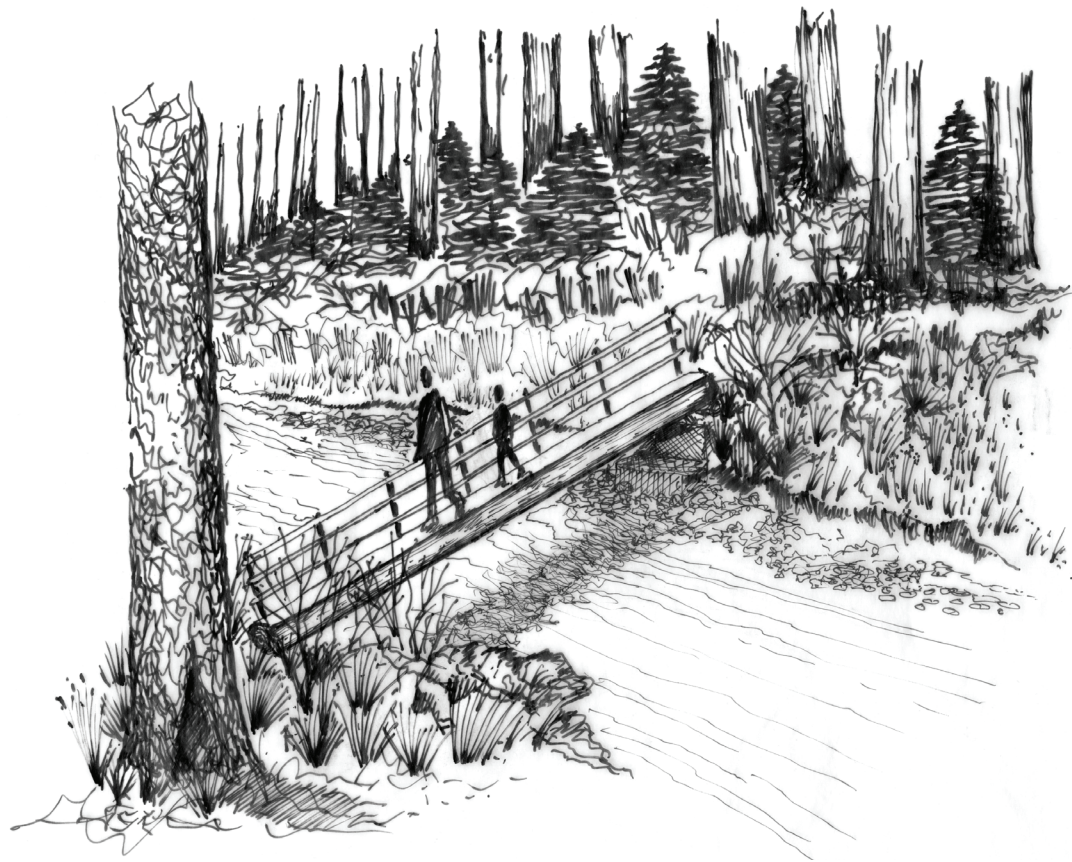


Fig. 45: A single-log stringer bridge may be used at secondary river crossings which facilitate multiple trail loops in Concept 2. Above is an illustration of such a bridge and the bridge structure viewed in cross-section.

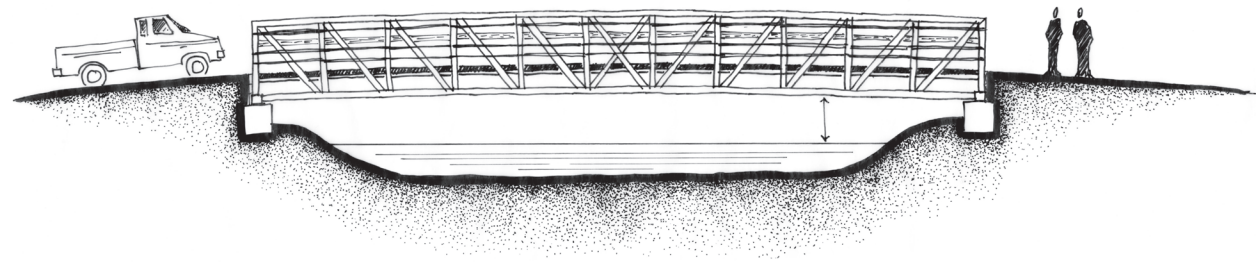


Fig. 46: A prefabricated steel truss bridge can be designed to accommodate emergency and maintenance vehicle traffic in addition to pedestrian traffic.

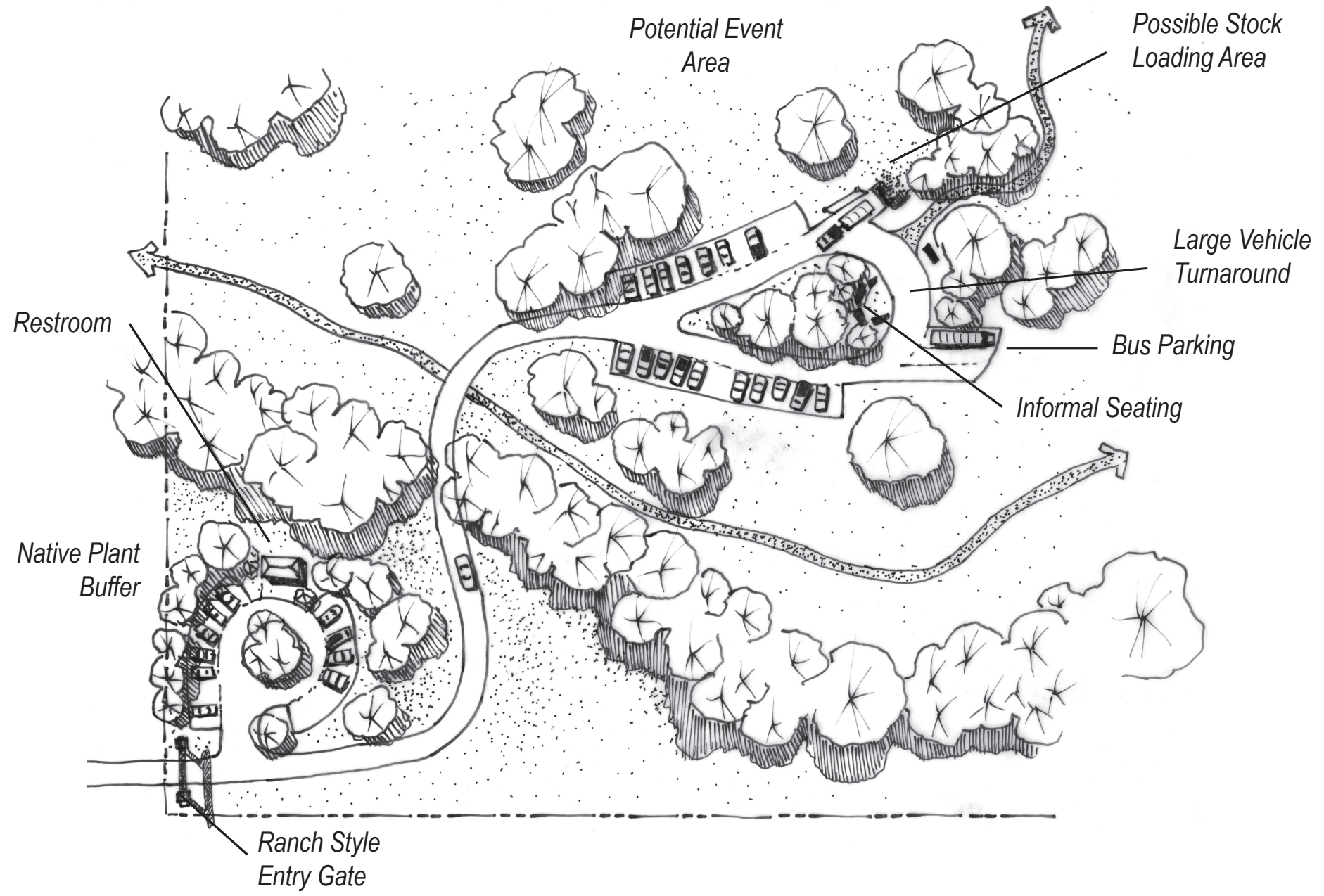


Fig. 47: Illustration of potential layout of the parking area located within the floodplain off Oxford Road.

Concept 2: Educational Nodes

The main purpose of the educational nodes of this trail concept is to communicate important ecological components of the area relating to traditional CSKT culture and values, and to educate audiences through tactile and interactive educational materials, which will be developed primarily for middle school and high school students.

Interpretative signage for this concept is a dominating feature. Signs throughout the system will highlight various active restoration efforts, while emphasizing an underlying message of passive restoration by providing practical 'how-to be passive' prompts for users. Signs will be mounted on pole stands, and will include two signs: one mounted at a height for older children and adults, and another placed lower for younger children.

The signs will present information in a way that is mentally stimulating, using elements of stories. When information is presented through stories, cognitive processing is deeper, and it is more likely that the information will be remembered and used. A story could be told, for example, about a single bull trout, from fry to spawning adult, in order to connect the signs and incorporate characterization.

A multi-panel trailhead kiosk will focus on the life-cycle, migration, cultural significance, and current status of the bull trout in the Jocko River. This kiosk station will also include a small interactive kiosk where visitors can see bull trout migration patterns and other multimedia from the interactive, educational DVD entitled 'Explore the River: Bull Trout, Tribal People and the Jocko River' compiled by the CSKT.



Fig. 48: Interactive kiosk

This design includes a small educational loop. Signs here will be strategically placed to showcase the four Cs (Complex, Clean, Cold, Connected) of a healthy bull trout habitat, according to the educational DVD. The educational kiosk will also offer more interactive features for learning; for example, buttons to press that play recordings from elders speaking about the cultural and ecological importance of the area.



Fig. 49: Tilted signs discourage target practice. Placing higher signs adjacent to lower signs allows people of multiple ages and abilities to appreciate educational material.

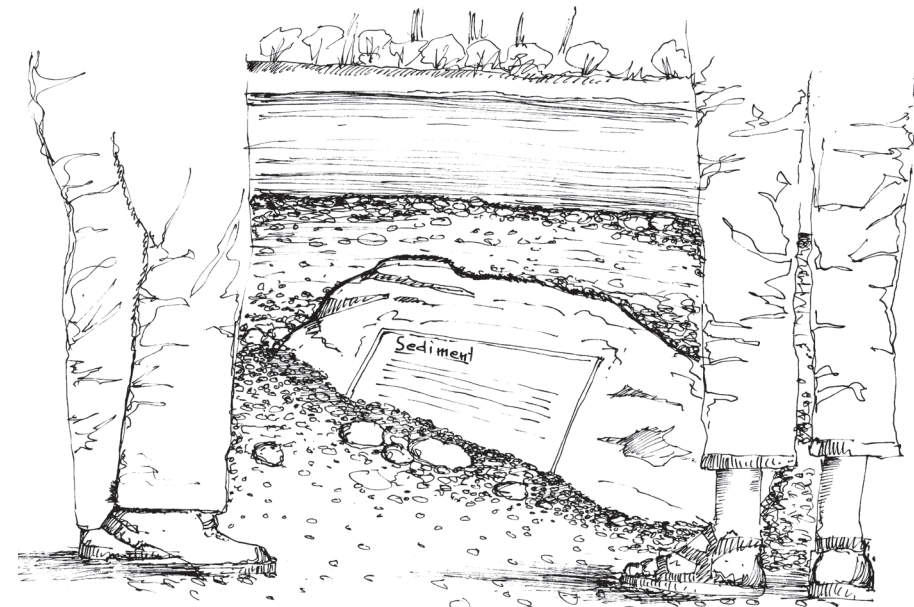


Fig. 50: A sediment sign may be placed where it may be buried and revealed over time.

Concept 2: Analysis

Overview

Concept 2 represents a highly interactive trail system that is rich with aesthetic quality, educational opportunity, and trail variety.

Trail Layout

This trail system features multiple circuits, which means less backtracking for the trail user along areas already passed. This concept, in contrast to Concept 1, incorporates existing hatchery trails and enhances them. A trail is imagined on the top of the ridge on the south side of the river, and connects to the Highway 93 trail on the south side of the river. Additionally, this trail system provides formal access to the river from the pow wow grounds, forging a clear path through Jerry McGahan's private property (see Land Ownership on page 9 for more information), and drawing attention to the most upstream point of the river restoration project. This point may be emphasized through the placement of a swimming hole. Overall, Concept 2 features a high degree of connectivity to the greater Arlee community and socially important areas.

Maintenance and Ecological Considerations

Parking (space for 50 cars and three buses) has been placed both within and above the floodplain, which will limit access at the times of the year when flooding potential is greatest. Concept 2 has a much larger construction and maintenance footprint than the other Concepts, due to increased parking, more kiosks, multiple bridges, and multiple types of trails, all of which lie within the floodplain and may be compromised during flood events. Though none of the trails are paved, environmental impacts are involved in the construction of a permanent gravel or dirt trail, and even the ephemeral trails that feature no improved surface. In addition, new trail construction will disturb parts of the Demonstration Reach, as well as areas outside of the restoration area that have not yet been impacted by trails.

The Concept 2 trail system offers an overlook of entire site from upper trail, as well as close views of important restoration features throughout. Riverside access is enhanced, in contrast to Concept 1, through the use of ephemeral trails. However, this does mean increased maintenance costs, as the ephemeral trails located within the floodplain must be re-formed after large flooding events. Additionally, the trails pass through many types of habitats, which provide greater visual interest and more

educational opportunities than the other two concepts. Because of this, the impact of increased foot traffic on ecologically sensitive areas is greater.

Educational Features

Of all the concepts, Concept 2 has the highest number of kiosks (four) and educational nodes, and features highly visible, variable, and detailed signage. This makes interpretive signage a dominating feature of this trail system. The prominence of interpretive signage, such as the multi-paneled trailhead kiosk, could leave it vulnerable to vandalism and other damage, which will increase maintenance costs. Additionally, the interactive nature of some of the signs will also translate into higher maintenance and overall costs; more complicated technologies will require more monitoring and upkeep.

Bridge Options

Three bridge locations are proposed in Concept 2. A central bridge near the main parking lot and kiosk is placed where machinery crossed the river during restoration construction. Using a prefabricated steel truss bridge here will provide safe vehicle access for maintenance and emergency purposes. Able to span up to 70', this type of bridge may give the river more room to meander than would other options. The bridges proposed at the east and west ends of the demonstration reach is placed to increase connectivity between sides of the river. Meant only to move people, single or multiple-log stringer bridges may be appropriate here.

Because of the large amount of construction and maintenance that will necessarily be involved in Concept 2, this trail system will carry the largest costs of all the trail concepts.

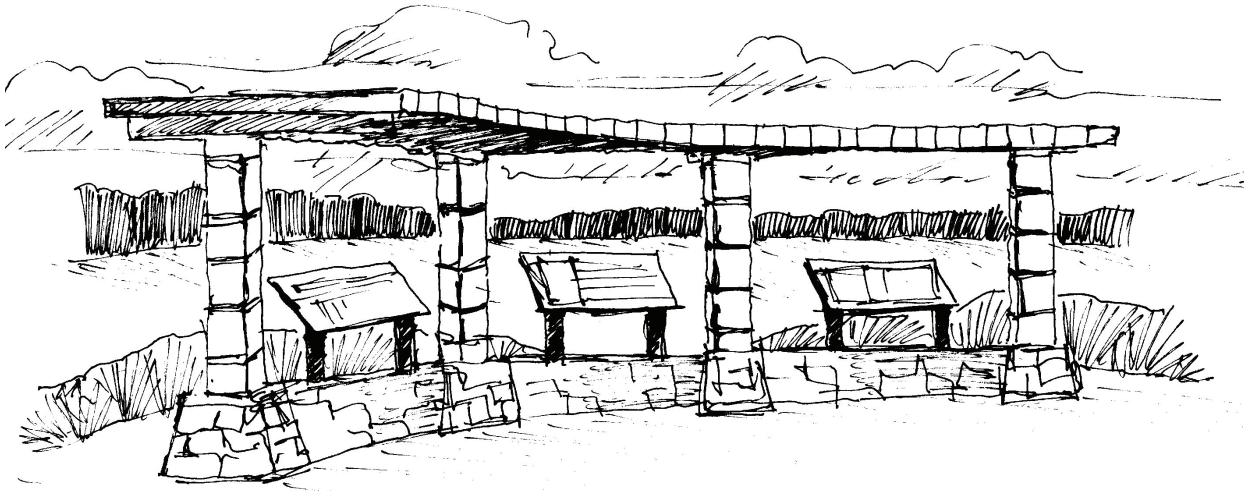


Fig. 51: An arbor covers tilted signs at the parking lot kiosk.

Concept 3

This 3.1 mile trail system is the most ecologically sensitive, utilizing ephemeral trails to gain river access. Additionally, the trail makes use of the existing roads, which will be actively narrowed to become single-track trails, thus limiting erosion and excluding vehicle access. Portions of the construction road will be completely removed for this trail system, and the parking area will be located out of the floodplain. This trail system features no permanent seating, signs, or kiosks in the floodplain. To enhance the visitor experience of the area, there are multiple loops that take the visitor through different habitat types.

Educational signage is more prominent than in Concept 1 but less so than in Concept 2. Materials emphasize personal stewardship and responsibility toward the restoration area and discouragement of social trails. As in Concept 2, one educational loop is dedicated to the four Cs of bull trout habitat.

A centrally-located prefabricated steel truss bridge spans the river, providing the most room for natural meandering over time.

Image withheld to maintain privacy of client.

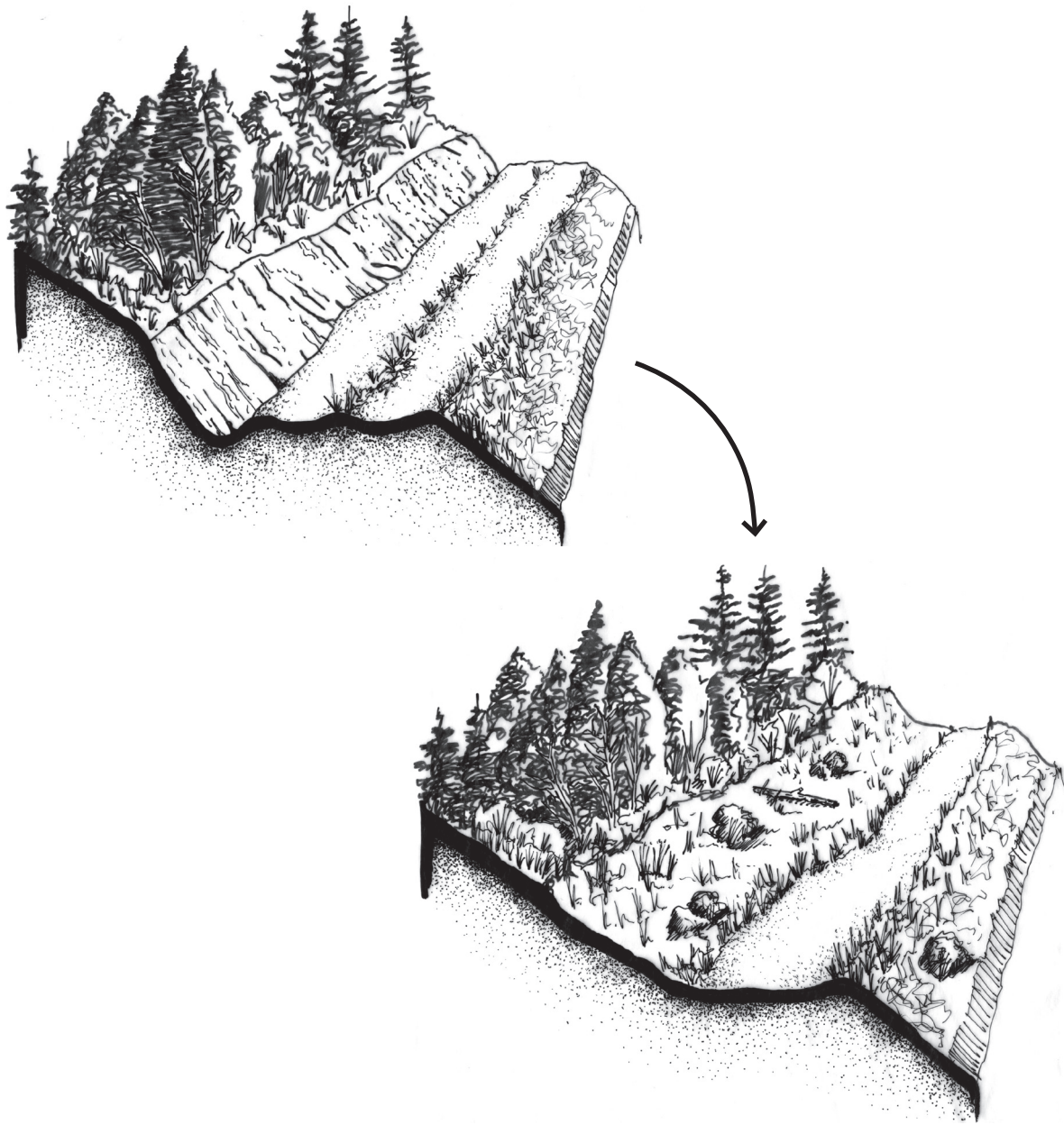


Fig. 53: Existing two-track construction roads (top) actively narrowed to single-track path by disturbing the compacted soil in one lane and planting native vegetation.



Fig. 54: Ephemeral trails near the river are mown into vegetation and blocked off during flood events or wet times of the year. No surface improvements are made.

Concept 3: Educational Nodes

The educational nodes in this trail system concept will stress environmental protection through themes of river health, the reduction of impacts, and the encouragement of responsibility for the maintenance of natural areas for future generations. Concept 3, like Concept 2, will communicate key themes from the aforementioned DVD, as well as help reduce the overall impacts of the trail.

The educational materials will be developed primarily for middle and high school children, similar to Concept 2.

Sign topics will focus on river and ecosystem health (What makes a river healthy? How does river health affect the surrounding ecosystem?), reducing impacts (How do we ensure that we will not have to restore our rivers in the future?), and environmental protection (Why is it important to protect native species? Why are native species at risk?). As mentioned in concept 2, signs should be arranged in a logical sequence and behave as an array of chapters that relate to and make up the story being told, which will provoke interest and capture the essence of what is to be interpreted (Westrup 2002).

Like Concept 2, this design includes a small educational loop. A sediment sign in the loop will be strategically placed, along with other signs on natural boulders, to showcase the four Cs (Complex, Clean, Cold, Connected) of a healthy habitat, also as in Concept 2. However, signage in this concept will not be located in the floodplain, thereby reducing ecological impact.

A multi-panel trailhead kiosk (Fig. 51) will inform trail users of local restoration efforts and provide information on key species (eg. bull trout).

In order to prevent the use of social trails (off-trail use, shortcutting) the use of messages that focus on personal responsibility and the encouragement of pro-environmental behavior can be an effective and economically efficient approach to reducing the impacts of trails on wildlife and the ecosystem at large (Schasberger et al. 2009).

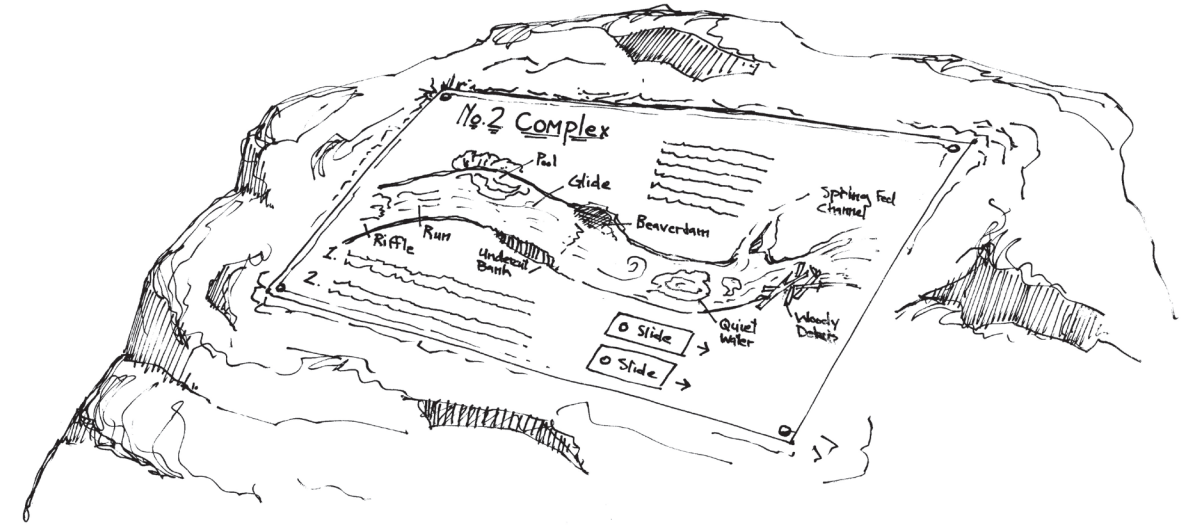


Fig. 55: Placards are attached to large boulders, creating unobtrusive signs resistant to flood damage, and taking advantage of local materials. This design may discourage use for target practice.



Fig. 56: A visitor stops to view a rock sign.

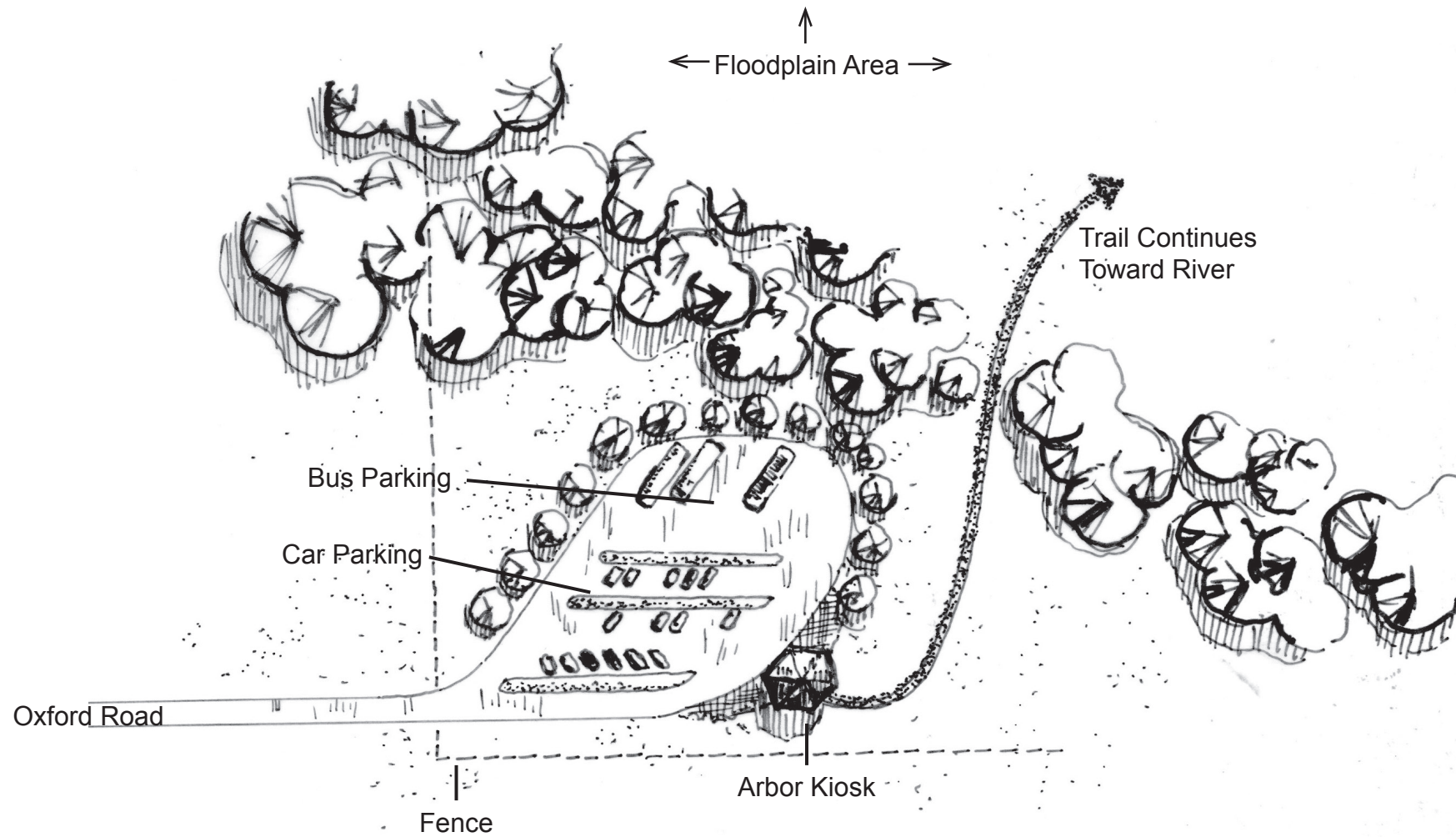


Fig. 57: The main parking lot in Concept 3 is placed at the end of Oxford Road above the floodplain. Features include bus parking and a central kiosk. A path connects the parking area to the trail system.

Concept 3: Analysis

Overview

Concept 3 proposes a trail system that is the most ecologically sensitive of all the options, while featuring multiple loops and ephemeral trails for river access to enhance the visitor experience.

Trail Layout

Concept 3 offers minimal connections to other community trails and areas of interest, such as the proposed Highway 93 trail, and the potential Oxford Road trail. There is also no connection to the pow wow grounds in this Concept, in contrast to Concept 2. Vehicle access is limited to the south side of the trail system. Though there is a substantial loop on the north side, there is no official entrance point for vehicles or foot traffic. Parking is limited in Concept 3 to reduce impacts, though there is the potential to park buses at the school for educational use. Schoolchildren may walk the short distance to the beginning point of the trail system.

Maintenance and Ecological Considerations

Portions of the existing construction roads are actively narrowed through re-vegetation to become single-track trails, and used as main trails in this design. This will limit erosion by leaving less soil bare and prone to runoff, and exclude vehicle access. The active re-vegetation of the trail should be monitored over time to ensure its successful conversion.

No permanent seating, signs, kiosks, or parking are located in the floodplain, unlike the other two Concepts, minimizing both impacts and maintenance costs.

Multiple trail loops will pass through different habitat types with the construction of new trails, both ephemeral and permanent (gravel or dirt). The construction of the new trails will have some ecological impacts, but these will be less invasive than in Concept 2.

Educational Features

The multiple trail loops, as in Concept 2, will offer a variety of aesthetic and educational benefits, and the river can be accessed through the use of ephemeral trails. Additionally, the main educational kiosks are located at the parking area and hatchery only; this minimizes the invasive nature of the signage, but signage in

Concept 3 will be more prominent than it is in Concept 1.

The material presented at the educational nodes will be reflective of the Concept's overall design; encouragement of environmental protection and human impact on the area will be stressed. In addition, the use of messages that focus on personal responsibility and the encouragement of pro-environmental behavior will help mitigate the possibility of the development of social trails (off-trail use, shortcutting) that could be damaging to ecologically sensitive areas. This technique may be used to discourage this practice in all Concepts.

Concept 3 does not feature vehicle access beyond the parking lot. This could present a possible safety issue, because there is no vehicle access at all to the trail on the north side of the river. The steel truss bridge may also be difficult to maintain because of this limited vehicle access; therefore it might be desirable to keep access for emergency and maintenance vehicles but limit it to the south side of the river.

Bridge Options

In this design, a prefabricated steel truss bridge is recommended. Though the infrastructure of installing such a bridge is significant, it can span up to 70', leaving the river more room to meander naturally. This bridge type may be designed to facilitate emergency and maintenance vehicles or pedestrian traffic only.

Cues to Care: Creating a Familiar Landscape

Joan Nassauer's work on the aesthetics of culturally and ecologically sustainable landscapes identifies the importance of creating an appearance of care for people to find them acceptable. In her book *Placing Nature* (1997), Nassauer writes that while some landscapes may be picturesque, this does not mean that they are ecologically sound. A golf course may fit into this category; it may be pleasing to the eye, but also contaminated with herbicides and pesticides. Conversely, an ecosystem may be ecologically healthy, but have the appearance of being a disorderly and uncared-for landscape. For example, a newly burned ponderosa pine forest may appear unattractive, yet fire is essential to the ecological health of these forests.

The Demonstration Reach Restoration area has the potential to be ecologically functional while appearing cared for by humans, even when natural disturbance patterns are present. The river channel has been engineered to allow the river to flood its banks. Flooding brings the deposition of sediment and woody debris, as well as the migration of the channel itself. To the trained eye, the effects of flooding may denote the health of the system; however, to the uninformed observer, these piles of rubble and uprooted trees might appear disorderly and uncared-for. Nassauer recommends using "cues to care" to help give untamed yet ecologically healthy landscapes the appearance of order and stewardship.

"Cues to care" take culturally accepted symbols of order and stewardship and apply them to ecosystems that sometimes are not picturesque in appearance. For example, in the West, a carefully-maintained fence is a symbol of a well-maintained ranch. Within the Demonstration Reach area, fences could be strategically placed in key, highly visible areas to denote a cared for landscape. Likewise, maintained path edges and birdhouses can demonstrate stewardship. Interpretive signage can further help foster greater understanding of landscape restoration processes.

Landscapes that are both ecologically healthy and meet the aesthetic needs of people are more likely to be cared for and sustained in the long term (Nassauer 1997). The Demonstration Reach area provides an opportunity to create just such a place. The ecological restoration of the Jocko River is an essential step; however, this landscape must also meet human needs if it is to become truly sustainable.

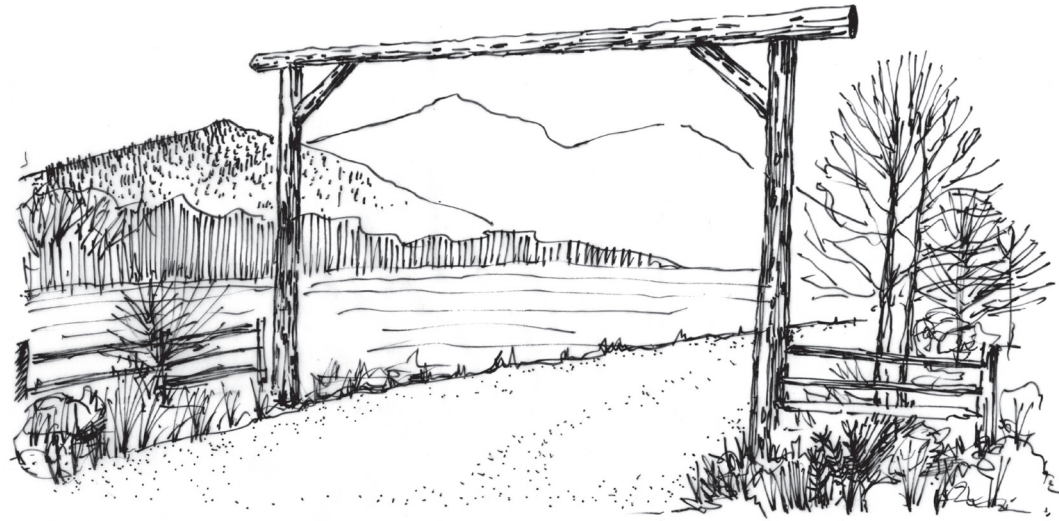


Fig. 58: A traditional ranch gate would be a familiar way of marking the entrance to the trail system.



Fig. 59: Traditional-looking fences are one way of denoting care. Fences could be used at trail entrances and along boundaries.



Fig. 60: Mown edges along trails mark an otherwise natural-looking area as important to and cared for by a community.

Additional Information on Bridge Design

The design recommendations in this booklet present strategies for bridge selection and placement based on the expectation that the restored Jocko River will meander over time, which is the intent of the CSKT Department of Natural Resources. However, river crossings are essential for providing public access to the river. If river crossings are to be part of the Demonstration Reach trail system, then tradeoffs between the ecological health of the river and public access must occur. The team presents two strategies that would minimize these ecological costs. The first strategy is to design bridge structures that are less expensive, have shorter spans, and could be moved and/or reconstructed after flood events. While cheaper in the short term, the continual maintenance costs and shorter lifespans of these designs may mount over time. The second strategy is to invest more in the bridge structure, which would allow for a longer bridge span. This would allow the river to move in the floodplain without damaging the structure. Both strategies have their advantages.

Regardless of which strategy is employed, the siting and construction of a bridge is a complicated task that will require thorough site analysis and expertise stemming from multiple fields. Groenier (2005) recommends drawing on knowledge from biologists, hydrologists, geotechnical engineers, and bridge engineers before settling on a bridge site. Site investigations should inventory streambed strata, floodplain width, soil types, observations of log jams, ice scour, and drift locations in the river (Groenier 2005). Rivers are dynamic systems and, ideally, bridges should be located away from aggrading and degrading areas, sharp curves, branched reaches, sloughs, and floodplains (Groenier 2005). All of these factors should be considered in the preliminary design of bridges.

Preliminary designs should account for the bridge span, bridge height and width, and the foundations needed for the bridge abutments. Bridge span can be estimated with the equation: $\text{Span} = \text{the width of the channel bottom} + 3 \times \text{the bridge height from the channel bottom to the trail surface}$ (USFS 2005). The lowest part of the bridge superstructure should be a minimum of 2' above high water (100 year flood). When considering the design of abutments, in Region 1 the Forest Service typically uses either a gabion or geocell foundation with a timber sill on which to set the bridge structure (USFS 2005). Generally, it is better to invest in the bridge span rather than in fortifying abutments; this is also better for the ecological health of the river (USFS 2005).

Multiple and single-log stringer bridges, spanning between ten and 45', are two designs that would be moderate to low cost, and could potentially be moved by helicopter or heavy equipment during flooding events. Because of these short spans, it is uncertain if they would function well in the Demonstration Reach site currently being considered for a crossing structure. If the ideal site could be found for these designs, they could be constructed using local material and expertise. The multiple-log stringer design can be built to any width, which could accommodate stock and light vehicle traffic. The single-log stringer design could only support use by hikers.

A prefabricated steel truss design is recommended for the second strategy mentioned above; a larger upfront investment in the bridge structure would allow for a longer bridge span. These structures are constructed by the manufacturer, and then delivered to the site. Continental Bridge and Steadfast Bridges are examples of companies that manufacture these types of bridges. Costs could reach \$100,000 for a structure measuring 8'x200'; shorter spans would cost less (Steinholtz 2007). According to the manufacturer Continental Bridge, single piece bridges can have spans up to 70', and larger spans must be transported in sections. These bridges can be designed to support vehicle traffic.

This section is an attempt to provide initial information about what bridge structures could be used for the Demonstration Reach area, but it is not an exhaustive investigation of all the options available. Consulting a bridge engineer is an important first step in choosing the right structure.



Fig. 61: Single-log stringer bridge



Fig. 62: Single-log stringer bridge



Fig. 63: Multiple-log stringer bridge

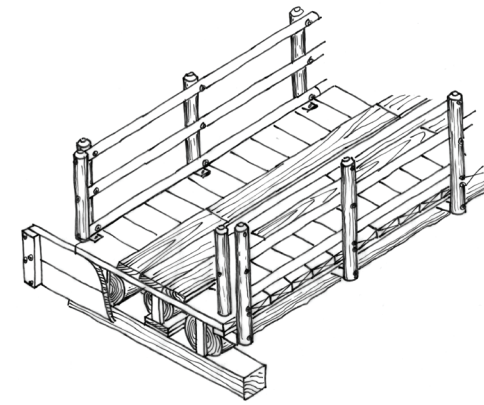


Fig. 64: Multiple-log stringer bridge



Fig. 65: Steel truss bridge



Fig. 66: Steel truss bridge

Additional Information on Road to Trail Conversion

Gravel roads exist in several areas of the restoration reach. These roads represent disturbed ground which may be modified into usable walking trails. Though some may see the entire demonstration reach as having been disturbed by the restoration process, the features created by that restoration have been carefully planned, and are intended to change over time with limited human disturbance whenever possible. The existing roads were used by construction vehicles and large equipment during the restoration process, and so represent areas void of significant engineered features. The use of the construction roads as trails should be strongly considered in the planning of trails in the demonstration reach.

Roads may be altered for use as trails by allowing natural growth of plants to narrow the road from both sides and the center. This will result in a two-track trail, with the most compacted ground where wheels traveled, resisting plant growth. Roads may also be physically narrowed down to a single track for use as a trail, disturbing the ground along one former tire track to encourage plant growth where it would otherwise be inhibited by compaction. Manual planting or seeding may speed the narrowing of the road in a two-track or single-track road to trail scenario.

For comprehensive information on road to trail conversion, please refer to “Best Management Practices for Road Rehabilitation: Road to Trail Conversion”, prepared by Brian R. Merrill and Ethan Casaday for the Roads, Trails and Resources Maintenance Section, North Coast Redwoods District, California State Parks, December, 2001 (available online at [www.parks.ca.gov/pages/23071/files/road to trail.pdf](http://www.parks.ca.gov/pages/23071/files/road%20to%20trail.pdf)).

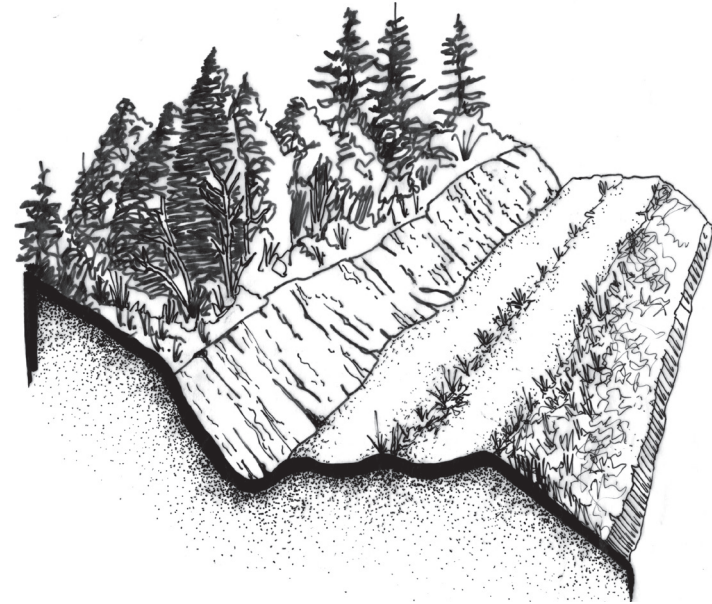


Fig. 67: A two-track dirt road similar to the construction road in the restoration area.

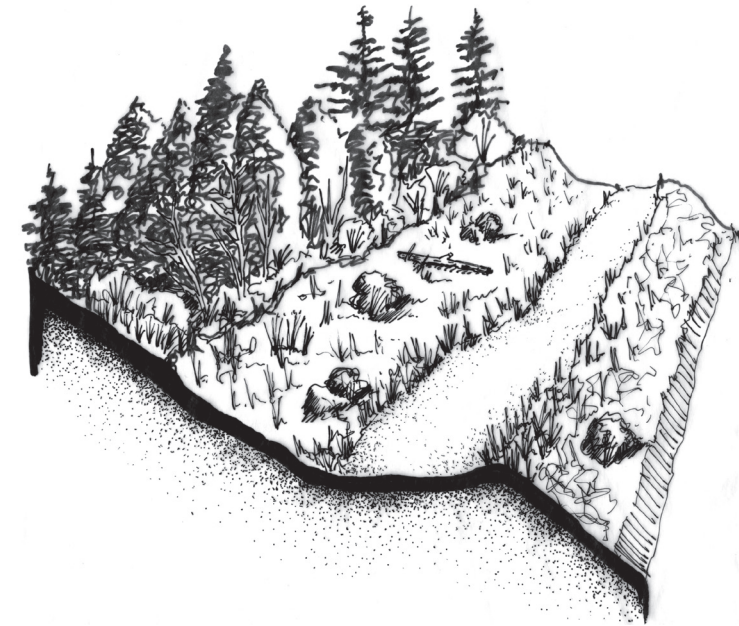


Fig. 68: A single compacted dirt path remains after active restoration.

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Appendix 1: Educational Views

Numbered photographs show where signs may point to specific features, and correspond to Fig. 28: Map of restoration features and educational views, page 21.











**TRAILS ON TRIBAL LAND:
UNDERSTANDING THE CHALLENGES AND BENEFITS
OF TRAIL PLANNING AND DEVELOPMENT FOR
AMERICAN INDIAN COMMUNITIES**

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INTRODUCTION

Our people have lived here from time immemorial. Until recently, we moved freely across the land. Our elders have related many stories of their free travel, both near and far, on foot or horseback. That movement was a central part of our culture and way of life...It was only in the past century that many of our old trails were blocked off [by development]. The inability of our people...to walk in any direction safely without obstruction contributes to the serious health problems in our community...The absence of a trail system also contributes to many of our young people no longer having daily interaction with the natural world. Too many of us spend too much of our time inside a car or inside a building.

The above is an excerpt from a letter of support written by the Salish-Pend d'Oreille Culture Committee regarding their approval of the establishment of trails in their community within the Jocko Valley on the Flathead Reservation. The use of trails to traverse the landscape was an important part of life for these cultures, as it was for many other American Indians.

For millennia, American Indians have been utilizing foot trails. These paths were used for traveling, war-making, trading, and venturing to sacred places. At the time of first contact with Europeans, the continent was already crisscrossed by an extensive network of trails made by American Indians (Blakeslee 1996). However, as the influence of Western technology and worldviews began to transform traditional Native American lifestyles, the use of these trail networks began to fade. This paper argues that many of the societal problems currently faced by Indian Reservation communities, such as land tenure, economic disparity, health epidemics, and transportation safety, may be mitigated by the revival of trail networks.

Trails have been a useful method for managing similar challenges in other off-reservation contexts. The benefits that these trails could bring to reservation communities, however, have not been well studied. Therefore, to inform this paper, a review of existing literature and a series of informational interviews with tribal resource managers were undertaken to better understand the benefits of trails.

Interviews were conducted with the purpose of gathering current, primary-source information concerning trails on reservations. In order to access interviewees on reservations with relevant knowledge, 33 accredited tribal colleges across the United States were contacted. Snowball sampling methodology was then used to direct the interviewer to land managers, parks and recreation managers, biologists, and other experts associated with trails. The majority of interviews (20) were conducted over the phone; two interviewees responded to the questions by email. The interview consisted of approximately 30 questions regarding establishment and use of formal and informal trails, trail maintenance, and impacts. Additionally, interviewee's were asked about issues encountered during trail planning and development. Overall, 22 interviews were conducted. Information, quotations, and common themes from the interviews are incorporated throughout this document.

INTRODUCTION TO THE RESERVATION SYSTEM

To understand the unique set of social challenges reservation communities face and how trail systems may alleviate these challenges, one must first grasp how the reservation system has impacted American Indians. The origin of today's reservation system can be traced to the Civil War era, when western expansion by Euroamericans consumed lands to the extent that there were no longer areas available to relocate American Indians. During this period, American Indians were forced to negotiate treaties which reduced their former territories, leaving them with reservations.

In 1879, the Dawes Act exacerbated the situation by dividing collectively owned reservations into individual allotments (Greenwald 2002). For 47 years (until overturned in 1934 by the Indian Reorganization Act), over half of the existing reservations were allotted. Indians gained nothing when forced to cede their lands to Euroamericans, except sometimes temporary sources of cash. Instead, they lost resource areas that made their subsistence cycles possible, buffer zones between themselves and Euroamericans, sacred sites, and traditional homelands.

Today, reservations in the United States constitute about 56,200,000 acres of land (US Census 2000). The American Indian population is concentrated into a few general areas, with 43 percent living in the western regions of the United States. Health and poverty are continuing challenges for American Indian communities. Over 33 percent of American Indians are considered clinically obese (CDC 2007), and American Indian communities have the highest poverty and unemployment rates in the US, with an average unemployment rate of 25 percent (US Census 2009). These issues are discussed in more detail below within their corresponding section.

It is clear that the reservation system has left an indelible mark on American Indian communities, both in the organization of land ownership, lifestyle, and economics. Understanding the modern influence of these historical events is critical for developing effective and enduring trail projects on reservations.

TRAILS ON TRIBAL LANDS: COMPLICATIONS, CONSIDERATIONS & OPPORTUNITIES

LAND TENURE

Consideration of land tenure in any landscape is critical for planning transportation infrastructure such as trail systems. Reservations have particularly complicated systems of land ownership, making it essential to develop a deeper understanding of land tenure patterns and their likely effects on trail planning. Reservations have been shaped by policies that dispossessed American Indians from their lands, resulting in a complicated patchwork of land tenure that makes natural resource planning difficult (ILTF 2010). While planning trail systems on reservations presents a challenge, trails may offer a way of recreating traditional patterns of movement, or realign community connections that have been severed by changes in land tenure. This section discusses current land tenure systems on reservations and the use of trail systems to connect communities across fragmented landscapes by drawing upon existing literature.

CURRENT LAND TENURE PATTERNS ON RESERVATIONS

Modern land tenure on reservations is a result of the Dawes Act and other policies of dispossession, which have created a mosaic of ownership types known as *checkerboarding*. Land on reservations falls into a variety of ownership classes, and each class has specific legal definitions and restrictions. Ownership can be defined as tribal, individual Indian, non-Indian, or trust and fee lands. With fee lands, the title and control of the land belongs to the owner; the owner controls land use decisions, and can sell the land without government oversight (ILTF 2010). Either a tribe or an individual American Indian owns trust lands. What distinguishes trust from fee lands is that the title to the land is held “in trust” by the federal government. Most trust lands are within reservation boundaries; however, some trust lands lie outside the reservation, but are protected by the federal government for American Indian use. While trust lands are under American Indian ownership, they require approval from the Secretary of the Interior to make any land use change decisions, which interferes with a tribe’s ability to make management decisions, including the creation of trail systems.

To further complicate matters, allotted lands suffer from fractured ownership. Fractured ownership results from the division of a parcel after the death of the original allottee to all of his heirs without actually subdividing the land. As generations pass, a parcel is divided repeatedly. In one example, a single 80-acre parcel on the Lac Courte Oreilles Reservation in Wisconsin had 2,285 owners. Fractured ownership requires the consent of the majority of owners before it is developed in any way, making it nearly impossible to make use of these properties (ILTF 2010). Routing a trail through a fractured parcel may require the consent of literally hundreds of owners.

According to the Indian Land Tenure Foundation (2010), checkerboarding “seriously impairs the ability of American Indian nations or individual American Indians to use land to their own advantage for farming, ranching, or other economic activities that require large, contiguous sections of land.” Trail development could easily be included on this list. Fractured ownership also restricts American Indians’ access to tribal lands that are used in traditional ways. This loss of access to cultural and sacred areas makes it increasingly difficult for each generation to remain connected to their cultures (ILTF 2010). One interviewee from the Chippewa Cree Reservation in Montana described this situation exactly when he spoke of accessing an important sacred site: "before we can get to the Sweetgrass Hills, we have to ask private owners if we can go through their land to get over there. I often wonder, they say 'freedom of religion', but we have to ask to get to these places...that makes it hard on us Native Americans...If it was up to me, I'd make sure there was a [trail] that goes directly up there so we wouldn't be harassed by anybody when we want to pray to the creator in the places where our elders [prayed] before the coming of the visitors that come from different parts of the world...they should respect [our] sacred sites" (Tribal representative, pers. interview).¹

Checkerboarded reservations often face jurisdictional conflicts with governments at the county, state, and federal levels because of their mixed ownership. Local and state governments compete with tribes to regulate, tax, and manage lands within reservations. These conflicts often result in “economic uncertainty, racial tension, and community clashes” on and near reservations (ILTF 2010). This labyrinth of land tenure, complicated by jurisdictional turf wars, makes trail planning a difficult endeavor. Well-planned trail systems could help restore access to tribally significant lands, provide a sense of spatial continuity on reservations, and be a useful tool for helping to return tribal sovereignty to reservations, strengthening strategies that are already being used by tribes to restore their land base.

RESTORING AMERICAN INDIAN LAND TENURE ON RESERVATIONS

American Indian communities can attempt to restore tribal ownership to their lands in two ways. Tribes can petition Congress to return their former land holdings, or they may repurchase fee lands lost to allotment. Starting with the Indian Reorganization Act of 1934, Congress gave the Secretary of Interior limited authority to aid in the return of tribal lands through land-into-trust provisions. Therefore, tribes will typically acquire fee lands within their territorial jurisdiction, and then petition the Secretary to provide trust status for these lands. Trust status ensures that tribal ownership is inalienable and free from state taxation, but also burdens the tribe with additional federal oversight which is required under this status designation. For instance, the federal government must approve any type of property transfer, including leasing for business or agriculture on trust lands (Leeds 2004). Tribes are free to purchase all fee lands on their reservation, just as any other potential buyer; however, they are often limited by cost, and the availability of lands for purchase. Ultimately, tribal sovereignty cannot be restored until

¹ All interviews were conducted in confidentiality, and some names of interviewees have been withheld by request.

all fee lands are returned to Indian ownership. However, creating trail systems that provide access to important cultural areas on reservations may be a step in the right direction.

OVERCOMING LAND TENURE ISSUES USING TRAIL SYSTEMS

No literature exists describing the use of trail systems to restore access to culturally important sites on reservations, or to create a sense of spatial continuity on checkerboard reservations. Nevertheless, some assumptions can be gleaned from existing research on trails and greenway planning in other contexts. According to Ahern (1995), “greenways are networks of land containing linear elements that are planned, designed, and managed for multiple purposes including ecological, cultural, recreational, aesthetic or other purposes compatible with the concept of sustainable land use.” Greenways do not always contain trails, but in this report, trail systems and greenways are considered analogous. Much of the existing greenway literature discusses land fragmentation in terms of landscape ecology, rather than addressing the mixed ownership found on reservations. From an ecological perspective, the landscape is becoming increasingly fragmented by human development (Soulé 1991; Noss 1993). Greenways can be used to connect islands of protected habitat and allow for migration of plants and animals (Erickson 2006). Greenways thus connect a fragmented landscape for the benefit of the ecosystem. Similarly, the checkerboard ownership patterns found on many reservations can be considered a form of cultural fragmentation. The field of human ecology, which studies how humans interact with each other and with their environments, has reinforced the importance of creating connected cultural systems as well as natural systems (Steiner 2002). Applied to the reservation, using trails to connect people across ownership boundaries could strengthen threatened cultural ties and provide access to culturally important areas.

Within the urban context, greenways and trail systems often occur across mixed ownership and can be used to connect to existing green spaces (Erickson 2006). Similarly, a reservation trail system could be used to connect tribal government offices, health and community centers, schools, powwow grounds, culturally important natural areas, and even sacred sites. Of course, every reservation is different in terms of opportunities for making important connections, as well as the challenges involved in making these connections. Just as in greenway efforts, land tenure is likely to be one of the key challenges to trails planning on reservations.

This was true for the Inupiat of the North Slope Territory in Alaska. There, Robert Suydam, a Wildlife Biologist for the North Slope municipal government, encountered difficulties planning a trail: "Since most of the land here is near Barrow—which is where we've installed [constructed trail segments] so far—is private land, we need to jump through hoops to get permission ... and to make sure we're working with the users to make sure we're putting it in the right place" (R. Suydam, pers. interview). Suydam's statements echo the findings of research conducted by Donna Erickson in 2006, which indicate that controversy and resistance were likely to surround the trails planning process; this was more acute in rural areas, where residents feared trails would bring unwanted outsiders and crime.

However, land tenure should not be considered an insurmountable barrier. Throughout the interviews, numerous individuals cited land tenure as a challenge to trail development, yet only one attributed the failure of a trail development project to land tenure. More often, land ownership issues only thwarted trail development projects, and were eventually overcome. For example, Robert Pell, a project manager for the Lummi Nation Planning Division (serving the Lummi Reservation in Washington State), handled land tenure issues by reaching out, "there were a lot of personal conversations we had with the landowners... they had a lot of personal connections with deaths and lack of personal safety along those roads" Pell explained (R. Pell, pers. Interview). These connections helped the trail project move forward, and provide a positive example of how future negotiations might be handled on other reservations. Furthermore, Erickson (2006) found that once trails were constructed, communities began to realize the benefits and change their views.

ECONOMIC CONSIDERATIONS

The dispossession of American Indians from their lands has contributed to the prevalence of poverty on reservations. When forced to cede their territory to Euroamericans, American Indians had no means of adapting to the imposed economic structure—a stark contrast to their traditional trade-based subsistence lifestyle—and suffered greatly. The poverty rates among modern American Indians remain three times higher than the U.S. average (Taylor and Kalt 2005).

Reservations continue to afford very few economic opportunities, and historically forced many away from their land bases to find work. By the 1980s, over 60 percent of American Indians lived off-reservation away from their traditional homeland and cultures (Lewis 1995). Today, per-capita income for American Indians is significantly lower for those living on reservations than those not, and the per capita incomes of both American Indian groups are lower than all United States citizens. Other measures of human welfare, which include life expectancy and infant mortality, reflect these patterns. The welfare of Indians living on reservations lags severely behind those living off reservations, and the rest of the nation on the whole. One theory that attempts to explain this drastic disparity is a lack of development opportunities attributed to powerlessness, dependency, and expropriation. According to this theory, American Indian economies will only prosper as tribes are freed from the paternalistic controls of the federal government. An example of such paternalistic control lies in legislation that stipulates tribes must seek approval from the Federal government before tribal trust lands can be developed. If this barrier were not in place, tribes would be much freer to explore economic development of their lands. Many tribes are now seeking economic development opportunities to close the well-being gap between themselves and society at large (Anderson 2009). With vast natural resources under their control, reservations could potentially tap into the ecotourism market to achieve this goal. The development of trails on reservation lands through ecotourism programs is an often overlooked yet effective way to utilize the natural resources on reservation lands to enhance economic opportunities.

TRAILS AS OPPORTUNITIES FOR ECOTOURISM

Ecotourism is the fastest growing segment of the international tourism market (Hearne & Tuscherer 2007), and with control of the natural resources on their land bases, American Indians can help solve some of the economic difficulties plaguing reservations through the promotion of trail systems. Attracting outsiders to use recreational trails could become a source of revenue, and tribal members could be employed in this new sector as guides, developers, educators or maintenance workers. Additionally, trails could help bolster existing reservation businesses by drawing more visitors. Some tribes already realize the benefits a trail system could bring to their communities; one representative from the planning department of the Fond du Lac Band of Lake Superior Chippewa stated: “[we are] hoping to connect our [trail] system to existing trails outside the reservation; if we do that then we can start bringing people to the reservation, to our casino, to our businesses” (Tribal representative, pers. interview). Trail systems as ecotourism attractions could easily lead visitors to other features on the reservation, thus deepening the economic benefits reservation communities receive from tourism.

MOTORIZED TRAILS ON RESERVATIONS

Trail systems need not be just hiking trails; many reservations have already accommodated other types of users. Numerous American Indian reservations have existing snowmobile trails, and there are several instances of reservation communities benefitting economically from these types of trails. A number of reservations in the Midwest including the Lac Courte Oreilles Reservation (Wisconsin), the Bay Mills Indian Community (Michigan), the Fond du Lac Band of Lake Superior Chippewa (Minnesota), and the White Earth Indian Reservation (Minnesota) connected their reservations to regional snowmobile trails in an effort to attract tourists to reservation businesses. The Fond du Lac Band of Lake Superior Chippewa have plans to connect snowmobile trails to their casino, offering another attraction for tourists to visit their reservation. Mike Swan, Natural Resources Director of the White Earth Reservation in Minnesota spoke of a similar approach in their community: "snowmobile trails hook up with our tribal casino and hotel, and people stay right there and then get on the trails and go out for the day" (M. Swan, pers. interview).

Some reservation communities may find trails for snowmobilers and all-terrain vehicle (ATV) users undesirable. For example, a tribal employee from the Lac Courte Oreilles Reservation in Wisconsin explained that some members of the tribe do not like youth using snowmobiles and ATVs on the existing unofficial trails, and as a result have passed an ordinance banning the use of these machines on unofficial trails and on roads. Due to the lack of official trails, however, the use of ATVs is illegal everywhere on the reservation. In this instance, snowmobiles are seen as a nuisance, contributing to increased noise levels, and environmental degradation. Though snowmobile trails may present a tempting economic opportunity for American Indian reservations, these communities must consider the potential drawbacks they may face from an increase in motorized tourism. Other less impactful opportunities may exist, and should be considered as well.

OTHER NON-MOTORIZED ATTRACTIONS

Some reservations have entered the ecotourism market through the implementation of horseback riding trails. The Santee Sioux Reservation in North Dakota is one that attracts off-reservation horseback riders. Users pay a small fee to have access to reservation lands, which brings in funds to the community. Other natural attractions and activities can bring tourists to reservation lands as well. Mark Roundstone, the Wildlife, Recreation, and Parks Administrator for the Northern Cheyenne Reservation in Montana explained how his reservation would like to use their resources to attract visitors:

The reservation is crossed by two corridors; the Tongue River corridor and the Rosebud Creek corridor. These corridors contain more songbirds than either of the Glacier and Yellowstone National Parks. We have over 480 [species of] songbirds...it would be ideal if we could partner with an organization like the Audubon Society to see if they would help us develop what we have called nature trails. Birders don't do any damage to their environment, they come in the morning and evening, sit, and take pictures, and then they leave. We have always wanted to take advantage of this [economic] opportunity, but have not been able to.

Songbirds, scenery, native plants, and other natural attractions are often abundant on reservation lands. Reservations have the potential to develop these attractions to bring tourists and revenue to their communities. This may be as simple as charging an entry fee; for example, Emily Boyd, a Biologist for the Game, Fish, and Parks Department on the Rosebud Reservation in South Dakota, described such a situation where visitors to the reservation pay a fee for a "habitat stamp" that allows them to hunt on the reservation (E. Boyd, pers. interview). Other reservations have taken advantage of this revenue-generating program, including the Navajo Nation, which offers a recreational use permit for hikers and backpackers recreating in their Little Colorado River Park (Tribal representative, pers. interview). The implementation of trails through reservation land will increase and enhance the recreation opportunities on reservations, allowing tribes to charge visitors for recreation permits. Tribes interested in attracting outside visitors might consider the benefits trails will afford them in terms of ecotourism and economic opportunities.

NOTES ON CULTURAL TOURISM

To date, reservation communities have not yet developed their ecotourism markets to meet the growing demand. Doing so would not only be potentially economically beneficial for them, but culturally as well: "...ecotourism can offer an economic return to the host communities for conserving and celebrating their cultures. Ecotourism development promises to offer American Indians employment alternatives which complement the natural beauty of reservation lands and respects Native American cultural traditions" (Hearne & Tuscherer 2007). However, it is important to consider the nature of ecotourism. Mike Swan of the White Earth Reservation explains that tourism on his reservation would be acceptable "if it is done sensibly and respectfully, we would have no problem with it; it would help with the local tourism. There are a lot of resources that people enjoy here" (M. Swan, pers. interview). Some American Indians fear that attracting outsiders who want to experience their lands, natural resources, and even cultures

may detract from the purity of their traditions. Emily Boyd commented: “There is a big difference between tourism and selling your culture; yes, we have recreational opportunities and would like to entice people to come to the area, but we don't want them disturbing our sacred sites” (E. Boyd, pers. interview). Such ecotourism development may be viewed as an insult to their cultures and traditions. In some American Indian’s views, their natural resources are not to be exploited; their cultures are not meant to be shared. Various tribes have benefitted from ecotourism programs that share their cultures with those who may be curious, but the cultural values of a tribe should be carefully considered before such programs are developed.

HEALTH

In many ways, the reservation system proved catalytic to the cultural assimilation of American Indians into Western society. Within a span of two generations, traditional American Indian foods became systematically replaced by readily available, high-calorie foods, and physical activity levels fell into steady decline (Story et al. 1999). Consequently, health professionals have documented a routine increase in obesity rates and health complications among American Indians since the 1940s (Sievers and Fisher 1985). These rapid lifestyle changes are generally seen as a primary contributor, along with genetic predisposition, to the alarmingly high rates of diabetes and cardio-vascular disease (CVD) common among American Indian populations (Burrows et al. 2000; Howard et al. 1999; Story et al. 1999).

CURRENT CHALLENGES

Diabetes and cardio-vascular disease are now among the leading causes of death in American Indian populations (CDC 2007). The obesity trend among American Indians further exacerbates the situation, as obesity is a known risk factor for both conditions, and a recent report by the CDC (2009) estimates 33 percent of American Indians are considered clinically obese.

THE ROLE OF PHYSICAL ACTIVITY

Two common threads exist between diabetes, CVD, and obesity: diet and physical activity. The focus of this report necessitates the examination of the latter. In 1993, Dr. Evan Benjamin led a study investigating the prevalence of Type 2 diabetes among Zuni Indians. He proposed that the risk of diabetes would decrease significantly if physical activity was increased and he was correct (Benjamin, Mayfield & Gohdes 1993). Furthermore, a study published by the *New England Journal of Medicine* found that “the protective benefit [of physical activity] is especially pronounced in persons at the highest risk for the disease” (Helmrich et al. 1991). The effect of physical activity on the pathogenesis of CVD is similar. In fact, recent research suggests that “30-40 percent of CVD was prevented simply by walking briskly for 2.5 hours a week” when compared to individuals who did less than this amount of physical activity (Manson 2002; 1999). Additionally, a study published by the *Journal of the American Medical Association* found that men who engaged in weight training for at least 30 minutes a week reduced their risk of CVD by an estimated 25 percent (Tanasescu et al. 2002). In brief, physical activity plays a major role in reducing the prevalence of diabetes, CVD, and obesity among American Indians.

Despite these findings, the American Journal for Preventative Medicine published a study, indicating more than one-third of American Indian participants “did not meet current recommendations for physical activity” (Duncan et al. 2009). Some believe reservations are to blame. According to Lisa Perkins, Community Health Promotion Director of the Cherokee Nation, one of the largest challenges for American Indians is that many reservations lack the infrastructure and environment necessary to lead a healthier lifestyle (Berry 2004). Like many rural areas, reservations are characteristically under-developed and economically disadvantaged; circumstances which make effective health promotion a particularly daunting task.

CREATING HEALTHY RESERVATION COMMUNITIES WITH TRAILS

Reservations face unique social and economic challenges that often handicap public health initiatives, which may explain the physical activity statistics cited earlier. One tribal representative lamented: “I don't know how on a reservation you can expect people to be out exercising or hiking when their income levels are so low that they have to spend a lot of their time working...so that they can provide food. We plan a lot of activities like canoeing, and...people can't go because they have children at home” (Tribal representative, pers. interview). Social challenges such as these have inspired an increasing number of tribes to invest in health-oriented community trail systems. Trail systems offer a safe and readily accessible place to exercise for individuals and families. Research indicates that trails even “facilitate walking by reducing barriers related to convenience and accessibility and encouraging ongoing physical activity maintenance because trails become a permanent fixture in the community” (Brownson et al. 2000).

The economic challenges faced by tribal health departments have also influenced the number of trails appearing on reservations. Mark Roundstone explained: “the main reason walking trails were developed on [the Northern Cheyenne] reservation was because of the high rates of diabetes, obesity and heart disease...you have to understand that reservations are very different than your average off-reservation community. For example, we don't receive any kind of state or federal funding... the utilities, parks, [and] streets are paid for by the tribe on a very minimal funding source” (M. Roundstone, pers. interview). Given their limited monetary resources, tribes need to take health promotion actions that are relatively low-cost, but effective trail systems can produce such results, as indicated by public health research which suggests “for every \$1 investment in trails intended for physical activity, there was an estimated \$2.94 in direct medical benefits” (Wang et al. 2005).

MOVING FORWARD: PLANNING TRAILS ON RESERVATIONS

The previous sections describe land tenure, economic disparity, and health issues on reservations, and propose that trail systems may help ameliorate these problems. Therefore, more information is needed to understand reservation-specific issues that may affect trail planning and development. The following sections address the essential considerations in the trail planning process for reservations. These sections include topics important to trail planning anywhere, but specifically reservations, such as community goals and worldviews, the existing planning framework on reservations, youth and community involvement in planning, educational opportunities, and funding challenges.

COMMUNITY AND WORLDVIEW

Important to any community planning process is the establishment of goals and the recognition of sensitive topics and locations. Reservations in the United States are home to cultures different from those that prevail in other parts of the country. While American Indian communities have cultural histories distinct from those of Euroamerican communities, each individual American Indian community is also quite distinct. Generalizations should not be made about American Indian attitudes and values toward natural resources, spirituality, community, economic goals, and land use (Nick Reo, pers. com.). Each community must determine the relative importance of these and other factors. When considering trails planning on reservations, it is important that all involved in the process, including professionals and community members, take a close look at local cultural values. Each community has a different worldview, or a collectively-held approach to seeing the world which helps define relationships among humans and/or relationships between humans and nonhumans. A local worldview may create a local land ethic or environmental ethic, as well as define priorities in community decisions.

The process of trail planning (as detailed in the following section) will likely involve people of multiple demographics. Community elders, other leaders, youth, families, small business owners, ranchers, farmers, equestrians, bicycle riders, and consultants external to the local community (to name only a few) each bring a different worldview to the planning table – be it a variation on a shared local view, or a strong individual view. Balancing a multitude of worldviews can inform decisions about trail routing, construction methods, destinations, publicity, maintenance and monitoring, and other topics.

Some of these design decisions may need to take into account sacred places. The concept of sacred places may be present in any given worldview being considered in trail planning. Sacred places are important to many cultures across the world, and cannot be described among American Indian communities with a single definition. For some, a sacred place may be a historical site of prayer, ceremony, or burial. Others may define a sacred place as any place with a strong historical or current cultural significance, such as an ancient food-gathering site, a good

fishing spot, or old homestead areas. In other words, a sacred place need not be related specifically to spiritual practice. The identification of sacred places may influence trail planning in determining locations to which local people would like improved access, and in defining the limits of access by non-local visitors.

Whether or not sacred sites are an important part of a reservation trail system, the study of local worldviews by those involved in trail planning on reservations will help guide decisions about trails. Openly discussing the worldviews of community members and other trail planners can help to avoid potential conflicts while creating the framework for ranking ecological, cultural, economic, social, and idiosyncratic sensitivities.

TRIBAL LAND USE PLANNING AND TRAILS

A tribe may undertake planning a trail system for many reasons; perhaps trails are desired for health considerations, or there is a safety issue with children walking or biking along busy roads. Several of the tribes that were interviewed are currently planning trails on their reservations, or have the desire to do so in the future. Trudy Ecoffey from the Pine Ridge Reservations commented: "it would be nice to have more formal trails. There is a lot of historical and ecological reasons to have trails, and I think it would be great for tourism" (T. Ecoffey, pers. interview). The Inupiat of Southeast Alaska are also planning a lengthy system of modular plastic trail segments to protect the tundra in their region (R. Suydam, pers. interview), while the Navajo expressed interest in creating more trails to help encourage tourism opportunities in their Little Colorado River Recreation Area (Tribal representative, pers. interview). These examples illustrate some current reasons why trails are being planned on reservations, yet whatever the motivation for creating trails, the planning of a trail system is a complicated endeavor that will be most successful if it fits within the greater vision and goals of the reservation community as a whole.

INTEGRATED RESOURCE MANAGEMENT PLANNING

The planning of an individual trail, or even an entire trail system, is likely to be a small part of the greater vision a tribe has for the management of its resources. Therefore, it is important that trail planning adhere closely to the broader planning objectives of a tribe. Tribal land use planning is not well-represented in academic literature (N. Reo, pers. com.). Integrated Resource Management Plans (IRMPs) can offer important insights into tribal planning in general. In 1988, the Bureau of Indian Affairs (BIA) first encouraged the adoption of IRMPs in an effort to identify and promote tribal members' interests, priorities, and plans. An assessment of the IRMP program conducted in 1993 indicated that these plans were not being widely implemented; however, some tribes have forged ahead with creating IRMPs and have realized benefits from them (Hall 1998). A total of 274 IRMP proposals were submitted during Fiscal Years 1998-2005 (Moriarty et al. 2006). The BIA has defined IRMPs as follows:

An Integrated Resource Management Plan is a tribe's strategic plan for the comprehensive management of a reservation's resources. The process by which IRMP's are developed is a

mechanism for the examination of the relationships among natural resources and their various uses, economic trends, cultural needs, and social forces. The ultimate goal of an IRMP is to create a balance within natural resource management actions, which reflects social, cultural, economic, and natural resource values of reservation residents (Hall 1998).

IRMPs are intended to be flexible planning tools, and are adaptive by nature (Reo 2008). While the IRMP planning process is intended to address the full suite of modern resource management concerns, they also can reflect traditional management practices. For example, Hall (1998) asserts that the Kemeyaay American Indians, from what is now southern California, have been using an integrated approach to natural resource management for centuries. The Kemeyaay use fire as their primary management tool in order to improve cropland, manage wildlife, and increase safety around their communities. Additionally, the Kemeyaay employed councils of specialists to manage particular resources, and worked using an integrated team-based approach (Anderson and Blackburn 1993). Regardless of whether the IRMP incorporates traditional land management practices or not, if the planning process is directed by the reservation community and tribal leadership and successfully captures their vision for the future of the reservation, an IRMP can be a powerful expression of tribal sovereignty (Hall 1998). In their article “Doing It for Themselves: Transformative Planning and Indigenous Peoples,” Lane and Hibbard (2005) argue that planning is an important means by which oppressed indigenous peoples can regain the ability to “guide and control their own fate,” and free themselves of the paternalistic controls of the Federal government. As discussed in the preceding sections, trails can be a valuable resource for tribes, and can be an expression of their sovereignty.

Other research suggests that in order to successfully increase community pride and local identity through trail systems, trail planners should include the community in the trail planning process, and inventory feedback from separate groups within the reservation. As a part of the planning process for the installation of a new trail, it is important to assess who is going to use a trail and why. Differing attitudes are important to understand if trails are to maximize their utility as quality of life enhancements (Shafer et al. 2000). Additionally, user input from the beginning of the planning process can help alleviate the need to fix ill-conceived designs or management policies, as locals have particular insights that are often difficult for trail planners to ascertain. Drawing on this local knowledge is essential to designing outdoor public spaces, including trails, that properly meet the needs of the community (Kaplan et al. 1998, Shafer et al. 2000). This research should be considered in the reservation context as well.

IDENTIFYING AND PROTECTING CULTURAL RESOURCES

Integrated Resource Management Planning inherently considers multiple resources important to a reservation community. Part of the planning process is determining how to address the wide range of resources under the tribe’s control. Some typical components of IRMPs are: vision statements, current status and issues for various resources, goals and objectives, and management plans for those resources (Reo 2008). The planning process should access what resources are important to reservation residents through public meetings, surveys, and other means. Hall (1998) points out that a tribe should not focus entirely on natural resources, but also consider other “non-natural” resources and activities, including commercial

and industrial areas, as well as culturally sensitive sites. Trails may fall within one of these non-natural resource focus areas. The Jicarilla Apache provide one example of some of the typical focus areas included in IRMPs; their IRMP included the following resources (Hall 1998). In the list below, the focus areas in which trails planning would best fit are noted with an asterisk.

Water	Infrastructure—utilities*
Cultural resources	Fish and wildlife
Forest/woodland	Wilderness/primitive areas*
Rangeland	Agriculture
Recreation and tourism*	Mineral/energy resources
Community development*	Housing
	Transportation*

After considering this list of focus areas, it is apparent that trails planning could fit within a number of these categories. Trail planning could be addressed within a single focus area, such as transportation, or as a sub-topic within multiple focus areas. However, if a tribe decides to conduct trails planning, using the IRMP process or through other means, it will be important to consider the multiple resources and activities that new trails would impact and support. It should be noted that IRMPs are not stand-alone documents. They require the support of individual resource plans, and therefore trail planning would likely require its own planning process outside of the IRMP.

Existing IRMPs can also provide a window into understanding what cultural resources, including sacred sites, individual tribes consider important. From reservation interviews, it was apparent that tribes are likely to have unique cultural and spiritual resources that require sensitive management approaches. The Fond Du Lac Band of Lake Superior Chippewa's IRMP (2008) provides one example of what one tribe considers important cultural resources. This plan identifies cultural resources as the "archeological remains of earlier inhabitants," including burial sites and former village sites which are given high priority for protection. The Fond Du Lac plan goes on to identify important traditional resources such as maple sugar, berries, medicinal plants, birch bark and basswood bark gathering sites, and other native plants as resources that require special protection. On the Rosebud Reservation in South Dakota, Emily Boyd, a tribal biologist, explained that "there are certain areas such as Sundance grounds that we would want to identify for our purposes only, but not for any other visitors" (E. Boyd, pers. interview). Another example came from the Little Bighorn Battlefield National Monument. While not a reservation, the area still faces similar planning concerns. Ken Woody, Chief of Interpretation at the National Monument explained: "there are some sacred areas out there that people should not be touching. And those [include] rock cairns: rocks that are piled up by the Indian people right after the battle to show where someone was shot or killed. We have a few out there from the day of the battle or the day after, and we have to be careful with [those sites]" (K. Woody, pers. interview).

Trail planning must take these sensitive sites into consideration. The earth moving required for trail construction, for example, may not be appropriate in certain areas. This was the case when the Lummi Reservation designed a walking trail that went through an ancient cultural area. Instead of using traditional sidewalks, a pervious type of asphalt was used and only six to eight inches of earth was dug in order to not disturb any culturally sensitive artifacts (R. Pell, pers. interview).

In addition, trails could prove a useful tool for controlling access to cultural areas on a reservation. For instance, on the Santee Sioux Reservation in North Dakota, off-reservation horseback riders are asked to report to the tribal offices which inform them where it is appropriate for them to ride (Tribal representative, pers. interview). If trails are designed to avoid sensitive locations on a reservation, and are equipped with a clear system for way-finding, then trails may mitigate unwanted access to these sites by tourists or other visitors.

COMMUNITY

Trails have been shown to increase community quality of life through access to natural areas, better land use, resident pride, and resident health and fitness (Shafer et al. 2000). Low-income American Indian communities are particularly in need of supportive environments with access to safe, affordable physical activity opportunities, such as community trails for hiking, bicycling, and transportation (Story et al. 2003). Trail development not only provides an opportunity for reservation communities to enjoy these benefits, but also serves as a way to improve safety, social equity, and community relations.

WALKING AND SAFETY

Many reservations (and rural areas in general) consist primarily of isolated patches of open country with low population densities. Due to the large distances between areas of interest within these communities, transportation often requires a motor vehicle. This heavy reliance on cars, along with scarce resources for infrastructure development, has contributed to a shortage of walking paths or sidewalks within rural and reservation communities. Walking outside is approximately 13 percent less common among rural residents compared to suburban ones (Eyler et al. 2003). Often this is due to the fact that rural areas and small towns are far more likely to lack proper facilities for bicycling and walking, including sidewalks, crosswalks, bicycle accommodations, and trails (Parks et al. 2003; Wilcox et al. 2000). This lack of access to walking paths has serious implications for safety within rural communities; for example, the probability of an accident is two times more likely at a site without a sidewalk than at a site with one present (Ossenbruggen et al. 2001).

Additionally, residents are often forced to walk along the side of busy roads in order to access areas within their community. This was the driving force for the construction of the Haxton Way Pedestrian Trail on the Lummi Indian Reservation in Washington. When asked as to the reason for the construction of a trail system, Robert Pell, Project Manager for Haxton Way project responded, “complete safety, utter safety...there have been too many deaths on that road” (R. Pell, pers. interview). Other tribes cite similar situations. In Montana, the Flathead Reservation battles safety issues regarding children who have no option but to walk on a busy highway across a bridge to get to school each day. The town recently was awarded a Safe Routes to School grant, which will allow them to create more walking paths within the community and address the lack of a walking path on the bridge. The Lac Court Oreilles Reservation also received Safe Routes to School funding to connect a series of existing unofficial trails, allowing children to access schools within the community (Tribal representative, pers. interview).

The dangerous safety conditions present on many reservations and other rural areas of the U.S. raise important social equity concerns. Mark Roundstone noted the high unemployment on reservations, which often force those unable to afford cars to walk along roads between communities. “A lot of people walk or hitchhike in the community out of necessity,” Roundstone mentioned, adding that “there are safety issues because the roads are narrow and vehicles travel quickly” (M. Roundstone, pers. interview). Trails may mitigate these dangerous conditions, as has been the case on the Winnebago Reservation in Nebraska. After the Winnebago Tribe built a trail connecting important areas within the community, Joy Johnson, Quality Assurance Manager at Ho-chunk Inc, noted that people began to use the trail to get to work and access human services such as the BIA office (J. Johnson, pers. interview). Research shows that connecting social groups and providing community access to transportation by means other than a car results in a more humane, accessible, and even democratic society (Erickson 2006). By implementing trail systems, American Indian reservations can address important safety concerns, and allow all community members equal opportunity to access areas within the reservation.

BRINGING COMMUNITIES TOGETHER

Many American Indian reservations, such as the Flathead Indian Reservation in Montana, struggle with divided communities. Differences arise between tribal members and non-tribal land holders, tourists and reservation residents, tribal and municipal governments, and between different tribal groups. The development of a trail system can serve to diminish these divisions by increasing social inclusion, community engagement, and by creating a shared sense of local identity (Lee 1999, Shafer et al. 2000, Tabbush and O’Brien 2003, Price and Stoneham 2001). A trail system serves as a shared space that allows members of the community to interact and enjoy outdoor areas in a way that is impossible with motorized transportation.

One way to bring communities together and encourage engagement is by using community volunteers in trail development and maintenance. Some reservations may turn to volunteers out of necessity due to lack of funds. The use of community volunteers, however, should not be seen as a last resort, as volunteer use can enhance a sense of community ownership of trails, which in turn can have a powerful positive influence on behavior and the desire to communicate with others about the project (Kaplan 2000). On the Blackfeet Reservation in Montana, a youth program installed benches, and a volunteer group paid for and installed exercise areas along the trails. Don White, Transportation Planner of the Blackfeet Reservation, noted that involving the local youth group helped promote community ownership in the walking park where trails were constructed. White explained that the trails were built on the reservation with the purpose of increasing fitness and health, but also have had the added benefit of “connecting communities” within the reservation (D. White, pers. interview). Thus, not only can the use of volunteers address the lack funding many reservations face, but local group involvement may also serve to raise awareness about trails, increase trail usage by community members, and bring separate groups together within the reservation.

INVOLVING YOUTH

On the Rosebud Reservation in South Dakota, a local chapter of the Boy Scouts of America built two trails that lead from the highway to natural areas. The Boy Scouts continue to maintain the trails, which provide access to natural areas for trips and allow the troop to earn merit badges (E. Boyd, pers. interview). This example of youth involvement in the trail planning and development process serves as a reminder that youth are important members of the community whose feedback should also be sought and utilized when planning trails on reservations. Collecting input from youth is an important step in the planning process; younger members of the community are not only primary trail users, but are also the group that stands to gain the most significant cognitive and physical benefits from trail use. A developed trail system will allow youth on reservations to walk to more places within their communities, promoting healthy lifestyles early in life.

In addition to physical benefits from outdoor activity mentioned in the health section, exposure to natural environments improves children's cognitive development by improving their awareness, reasoning, and observational skills (Pyle 2002). Children with views of and contact with nature have been shown to score higher on tests of concentration and self-discipline (Wells 2000, Taylor et al. 2002). These academic and cognitive benefits may be especially important for American Indian students, who continue characterized by disproportionate educational achievement (Beaulieu 2000). On many reservations, students cannot realize these benefits as their only transportation option is by car.

Although cognitive benefits from increased physical activity and interaction with nature may be minor compared to socioeconomic status, school funding, testing bias, and other factors affecting academic performance on reservations, trails may also contribute more directly to higher academic achievement as a platform for hands-on, outdoor environmental and cultural education that can be connected to classroom activities. Zwick and Miller (1996) found that when a culturally-sensitive, activity-based outdoor science curriculum was implemented with fourth grade students, American Indian students had significantly higher achievement scores than students in a control group who did not receive the culturally-sensitive curriculum.

Increased interaction with natural environments also stimulates social interaction between children, reducing the impact of life's stresses and helping them deal with adversity (Moore 1986; Bixler et al. 2002). Dealing with adversity and stress may be especially relevant to American Indian youth, who often must deal with high poverty levels and must constantly adjust to the demands of both their cultures and white American culture (LaFromboise et al. 1993). The stressors associated with this adjustment are particularly notable for youth (Beauvais 2000). American Indian communities should consider developing trail systems in order to allow youth to reap these important physical and cognitive benefits.

STRENGTHENING CONNECTIONS TO CULTURE

For some reservations, trails may also promote the well-being of American Indian youth by increasing the time youth spend outdoors amidst their traditional land-base, which can be an opportunity to strengthen cultural connections. LaFromboise et al. (2006) found that, in addition

to the importance of family, the strongest predictor of resilience and well-being among American Indian youth was community enculturation and engagement in traditional cultural values.

Allowing access to these important areas through trails may facilitate cultural heritage connections among American Indian youth and the larger community by providing a place to safely gather in order to share traditional knowledge with younger generations or engage in cultural practices. For the Inupiat Indians in Alaska, trails used for cultural practices like whale hunting are essential. Bryan Thomas, Arctic Scientist and Logistics Planner at Barrow Arctic Science Center in the North Slope of Alaska, highlights the importance of the trails for the community:

I can tell you that the whole community really gears up to do whaling. It is something that you are either on a [whaling] crew or you know someone who is on a crew and you do whatever you can to help because it feeds the community for the whole year. So it's something that everyone participates in one way or another. It impacts everyone, and is very important (B. Thomas, pers. interview).

Trails allow a method of accessing and experiencing a reservation's shared land base, which offers a place for community and continuity for American Indians in modern times. In the simplest sense, traditional territory provides a safe haven from the mainstream Western culture that has engulfed other ethnic groups. Lewis (1993) offers the Hupas of Northern California as an example: "[they] call themselves Natinook-wa, 'the people of Natinook, the place by the river to which the trails lead back.'" To them, the Natinook Valley is the center of creation, and their homeland offers them the identity of the people of this center. This example clearly illustrates the people's intimate ties with their land and the identity they derive from the Natinook Valley. Trails, in this instance, could provide the Hupas a way to experience these connections. On the Lummi Indian Reservation in Washington, trails are a means of enhancing culture, as walking has for centuries been the traditional method of transport (R. Pell, pers. interview). For these tribes and many other American Indians, trails can provide a way to safely learn about traditional culture and to share traditional knowledge with younger generations.

TRAIL SIGNAGE AND EDUCATION

The inclusion of signage within a trail system is an opportunity for reservations to enhance environmental protection, attract visitors, and provide education for trail users. Specifically, signage may serve as a method of attracting tourists to the trail if the trail is designed for public use and revenue. Reservations experiencing difficulties with human disturbance of natural areas may also find signage to be helpful in encouraging environmental protection. For example, signage that includes messages of awareness may reduce the use of ecologically damaging social trails (Bradford and McIntyre 2007).

The main benefit of signage, however, is education. Interpretive signs can enhance knowledge and understanding of ecology and culture during a visit to a natural area. Emily Boyd from the Rosebud Reservation in South Dakota emphasized the importance of using trails as a means of education: "I see education being the greatest asset that trails could bring. I remember as a child you would have to travel off the reservation to have access to outdoor educational opportunities. Trails would be a way to get people to be more aware of their surroundings" (E.

Boyd, pers. interview). For reservations, this may mean sharing culturally important species and ecological stories. Tribes may also choose to incorporate language, or to describe historically and culturally important areas. A system of well-planned interpretive signs can help promote inquiry, captivate learners, and stimulate constructive discussions (Serrell 1998).

Several interviewees expressed the desire for incorporating educational components with their trails. For example, Mark Roundstone noted that the Northern Cheyenne Reservation has many historical areas that “could really use trails, or even kiosks to describe them” (M. Roundstone, pers. interview). Unfortunately, lack of funding often prevents reservations from pursuing educational opportunities. Amanda Bolzac, a Tribal Biologist of the Chippewa tribe of the Bay Mills Indian Community in Michigan, noted that the tribe would like to create an educational area within culturally important homestead sites on the reservation, which can be accessed by a series of trails. The educational area would include cultural and historical information, and would be used primarily for fieldtrips for local school children. The plans have not been carried through mainly due to a lack of funding (A. Bolzac, pers. interview).

Signage geared towards school children could also enhance the academic curriculum of local schools, and serve as a means of engaging children with the environment, as well as cultural history and heritage. As Western influence exacerbates a loss of diversity and cultural identity in American Indian communities, many scholars believe the continued survival of their cultures depend upon “educating young people in their own language and customs” (Lewis 1993). In Arlee, Montana, on the Flathead Indian Reservation, culturally important species and language are highlighted in educational materials currently being designed for use along a proposed trail. The signs and pamphlets focus on culturally important wildlife, such as the bull trout and native plants, which will compliment an educational, interactive DVD that is also used in local schools. The DVD, entitled “Explore the River: Bull Trout, Tribal People and the Jocko River,” covers topics including hydrology, habitat, fish biology, culture and history, and restoration of the river. Other reservations also described the importance of using trails as a means of cultural education: a representative from the Rocky Boy Reservation in Montana noted that one of the main reasons for the creation of a trail on their reservation was to “teach [children] about the cultural uses of plants” (Tribal representative, pers. interview). Clearly, there exists a significant opportunity for reservations to use interpretive trail materials as a means of educating resident and visitors about culture and natural resources.

FUNDING

CHALLENGES

A major challenge reservation communities face in trail development projects is funding. However, this cannot be entirely attributed to the previously discussed economic conditions on reservations. There are a multitude of other facets that contribute to this problem which must be considered. For example, under the treaties between many American Indian nations and the United States, tribal lands have sovereignty. This designation limits the funding horizon for reservation communities. Mark Roundstone, Wildlife, Recreation, and Parks Administrator for the Northern Cheyenne Reservation in Montana explains, “we don't receive any kind of state or federal funding for...utilities on the reservation...Unlike off reservation communities,

reservations do not receive state funding because [as sovereign nations] they do not pay taxes to the state.” Most federal recreation funds are split, according to various formulas, between the 50 states. Since reservation communities do not pay state taxes, states have little incentive to use their ration of federal funding on reservation projects. Furthermore, Tom McDonald, Division Manager of the CSKT Fish, Wildlife, Recreation, and Conservation Program (FWRC) in Montana, explains, “Most of the money [allocated through state grants from the federal Wildlife Restoration Act or Dingell-Johnson dollars²] is cost-reimbursable, meaning the tribe would have to front the cost and then get paid back” (T. McDonald, pers. interview). These grants present major problems for tribal governments who often do not have the monetary resources to front the cost of trail development projects, and lack the personnel needed to write the various grant applications.

Whereas states receive funds from a multitude of sources, tribal governments must often create partnerships with states or federal agencies to attain the necessary funding to develop trails. The BIA does not have an official trails program; instead, the Bureau handles trail projects through the Indian Reservation Roads Program (IRR) which aims at addressing “transportation needs of tribes by providing funds for planning, designing, construction, and maintenance activities” (Federal Highway Administration). Monies from this program are permitted for trail development projects. However, many tribes cannot spare these precious dollars on non-critical transportation projects like recreational trails.

Another common method county and state governments use to generate funds for a trails project is to establish an ‘improvement district’, which taxes those nearby to fund improvements. However, according to McDonald, reservation checkerboarding makes such options implausible for tribal governments. It is extremely difficult to levy a maintenance tax on private land owners living within the reservation boundaries. Some tribal constitutions may even limit a tribal government from collecting taxes.

OPPORTUNITIES

Despite the challenges tribal governments face when attempting to fund a trail system, there have been notable successes.

² Passed in 1950, this Act specifies that tax revenues from certain fishing equipment be dispersed among states. Allocation is based on geographic area (40 %) and the number of individuals holding fishing licenses (60%). Funds may be used by states for “comprehensive fish and wildlife resources management plans.

Funding Resources

Specifically target tribes:

- SAFETEA-LU
- American Recovery and Reinvestment Act
- IRR Program
- Indian Health Service Grants

May require partnerships:

- National Scenic Byway Program
- Recreational Trail Program
- Public Lands Discretionary Program

Possible Partners:

- Fish & Wildlife Service if area intersects critical species habitat
- Army Corps of Engineers if area intersects wetlands
- State government
- County government
- National and Local Volunteer Organizations

Alternative Funding:

- Robert Wood Johnson Foundation: Active Living by Design Grant
- Safe Routes to School
- Local special interest group non-profits
- Revenue from tribal recreation fees



Haxton way pedestrian path on the Lummi Reservation.
Photo by Rockethorse, courtesy of Robert Pell

Throughout the interviews, multiple individuals cited SAFETEA-LU funds, American Reinvestment and Recovery Funds (ARRA), and collaborative partnerships as the main sources funding reservation trail projects.

SAFETEA-LU

SAFETEA-LU stands for ‘Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy of Users,’ and was passed in 2005 with the goal of providing “funding for highways, highway safety, and public transportation” (Federal Highway Administration). Unlike Dingle-Johnson Dollars, SAFETEA-LU includes specific earmarks for Indian Reservations and defines tribes as ‘eligible direct recipients,’ meaning tribes do not have to go through their state to receive program funds (Federal Transit Authority FAQ).

American Reinvestment and Recovery Funds

Many interviewees also noted that they capitalized on funds made available by the American Recovery and Reinvestment Act (ARRA) of 2009. For example, the Winnebago Tribe of Nebraska utilized ARRA funds to construct a mile long bicycle/pedestrian trail on their reservation (NE Department of Roads). Robert Pell from the Lummi Indian Reservation in Washington also noted that ARRA funding was utilized in the construction of the Haxton Way Pedestrian Trail, a 2-mile pedestrian trail and boardwalk complete with state-of-the-art solar lighting.

Collaborative Partnerships

The interviews revealed that almost all of the trail development projects on reservation lands were the product of collaboration between multiple tribal and non-tribal entities. As Mike Swan from the White Earth Reservation in Minnesota explained: “The more players you get together to work on something like [trails] the better off you’re going to be. [Create partnerships] together, because if only one entity is going to do it, and they don’t get the support of other [organizations] it can be a barrier” (M. Swan, pers. interview). Tribes must be creative in how they manage and allocate funds for trail development processes. In fact, interviewees noted partnering a wide array of groups, including: Boy Scout troops, county governments, the Fish and Wildlife Service, volunteer church groups, college extensions, tribal and non-tribal health service departments, the Army Corps of Engineers, the BIA, and state departments. Transportation Enhancement Programs were also frequently mentioned. Although the name given to these funds differs from state to state, the basic purpose of these federal funds is to strengthen the cultural, aesthetic, or environmental value of the nation’s transportation system. Each state is responsible for allocating these funds, and therefore it is important to consider the nature of the tribe’s relationship to the state and the cost-reimbursement conditions before pursuing these funds.

Although there is a spectrum of funding possibilities for trail development, the three previously mentioned sources (SAFETEA-LU, ARRA, and Collaborative Partnerships) are seemingly the most accessible to tribal governments. Trails planning efforts should closely examine the availability of these resources in their pre-project research.

CONCLUSION

An established trail system could offer numerous benefits to reservation communities. Re-establishing the use of trails to traverse their landscapes is an important part of life for American Indian cultures, and could mitigate the difficulties presented by the reservation system. Issues of land tenure complicate the potential establishment of a trail system, but well-planned trail systems could help restore access to tribally significant lands and offer a way of recreating traditional movement patterns. Additionally, trail development along with land acquisition efforts could prove to be a useful tool for helping to return tribal sovereignty to reservations while strengthening cultural ties. A well-planned trail system could also address issues of economic disparity by cultivating income earned through ecotourism; reservations could use their natural resources to attract visitors, and improve their economic prospects. Obesity-related health disorders could be curbed due to the increased access to recreation opportunities community trails offer, and transportation safety problems could be solved by moving pedestrians away from busy roads. In conclusion, trail systems have great potential to improve the quality of life for reservation communities, provide physical and cognitive benefits for youth, and serve as a platform for important educational opportunities.

However, planning a trail system can be fraught with many challenges, and careful consideration must be given before undertaking such an endeavor. As with any community, reservation or otherwise, clear goals must be established that reflect the worldview and cultural values of that area and trail projects should be folded into the existing planning framework. As stated previously, an Integrated Resource Management Plan can be an effective tool for accomplishing this integration. Furthermore, the community at large should be involved in the planning process, for it is the whole community that stands to benefit from the establishment of local trails. The pages of this report recount the extensive benefits found in developing trail systems on reservations and give credence to the conclusion that trails are an effective tool for meeting the unique needs faced by reservation communities.

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APPENDIX 1: INTERVIEW RESULTS

The tables below provide examples of broad trends seen throughout the 22 interviews conducted; however it would be a mistake for readers to assume these conditions exist on all American Indian reservations.

Main Purpose of Trail

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> • Health, Walking Trails • Historical Preservation • Recreation • Transportation • Tourism, Historical significance • Recreation, Cultural Perseverance • Historical significance • Transportation, Recreation, • Culture, Traditional Use • Whaling, Hunting, Subsistence • College Nature Trail • Health/Recreation • Cultural Preservation • Connecting Community | <ul style="list-style-type: none"> • Access to natural/culturally significant areas • Emergency vehicle access • Nature Trail, Recreation • Having a safe place to walk • Quality of life • Transportation • Health promotion • Connecting community • Connecting community • Safe transportation • Recreation/Walking | <ul style="list-style-type: none"> • Recreation and Health, Connecting Community • Recreation, Walking, Biking, Horseback Riding • Cultural Significance • Ecology Studies • Historical Preservation • SAFETY* • Community Transportation • Health, Cultural Preservation • Health, Recreation • Connecting Community • Cultural Perseverance |
|---|---|--|

Of the individuals interviewed, only two reported having no formal or informal trails on their reservation. The remaining interviewees reported that either formal or informal trails existed on their reservation. The 13 formal trails recorded were generally described as walking trails that (1) connected communities or (2) promoted health. Very few of the formal trails were explicitly described as tourist attractions, however, six of the 18 reservations mentioned seasonal snowmobile trails. One reservation reported having an established nature trail as well. Interviews revealed the main use of trails generally fell into one of four categories: recreation, transportation, health or tourism. Recreational use of existing trail systems was by far the most common and included activities like walking, snowmobiling and ATV use. Transportation use was the second most frequently reported use of existing trails, and often consisted of moving between communities within the reservation. Health promotion and attracting tourism were less frequently cited, however were consistently reported throughout the interviews.

An eclectic mix of trail users were referenced and varied from drug traffickers to Boy Scouts. Informal trails were generally attributed to animals, ATVs or human established social trails.

Main Users of Trail

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> • Experienced hikers from off reservation • Mostly tourists, park visitors • Horseback riders and mostly tribal use • Community members • Snowmobile users • Whalers • Youth and ATV users • Walkers, Bikers • Park used by almost all the community | <ul style="list-style-type: none"> • Hunters, and people who pick berries and traditional herbs. Boy scouts, but other people may use them too • Residents who living in housing projects outside of town, community members • Biking, walking, ATV, People of all ages, Outside visitors • Restricted: no horses, motorized vehicles. Walkers. | <ul style="list-style-type: none"> • Kids who live in outlying housing areas • Diverse group; people come from all over to use the trails • Those with health issues, youth, some visitors • Walkers, Horseback Riding, Hunting (during season) • Illegal traffickers, horseback riders, individuals with health concerns |
|--|---|--|

People/Institutions Involved in Development Process

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> • Tribal Natural Resources • Tribal Housing • Indian Health Services • Tribal Maintenance Dept, Tribal Cultural Committee, Tribal Historical Department. • Whaling Captains and crews • Community members • Fish and Wildlife Department • State Costal Management Department • Private Snowmobile Club • Community College Extension Department and Agriculture and Natural Resources Department • Tribal Natural Resources Department | <ul style="list-style-type: none"> • BIA Fire Department developed fire trails • Boy Scouts (local chapter) • Natural resource district in Nebraska • Tribal Economic Development Corporation • Tribal Resource Planning Department • Community Members • Local County (trail on their road) • Local city governments • Local Non-profit • Local non-profit held a lot of different public meeting in the area, talking with state, tribe, trying to educate people. Advertising it, to try to get people to leave comments of concerns | <ul style="list-style-type: none"> • Tribal planning department • Local youth group • Volunteers (Global Volunteers) young people come in from Church groups • Army Corps • Tribal Planning Department • Community members • Cultural Groups • Tribal Government • Tribal economic development branch • BIA roads department • State Department for transportation • Tribal roads committee • Recreation department • Tribal Governing Board. |
|---|---|---|

Funding was by far the most frequently reported obstacle faced by tribes in trail development projects. Land related issues (mainly ownership fragmentation) were also cited in many of our interviews. Surprisingly, many interviewees also noted they faced obstacles originating from within their tribe.

Obstacles

Funding

- Funding was the biggest obstacle to trail development.
- Limited ability to access grant funding (Of 600 tribal government employees, only 5 grant writers).
- Funding
- Accessing funding in a timely manner (her tribe had to wait 4 years)
- Funding
- Cooperation of different tribal programs to share funding.
- Funding
- Lack the funding to develop such resources
- Funding (original funding fell through and it was not completed)
- Limited tribal funds are prioritized for food, health, and housing programs.

Land Related

- Lack of in-house expertise to ensure they have the lightest footprint on land
- Upkeep and maintenance
- Access management
- Potential vandalism
- Multiple land owners right-of-way issues, allotments, private land owners.
- Railway right-of-way issue, Maintenance
- Land ownership
- Pattern of land ownership
- Non_tribal landowners
- Right-of-way issues
- Harsh terrain
- Rugged terrain
- Permitting and wetland issues
- Wetlands (avoiding them)
- Culturally sensitive areas (must plan around sometimes)
- Seasonal light patterns given were we are it is dark all winter!

Other

- Sometimes obstacles come from within the tribe, it just wasn't a priority... You have to really want it
- Politics on the reservation and within the tribal government.
- Feels like trails are not a priority with the tribe.
- Burocracy type barriers
- Allotment is not really a problem
- The illegal trafficking on the reservation is big business and it is not safe to go out and walk because of the traffickers and boarder patrol.
- Complying with grant requirements: for example, their funding is for a non-motorized trail, how are they going to enforce that (and pay for that enforcement) to ensure people don't use these kind of vehicles on the trail. Grants do not cover these costs.
- If federal funds may have to go through NEPA
- Garnering community support
- Discrimination within the federal and state systems.
- Lack of resources (personnel)
- Labor intensive to make trails
- Negative perception of ATVs

Maintenance

- The trail is maintained in the summer by a tribally funded youth work program.
- College student volunteers (around 15 people) are used to maintain these sites.
- Whaling crews maintain the trails, and in the first few years use government funds to do so.
- The Indian Health Services trail is maintained by the Indian Health Office's maintenance crew
- Trails and sidewalks that were developed as part of planned communities on the reservation were not maintained and have fallen into disrepair.
- If they maintained established ATV trail it could really cut down on erosion.
- The college trail is going to be maintained by student interns who are funded through the USDA Land Grant funds.
- BIA Fire Department maintains fire roads.
- The Boy Scouts maintain their trails.
- Increased access supports commerce
- Tail Maintenance would be handed off to the tribal construction company
- Snowmobile club maintains snow trails
- We rarely maintain them because people use them all the time. So they don't need much maintaining.
- County does maintenance
- Maintenance is funded by Tribal-roads division which gets funds through the federal government
- The informal trails are not maintained.
- The fire trails are maintained by the economic development department.
- The formal trail is maintained using various sources, economic department, BIA Roads.
- Non-profit and volunteers are the main people who maintain the trails.

Given the emphasis on funding as an obstacle by many of those interviewed, it was interesting to review the notably creative ways in which tribes did gather the necessary funds for trail development. Despite the difficulty tribes face in accessing federal/state funds, it was the most often reported monetary source for trail development. Federally funded and state allocated transportation enhancement programs were the most frequently reported. Collaborative partnerships also resulted in tribes garnering funds for trail development which they would otherwise not have access to (eg.USFW or USDA funds).

Funding Sources

Tribal	Federal/State	Other
<ul style="list-style-type: none"> • Fee money from tourism • From whaling/hunting money • Coastal Impact Assistance Funds • Some Tribal funds • His strategy was to bank the annual allocation for a few years until they had the money to front for the grants. • Tribal revenue • Tribal Economic Development branch • BIA Reservation Roads • Tribal dollars • Funded by their own revenue • BIA funds • Indian Health Services • Indian Reservation Roads • Had some transportation enhancement funding (state to the tribe) 	<ul style="list-style-type: none"> • Federal funding provided to tribes through the Natural Resources Department • State grants through game fish and park departments • State (4x) • US Fish and Wildlife Service • USDA grant • State department of transportation • Army Corps of Engineers • Federal • Funding from the State Natural Resources District • American Recovery and Reinvestment Act stimulus funds through state. • State Department of Transportation Enhancements • Community Transportation Enhancement Program • Safe-Routes to school 	<ul style="list-style-type: none"> • American Recovery and Reinvestment Funding • County funds (tribe has special agreement with county) • Non-profit funded the project, did all work themselves. • Robert Wood Johnson Foundation • Tribal funds are not used • Coastal Zone program as long as your project falls into the watershed. • County

Positive observed effects of existing trails generally involved around increased access to recreational, community or cultural resources. A few respondents even noted how trail development had provided jobs within the community. Negative effects of trails focused on the resulting environmental impacts. Erosion was cited the most often, however, maintenance and upkeep were also highlighted.

Effects of Trails

Good

- Health benefits have been observed.
- Increased access supports commerce
- Good effects- brings in money for the tribe. Trails used for hunting and gathering, some go through old homestead areas. Trails used to access culturally important areas.
- Easier to ride 4 wheeler on hardened trail than on tundra. Also given an opportunity to educate people on why they are building the trail because of threatened sea duck/impacts to wildlife.
- "Lummi traditionally walk just about everywhere, so they [trails] enhances the culture really"
- Cultural trails; teach kids about traditional uses of plants. Medicinal plants, edible berries, edible roots. Share the knowledge of the elders; used trails to do this
- They have a good effect because it is bringing money on to the reservation, and a lot more people are interested in our reservation now.
- People use the fire roads on the reservation to access traditional areas to pick berries and medicinal herbs. The fire roads provide important access to traditional resource areas and even people's homes.
- Has provided a few jobs.
- Used building of trail to educate people about threatened sea duck/wildlife impacts. We had to talk to landowners and users of the trail about putting the hardened trail in, and tell them why they are putting trail in. Verbal communication is an opportunity for education.
- "people getting out there and looking at the past and not forgetting the past. Some of this is a way to remember the Bigfoot trail is to do the ride across the trail."
- Provided employment for the local workforce. Usually the road construction department runs out of money before the year is over and then they have to lay people off because they are out of money. By transferring the funds to the local BA Don White basically prevented these people from being laid off so soon cause he put them to work on park construction.

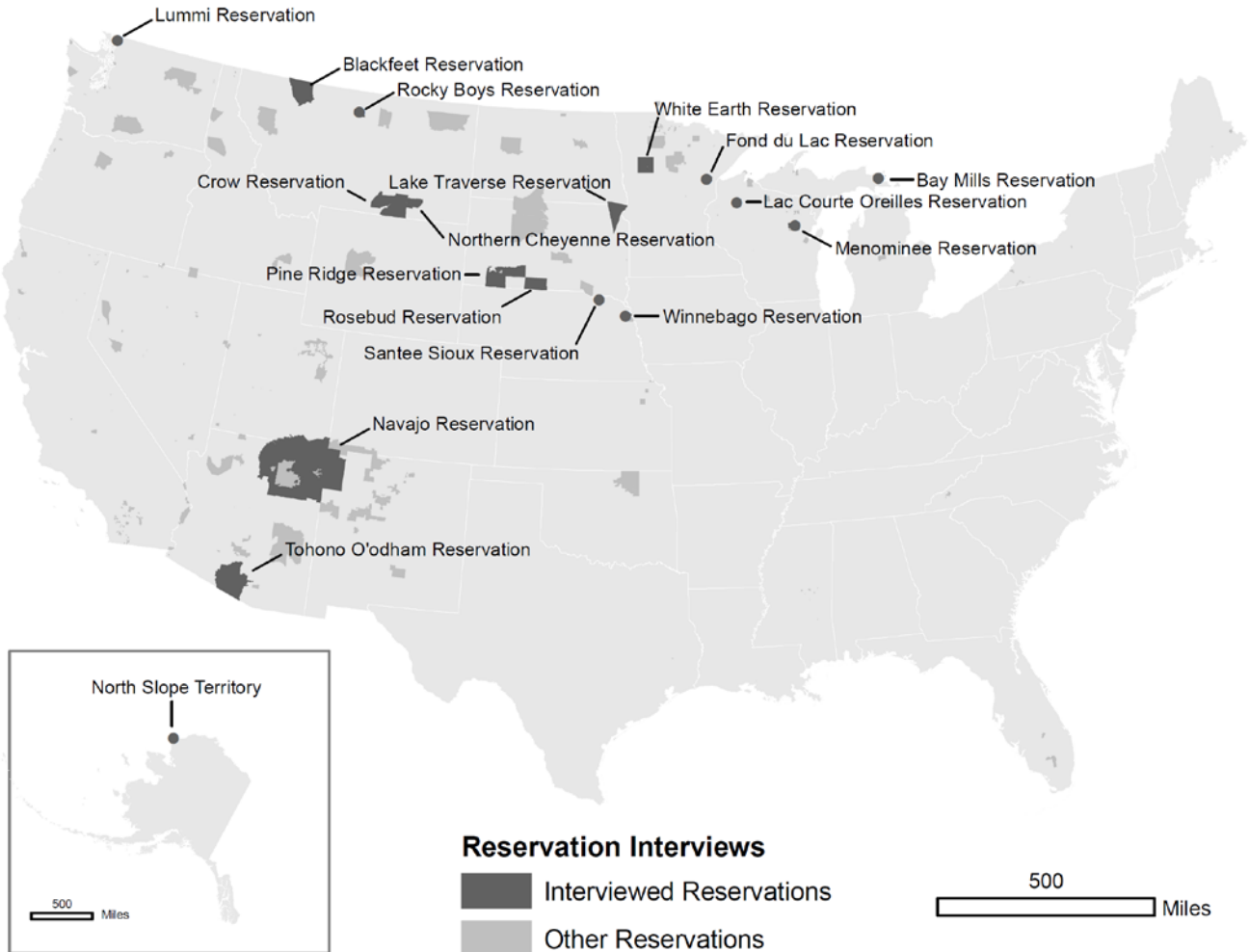
Bad

- We have boarder patrol running all over our nation on our trails using ATVs.
- People going off trail, keeping people away from sacred sites
- Keeping people on trails, keeping people away from sacred sites-- both issues they face.
- Maintaining some of the wetter areas has been a challenge- problems with beaver, need to put stuff down because of sinkholes, flooding. There has been some traffic issues- snowmobile trails cross roads. Snowmobile trails-makes things busier, an annoyance- noise, etc.
- ATV snowmobile trails (people don't like them in general) but people recognize the need to have these trails. You know people get out and exercise.
- The illegal trails are a big problem because they cause erosion. If they maintained established ATV trail it could really cut down on erosion.
- Erosion damage from ATV trails
- Maintaining some of the wetter areas has been a challenge- problems with beaver, need to put stuff down because of sinkholes, flooding. There has been some traffic issues- snowmobile trails cross roads. Snowmobile trails-makes things busier, an annoyance- noise, etc.
- Regret some of materials they used for the hardened trail. Used flexible matting to allow for expanding/contracting but was not best material to use for hardened trail. Would be more selective on where they implement it. Also need money to try and make trail longer.
- Trails and sidewalks that were developed as part of planned communities on the reservation were not maintained and have fallen into disrepair.

Other

- Hiking trails, horse trails are not seen as a problem because it is not seen as a lot of damage to the environment
- There are members of the tribe that did not like youth using snowmobiles and ATV on existing unofficial trails. An ordinance was passed banning the use of snowmobiles and ATVs on unofficial trails and on roads. Yet they have not provided any official trail, in effect making it illegal to drive ATVs anywhere.

APPENDIX 2: MAP OF RESERVATIONS INTERVIEWED



APPENDIX 3: TRAIL PLANNING FRAMEWORK

Trail Planning Framework Goal

The goal of the following framework is to provide a series of practical steps to guide communities, local governments, and design professionals through the planning of trails on reservations, assuring that the opportunities and challenges specific to reservations are addressed.

These guidelines are meant to build on existing research and design practices and are informed by conversations about trails with individuals at 22 reservations across the United States. While this list of points is not a comprehensive recipe that will lead to successful trail design and implementation, it is intended to function as a straightforward, clear, and practical list of essential questions that should be asked by communities and designers during the process of trail planning on reservations.

The framework is divided into six sections: establishing cultural context, establishing goals and objectives, accessing funding, working with land ownership, sensitivity to ecological context, and construction, maintenance and management. The first two sections should be addressed in the planning process before design work begins. All sections present considerations that should be made to inform the process of designing a trail system and do not necessarily represent discrete or step-by-step instructions. Rather, these considerations may need to be addressed and revisited at multiple points during the design process, but will should all be reflected in the final trail design.

1) Establish Cultural Context

- *Listen to community members at all stages in the planning and design process.* Ask questions, but mainly listen. It is possible to do this through one-on-one conversations, conducting surveys, holding open meetings, and inviting the public to design charrettes. Find other ways appropriate to the community to make it clear that the planning team is listening.
- *Write a case study of local culture, past and present.* Talk to important community members including elders, young people and children. Include images of local character and culturally important symbolism to inspire design ideas. This document could be useful in making design decisions or for securing funding.

2) Establishing Goals and Objectives – Community Involvement

- *Identify the preferred uses of the trail system.* Ask the community what uses they envision for a trail system.
- *Target the preferred users of the trail system.* Once a key audience for the trail system is identified, keep this audience in mind when making trail placement and design decisions.
- *Recognize other uses and users.* Acknowledge that not everyone will use the trail system the same way and make accommodations if deemed necessary. If the community and planning committee wish to prohibit certain uses, carefully consider how to do this.
- *Consider aspects of the community that may benefited from a trail system.* These may include opportunities for health promotion, cultural and ecological education, community-building activities, and ecotourism. Choosing a main purpose for the trail will impact many decisions and will reflect the wishes of the community at large.

3) Accessing Funding

- *Research private and public funding sources.* Available funding opportunities may depend on the extent and goals of the trail project. Look for funding sources that support trail system goals or research funding sources as a way to help develop goals for a trail system. While it is good to

have some knowledge of available funding before digging deeply into design, evidence of community support and design ideas could help secure funding.

4) Working with Land Ownership

- *Identify the extent of the desired trail system.* The ideal extent may depend on the goals of the trail system.
- *Identify a range of locations ideal for placement of the trail system.* This can include identifying specific destinations for the trails, a general area, or alternate routes within an area.
- *Determine land ownership in areas being considered for the trail system.* Within a relatively small area, this may include dealing with private, public, or trust land, city, county and state rights-of-way along roads, and easements held by a number of possible people or groups.
- *Bring all land owners near the proposed trail system to the planning table.* Where there is initial resistance, open discussion of plans and ideas for the potential trail system may decrease that resistance.

5) Sensitivity to Ecological Context

- *Identify ecologically sensitive areas the trail should avoid.* This could include wetlands or any body of water, undisturbed areas of native vegetation, key animal habitat, or any number of other physical features depending on local landscape and ecology.
- *Identify ecological challenges to consider in the construction of the trail* no matter where it is placed, based on the local ecosystem. Commonly this should include attention to possible erosion problems, including those caused by horses, llamas, or motorized vehicles if they will be allowed to use the trail system.
- *Balance ecological concerns with the desire for specific aesthetic traits in the placement of the trail system.* Find ways to provide people with good views of natural features without negatively impacting them.

6) Construction, Maintenance and Management

- *Consider the maintenance implications of design decisions.* Choices about trail surface material, routing, accessibility, and amenities can be made with maintenance requirements in mind.
- *Find local construction companies with trail-building experience.* If there are none, consider implementing the trail system in phases. During the first phase(s) an outside company may train local companies and people, ensuring the creation of local jobs.
- *Consider creating a policy to encourage the use of local labor and physical resources.*
- *Reach out to existing community groups who may become involved in trail stewardship.*
- *Create a long-term management plan.*
- *Consider creating a group to administer decision-making for the trail system in the long term.*
- *Work with local schools and youth programs.* Whether or not it is a formal goal for the trail system to provide educational opportunities, trails may provide a number of opportunities to local schools and other organizations.

Reservation + Location	Tribe	Contact Name	Interviewer Name	Contact Position- (also, tribal member?)	Consent	Existing Trails - Formal Trails Description
Northern Cheyenne Reservation, Montana		Mark Roundstone	Nick	Wildlife Recreation and Parks Administrator	Record and use name	Two walking trails exist within the community, one at the Indian Health Services grounds and the other at the recently developed People's Park. The People's park contains ball fields and other active recreation opportunities. The People's Park trail around a 1/4 mile and have a gravel surface. The Indian Health Services trail is also about 1/4 mile around and is paved.
Navajo Nation, Arizona	Navajo	na	Ann	Little Colorado River Park Manager, tribal member	Record, anonymous	No formal trails.
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Crow	Ken Woody	Ann	Chief of Interpretation, Little Big Horn Battlefield National Monument, not tribal member	Record, use name	Formal trails in park. One of them is Deep Ravine- 3/4 mile, starts from visitors center. Upgraded it so its handicapped accessible. Have another sidewalk trail, goes where the soldiers were lying and hiding- were under siege after the battle
Pine Ridge Reservation, South Dakota	Oglala Sioux	Trudy Ecoffey	Ann	Not tribal member	Record, use name	Bigfoot trail. Starts up on another reservation (Standing Rock/Cheyenne River Reservations). Trail based off of Bigfoot, a chief in the 1890s who came down towards Wounded Knee, he and his group was massacred by the 7th calvary. Some of it is highway but some of it is also offroad. That is the only one she can think of that is formal. It is used for horseback riding. Every December they have a "Bigfoot ride."
Bay Mills Indian Community, Michigan	Chippewa	Amanda Bolzac	Ann	Tribal Biologist, tribal member	Record and use name	Snowmobile trails are established- these trails are part of a larger trail that goes throughout Eastern UP
North Slope Territory of Alaska	Inupiat	Robert Suydam	Ann	Senior Wildlife Biologist- works for Northslop Borough (municipal government). Not tribal member	Record and use name	Most trails cut or placed- long process, chipping away at sea ice. Some trails consist of just markers along the ice to guide people. Few geographical features to guide people, for people to use to navigate. Trails in summer time on land- established so people can go out and access cabins, or go out and hunt caribou. Those trails tend to occur in traditionally used areas (higher, drier areas). 4 wheelers, snowmobiles used in summer time on tundra. Those vehicles, especially the 4 wheelers, really chew up the tundra in the summertime. Impacts wildlife species, erosion, water quality. Decided to deal with these issues by making a hardened trail. Been used in other places (NPS has used this in S Alaska). Helps give land more stability and rigidity. use it by fascening panels together accross the tundra. Made of plastic. Gives better traction for 4 wheelers. Have already installed a mile of it. Were worried bc all the land is permafrost, so were concerned that the trail would increase the solar radiation and increase thaw depth in summertime. But this hasn't been the case. Hoping to install a few more miles in the next couple years.
North Slope Territory of Alaska	Inupiat	Bryan Thomas	Ann	Arctic Scientist, not tribal member "Logistics Planner at Barrow Arctic Science Center"	Record and use name	Trails seasonal. Most trails temporary. Snowmobile trails not in same place every year, because trails goes away when ice melts. Ephemeral trails. Many whaling trails.

Reservation + Location	Existing Trails - Informal Trails Description	Existing Trails - Main Users	Existing Trails - Establishment
Northern Cheyenne Reservation, Montana	Most trails on the reservation are made by animals, mostly cattle. They are very narrow and very rough. People occasionally use them, mostly ranchers who ride them on horseback for work.	The primary users of informal trails on the reservation are ranchers who ride them on horseback for work purposes. Formal walking trails are mostly used by tribal government workers on their lunch breaks. The tribal government offers paid exercise time. At the People's Park trail spouses and others will use the trail when their friends or partners are playing sports. The People's Park trail is new and is in a bad location so is used less often. The Indian Health Services is used quite often. There is a very high incidence of unemployment on the reservations so many people have to walk along roads between communities because they cannot afford the transportation service. A lot of people walk/hitchhike in the community out of necessity. There are safety issues because the roads are narrow and vehicle travel quickly.	The main reason walking trails were developed for the People's Parks and Indian Health Services was because of the high rates of diabetes, obesity and heart disease on the reservation and they wanted the people to take an interest in walking as a form of exercise.
Navajo Nation, Arizona	Informal, for experienced hikers only. Rugged, steep cliffs characterize the environment in which the trails are located. Hikers come back every year, and are familiar with the trails. They tell their experience on the trails to the park managers. Trails are very hard to find, because its such a big area (Little Colorado River Area is over 360,000 acres). Route to get there is hard to explain to anybody. <u>Many canyons, and dead-ends.</u>	Experienced hikers from outside the reservation. The parks trail descriptions are written by these experienced hikers that use the trail. Most of the park employees do not use the trails because they are too rugged and advanced. People inquiring about the trails are directed to speak with the experienced hikers.	Not sure. The trails were already existing when the interviewee came to work at the place.
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	2 primitive dirt trails, very short, go down to certain areas of little big horn battle.	Tourists, park visitors	Established bc it is a national battlefield, well known. Development had to happen. Became national cemetery in 1879. Handed over to NPS in 1940.
Pine Ridge Reservation, South Dakota	Mostly informal trails- footpaths people have made themselves	On the bigfoot trail- horseback riders. Mostly people from the reservation use the trails.	Bigfoot- historical trail that the tribal people used to use back before white settlement.
Bay Mills Indian Community, Michigan	Many footpaths	Footpaths/informal trails- community members; Snowmobile trails- wider use	Footpaths- some very old- probably used for 100 years. Not sure when snowmobile trails were established.
North Slope Territory of Alaska	Some informal trails to go out on sea ice.	Whalers (organized crews- these crews work on the trails together). Some biologists/climate change scientists also use/build the trails-- scientific use of trails. Some film crews also use the trails. In the summer- a lot of 4 wheelers	When the sea ice freezes, the currents and wind means that the ice moves around all the time-- this causes big pressure ridges. These ridges can be 20/30/60 feet high. Need to get from shore to open water to hunt whales- need to navigate through/around the big pressure ridges. People go out with picks and break up the ice. Used for 6 or 8 weeks in the spring time. The process of making the trails can take a month and half or two months- to use them for just 6 weeks.
North Slope Territory of Alaska	Seasonal hunting, trails only used when hunting for certain things.	Whalers, hunters- mostly tribal members. Might be used for subsistive hunting of other animals as well. Also, cultural reasons, but "Not sure there is a way to separate that...culture and subsistance one and the same"	Established by whaling captains "In terms of the trails on the ice, it's a process to make them...literally chipping by hand. It matters a lot where they are and how much effort it takes to make them"

Reservation + Location	Trail Use - Main Purpose	Trail Use - Outside Visitors
Northern Cheyenne Reservation, Montana	Health	<p>NO-there is no advertisement off of the reservation for recreational opportunities that exist there. "People hunt because they have always hunted. People fish because they have always fished."</p> <p>"If funds existed to develop trails we would not have any qualms about the public using them regardless of whether they were tribal members or not."</p>
Navajo Nation, Arizona	Recreation- seclusion, "getting away from everything," the challenge, connected to the Grand Canyon. Some people will come from the Grand Canyon National Park and use the trails to get to the Navajo Nation parks (transportation)	<p>No, it's hard to use the trails unless you have been using them or you get an experienced hiker who has been using the trails to guide you. Most of these hikers are from outside the reservation, but come back every year. They like the seclusion and don't want more outside visitors coming. People using the trails must purchase a permit (\$5 per person per day, \$5 per person per night for camping).</p>
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Tourism (National Battlefield)	Yes- mostly tourists
Pine Ridge Reservation, South Dakota	Recreation, Cultural (Bigfoot trail)- "for the native people to heal from the past...of white oppression."	Not many. No advertising really. BUT she thinks it would be great if there were more developed trails that were advertised- she thinks people would be supportive of this.
Bay Mills Indian Community, Michigan	Transportation, Recreation, Culture	Snowmobile trails are advertised for outside visitors at resort, and there are signs.
North Slope Territory of Alaska	Whaling, hunting, subsistence	Definitely not advertised for outside visitors. Whalers try to restrict who goes out on the ice- sensitivity bc whales are spooked by sounds people make. Don't want to deflect a whale away from a whaling camp.
North Slope Territory of Alaska	Whaling, hunting, subsistence	Labor intensive to make, so if someone wants to use the trail, they need permission. Most maintained for private use.

Reservation + Location	Trail Use - Tribal Use Only	Trail Planning & Development - Description
Northern Cheyenne Reservation, Montana	Some-only around cemeteries because of respect for ancestors.	<p>The Indian Health Services Trail was developed by their staff.</p> <p>"The People's Park was a very interesting project, I was the head of that project. It was one of the few and first times that several programs put in money to develop [a community amenity]. Usually what happens is the programs become very territorial. This is one of the only times these organizations opened their doors and allowed funding to go to that project."</p>
Navajo Nation, Arizona	No, mostly people from outside the reservation use the trails.	Not really formal trails, not sure about how they started or who discovered the trails.
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Many sacred sites- battlefield/graveyard. Cheyennes don't have problems with the park keeping most sites open to visitors.	Established bc it is a historically important site
Pine Ridge Reservation, South Dakota	Mostly tribal use	Didn't know
Bay Mills Indian Community, Michigan	Yes! There are some trails the community would want to maintain for private use, for cultural and historical purposes. There's some old homestead areas that there are some trails on, and the tribe would like to make this into an educational area.	Different departments- maintenance, historical (keeps track of old homestead sites), cultural committee--all these are part of the tribal government.
North Slope Territory of Alaska	Other whaling crews who didn't make the trails need to ask permission to use them.	When the sea ice freezes, the currents and wind means that the ice moves around all the time--this causes big pressure ridges. These ridges can be 20/30/60 feet high. Need to get from shore to open water to hunt whales- need to navigate through/around the big pressure ridges. People go out with picks and break up the ice. Used for 6 or 8 weeks in the spring time. The process of making the trails can take a month and half or two months- to use them for just 6 weeks.
North Slope Territory of Alaska	Labor intensive to make, so if someone wants to use the trail, they need permission. Most maintained for private use.	Trails on ice- process to make them. Matters a lot where they are, takes lots of effort to make them-literally chipping away by hand.

Reservation + Location	Trail Planning & Development - People and Institutions	Trail Planning & Development - Community Involvement
Northern Cheyenne Reservation, Montana	Tribal Natural Resources Tribal Housing Tribal Health	Went to local high schools and asked them what they wanted. The students came to the Tribal offices and asked for what they wanted. They really wanted basketball, basketball is really popular on all reservations. Softball and horseshoes were also really popular.
Navajo Nation, Arizona	Not really formal trails, not sure about how they started or who discovered the trails.	N/A
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	NPS. Tribal government probably not involved. If they were to develop something now, they would contact tribes. Have consultation meetings with tribes who were involved in the battle all the time now. But back when the trails were established, that wasn't done as much.	Nope
Pine Ridge Reservation, South Dakota	Didn't know	Didn't know
Bay Mills Indian Community, Michigan	Tribal Maintenance Dept, Tribal Cultural Committee, Tribal Historical Department.	N/A
North Slope Territory of Alaska	Whaling crews	
North Slope Territory of Alaska	Each whaling captain makes decisions based on the ice where they think a good place would be to watch for whales and stage their hunt. Every season each whaling captain decides how that will happen.	Whole community gears up to do whaling. Feeds community for the whole year. Something everyone participates in. Impacts everyone.

Reservation + Location	Obstacles to Trail Planning & Development
Northern Cheyenne Reservation, Montana	<p>Funding was the biggest obstacle to trail development.</p> <p>It is sometimes difficult for different tribal programs for cooperate and share funding.</p> <p>The Tribal government has a limited ability to access grant funding. Of 600 tribal government employees, only 5 were grant writers.</p> <p>Still discrimination within the federal and state systems. When tribes compete with off reservation communities for funding, it was the interviewees opinion that the off reservation communities would be favored.</p> <p>Because of the high level of poverty on reservations, limited tribal funds are prioritized for food, health, and housing programs. Recreation are allocated little money.</p>
Navajo Nation, Arizona	<p>Would like more formal trails, but this depends on the funding. Hard to develop trails because of the rugged environment- very rocky, steep, many cliffs. There are also problems with land owners and patterns of land development because the park needs to get permission from land owners for trail use etc. Also problems because they haven't been able to map out the trails bc they are so rugged, and they don't have people working for the park that are able to do this work for them.</p>
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	<p>"Because it's a battlefield, a lot of tribes are going to consider certain areas sacred, or landmarks, you may not want the visiting public to be near or touch, it could get damaged."</p>
Pine Ridge Reservation, South Dakota	<p>Funding</p>
Bay Mills Indian Community, Michigan	<p>"Certainly funding, and some community support." Community support- to do certain projects, they need to go through the government, need resolutions etc to go through tribal government. Burocracy type barriers.</p>
North Slope Territory of Alaska	<p>Challenges with hardened trail- location--putting it through areas that are very wet. Finding the right spot without causing more permafrost melt/erosion was a challenge. The hardened trail also isn't very flexible, so microtopography is an issue as well. Also, PATTERN OF LAND OWNERSHIP: "Some of the other challenges are kind of more political in nature. Since most of the land here nere Barrow, which is where we've installed this stuff so far, is private land, we just need to jump through the hoops to get permission to install it on private land and to make sure we're working with the users to make sure we're putting it in the right place"</p>
North Slope Territory of Alaska	<p>Labor intensive to make trails, seasonal light patterns --> dark all winter!</p>

Reservation + Location	Trail Funding Sources
Northern Cheyenne Reservation, Montana	<p>"You have to understand that the reservations are very different that your average off reservation community. For example we don't receive any kind of state or federal funding for any kind of utilities on the reservation. The reservation utilities, parks, and other services are funded by the Tribe on a very minimal funding source. We have to be creative and ask for assistance. for example, we have a couple of summer youth programs that come and mow the grass at our park."</p> <p>Unlike off reservation communities, reservations do not receive state funding because they do not pay taxes to the state. However, the states do count the population of reservations toward federal funding that they receive, but the tribes do not see any money from the state because of sovereignty issues, that would be the states foot in the door to controlling other matters on the reservation.</p> <p>All of the funding for parks and trails would have to come from tribal programs that are federally funded. If hiking trails were developed away from community centers, these trails would have to be funded solely by the Natural Resources Department.</p> <p>In addition to a lack of funding, the Tribal government has a limited ability to access grant funding. Of 600 Tribal government employees, only 5 of them were grant writers.</p>
Navajo Nation, Arizona	Grants- Navajo Nation Gvmt operation, so they need to find funds from the government.
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Most recent trail- funded through fee money- money they take through the gates of the park.
Pine Ridge Reservation, South Dakota	Trails not really maintained. Most are informal. Have looked at a few grants to get more trails. Haven't been successful. Applied to state grant through game fish and park that helps develop trails.
Bay Mills Indian Community, Michigan	Specifically funding for maintaining snowmobile trails from the state.
North Slope Territory of Alaska	1st phase of hardened trail- US Fish and Wildlife Service provided funding- used justification--trails go through habitat- threatened species of sea duck. Development of trail will concentrate 4 wheelers into one spot- this could reduce impacts to birds. Money, to help mitigate coastal and near shore impacts. These are both government funds.
North Slope Territory of Alaska	From whaling/hunting money- trails established to hunt, so the trails make money this way

Reservation + Location	Trail Maintenance	Unintended benefits/consequences
Northern Cheyenne Reservation, Montana	<p>The People's Park trail is maintained in the summer by a tribally funded youth work program.</p> <p>The Indian Health Services trail is maintained by the Indian Health Office's maintenance crew.</p>	
Navajo Nation, Arizona	Not maintained formally. Only the hikers using the trails would be the ones maintaining them. There are two viewpoints that are maintained by the park, but these aren't really trails. College student volunteers (around 15 people) are used to maintain these sites.	N/A
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Use fee money (entrance money people pay to see the battlefield)	Consequences- people going off trail, keeping people away from sacred sites
Pine Ridge Reservation, South Dakota	Nothing officially maintained	N/A
Bay Mills Indian Community, Michigan	Snowmobile trails "somewhat maintained." There is a maintenance department that does this, within the tribal government--under parks and rec maintenance. Get some state funding to maintain the snowmobile trails (she thinks)	Maintaining some of the wetter areas has been a challenge- problems with beaver, need to put stuff down bc of sinkholes, flooding. There has been some traffic issues- snowmobile trails cross roads.
North Slope Territory of Alaska	Whaling crews maintain them. For the hardened trail, they used their government funding to maintain trail for a couple years after they've installed them, but haven't figured out how to maintain them after that.	Regret some of materials they used for the hardened trail. Used flexible matting to allow for expanding/contacting but was not best material to use for hardened trail. Would be more selective on where they implement it. Also need money to try and make trail longer.
North Slope Territory of Alaska	Whaling crews maintain them	

Reservation + Location	Effects of Existing trails	Education	Cultural Use
Northern Cheyenne Reservation, Montana	Health benefits have been observed.		
Navajo Nation, Arizona	Both good and bad- land users that are trying to oppose things, they need to go through them to get their approval, which is a problem (see obstacles).	N/A	N/A
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Keeping people on trails, keeping people away from sacred sites--both issues they face (see quotes)	Have booklets at the trailheads. Give ranger talks. Give handouts at the gate.	Yes- culturally important site- many people died in the battle. Also,"There are some sacred areas out there that people should not be touching. And those are like rock cairns- rocks that are piled up by the Indian people right after the battle to show where someone was shot or killed. We have a few out there from the day of the battle or the day after or so. And we have to be careful with that kind of stuff."
Pine Ridge Reservation, South Dakota	Good effects- "people getting out there and looking at the past and not forgetting the past. Some of this is a way to remember the Bigfoot trail is to do the ride across the trail."	N/A	Bigfoot trail. Starts up on another reservation (Standing Rock/Cheyenne River Reservations). Trail based off of Bigfoot, a chief in the 1890s who came down towards Wounded Knee, he and his group was massacred by the 7th calvary. Cultural (Bigfoot trail)- "for the native people to heal from the past...of white oppression."
Bay Mills Indian Community, Michigan	Brings in tourists for the snowmobile trails-makes things busier, an annoyance-noise, etc. Good effects- brings in money for the tribe, (winter- down time for some MI tourism, so its good this brings ppl into the area)	There's some old homestead areas that there are some trails on, and the tribe would like to make this into an educational area. It would include cultural information, historical information. Would be used for fieldtrips for kids. Haven't been able to do this bc of funding.	Trails used for hunting and gathering, some go through old homestead areas. Trails used to access culturally important areas.
North Slope Territory of Alaska	Positive effects- easier to ride 4 wheeler on hardened trail than on tundra. Also given an opportunity to educate people on why they are building the trail bc of threatened sea duck/impacts to wildlife. Has provided a few jobs.	Used building of trail to educate people about threatened sea duck/wildlife impacts. Go and talk to landowners and users of trail about putting the hardened trail in, tell them why they are putting trail in. Verbal communication is an opportunity for education. Put up signs about who the trails were funded by and why.	
North Slope Territory of Alaska			Subsistence hunting/cultural use of trails one and the same

Reservation + Location	Historical Trails
Northern Cheyenne Reservation, Montana	There is an ancient cairn located on the reservation called the "miracle of ice." The cairn is gated, but next to it there is a remnant of a historical trail that is paved with flat sandstone pavers. Unfortunatley, Tribal Housing built a house in the middle of the trail.
Navajo Nation, Arizona	No historical trails, but because the development of the trails is unknown, these trails might have existed for quite some time.
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	yes- historical battlefield- Little Big Horn Battle
Pine Ridge Reservation, South Dakota	Bigfoot trail. Starts up on another reservation (Standing Rock/Cheyenne River Reservations). Trail based off of Bigfoot, a chief in the 1890s who came down towards Wounded Knee, he and his group was massacred by the 7th calvary. Some of it is highway but some of it is also offroad. That is the only one she can think of that is formal. It is used for horseback riding. Every December they have a "Bigfoot ride."It is about "people getting out there and looking at the past and not forgetting the past. Some of this is a way to remember the Bigfoot trail is to do the ride across the trail."
Bay Mills Indian Community, Michigan	Some of the informal walking trails have been there for upwards of 100 years, and run through old homestead sites. Some areas people have used for hunting and gathering for many generations.
North Slope Territory of Alaska	Whaling trails ephemeral. Summer trails historically used because of good locations- high, dry areas always used for trails. This keeps trails in the same spot. There are lots of routes (some flexibility in where they are over the years) that have been used for a long long time.
North Slope Territory of Alaska	

Reservation + Location	Important Quotes	Other Notes
Northern Cheyenne Reservation, Montana	<p>"You have to understand that the reservations are very different that your average off reservation community. For example we don't receive any kind of state or federal funding for any kind of utilities on the reservation. The reservation utilities, parks, streets and things like that are run by the Tribe on a very minimal funding source. We have to be creative and ask for assistance. for example, we have a couple of summer youth programs that come and mow the grass at our park."</p> <p>"I will occasionally see kids who have an appointment in town or got up late and are walking to school walking along our main highway. I would like to see a trail allongside the highway or somewhere where kids can walk without the possibility of getting hit by a car. I wouls also like to see bike trail, even one mile, in each of our communities because our kids ride a lot of bike and they ride them on the highway."</p> <p>"We have a recreational area called Crazy Heads with fishing ponds, swimming ponds, and springs. I would like to see some developed trails in that area to be able to see the wildlife. There is a gravel road that goes along Delvis Creek to the ponds, but I would like to see a trail on the other side [of the stream] so that our kids who are fishing can get there safely."</p> <p>"We have some historical areas [on the Northern Cheyenne Reservation] that could really use trails or even kiosks to describe them."</p> <p>"[The Northern Cheyenne] reservation is crossed by two corridores; the Tounge River corridor and the Rosebud Creek corridor. These corridores contain more songbirds than either of the National Parks, Glacier and Yellowstone. We have over 480 [species] of songbirds. We have just talked about this, but it would be ideal if we could partner with an organization like the Audubon Society to see if they would help us develop what we have called nature trails. Birders don't do any damage to their environemnt, they come in in the morning and evening, sit, and take pictures, and then they leave. We have always wantes to take advantage of this opportunity, but have not been able to."</p>	<p>98% of the Northern Cheyenne Reservation is in tribal ownership. The other 2% of allotted land is owned by tribal members.</p> <p>Has an interest in developing trail to a local fishing area for wildlife viewing as well as to allow kids to get to a favorite fishing and swimming area safely.</p> <p>Would like to see a trail to a historically and culturally important buffalo jump site to allow visitors a and guests to see the site without worrying about them falling down. Even better yet would be to have a handycap accessible trail there.</p> <p>They have an interest in developing nature trails in tow riparian corridors on the reservation. These corridors have 480 species of song birds and the Tribe has talked about partnering with the Audubon Society to develop these trails. This would be a welcome source of revenue for the tribe</p>
Navajo Nation, Arizona		<p>Would like to develop a brochure/map of the existing trails, but due to the rugged/dangerous nature of the trails they haven't been able to do this yet.</p>
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	<p>"Visitors have a tendency to want to walk off trails, and start their own trails. Its really difficult to keep people on trails. We're a prairie ecosystem and once someone walks across an area, you can really see where they went. This whole battlefield is an archeological site, and we try to keep them on the trails. We have safety messages and signage, but its really hard to keep people on trails. Pretty soon you see people making trails everywhere, and its pretty hard to reign them in." "There are some sacred areas out there that people should not be touching. And those are like rock cairns- rocks that are piled up by the Indian people right after the battle to show where someone was shot or killed. We have a few out there from the day of the battle or the day after or so. And we have to be careful with that kind of stuff."</p>	
Pine Ridge Reservation, South Dakota	<p>"It would be nice to have more formal trails. There is a lot of historical and ecological reasons to have trails, and I think it would be really great for tourism and things like that if there were more trails developed on the reservation."</p>	<p>They got an IRR earmark for Extend bike trail in Pine Ridge to the SuAnne Big Crow Boys & Girls Center</p>
Bay Mills Indian Community, Michigan	<p>"I certainly want to stress that funding is an issue, because a lot of the area here is wetland area, so if we do more accessible trails than footpaths, we have to go over the wet ares, and boardwalks become very expensive. It's been hard to do more established trails here."</p>	
North Slope Territory of Alaska	<p>"Some of the other challenges are kind of more political in nature. Since most of the land here nere Barrow, which is where we've installed this stuff so far, is private land, we just need to jump through the hoops to get permission to install it on private land and to make sure we're working with the users to make sure we're putting it in the right place"</p>	<p>Tribal system in Alaska different- for profit corporations and non profit organizations associated with tribal land. Much of tribal land is owned by for profit corporations- shareholders are native people</p>
North Slope Territory of Alaska	<p>"I can tell you that the whole community really gears up to do whaling. It is something that you are either on a crew or you know someone who is on a crew and you do whatever you can to help because it feeds the community for the whole year. So its something that everyone participates in one way or another. It impacts everyone, and is very important."</p>	

Reservation + Location	Email, to send Final Report to
Northern Cheyenne Reservation, Montana	
Navajo Nation, Arizona	h_webster2005@yahoo.com
Little Big Horn Battlefield National Monument, Crow Agency, Montana (National Monument Site)	Ken_Woody@NPS.gov
Pine Ridge Reservation, South Dakota	trudy_ecoffey@hotmail.com
Bay Mills Indian Community, Michigan	abosak@baymills.org
North Slope Territory of Alaska	robert.suydam@north-slope.org
North Slope Territory of Alaska	

Reservation + Location	Tribe	Contact Name	Interviewer Name	Contact Position- (also, tribal member?)	Consent	Existing Trails - Formal Trails Description
Lac Courte Oreilles Reservation, Wisconsin		na	Nick	Tribal Extensions Director	record but anonymous	The [Lac Courte Oreilles Ojibwa Community College] has a nature trail that was developed by the extensions department. It loops behind the college and goes through some different types of trees that are labels. This 1/8-1/4 mile trail was recently added to to connected to the college farm. A recent addition was developed as away to promote healthy/traditional lifestyles. The college is planning on using the trail during workshops that promote traditional/healthy lifestyle opportunities like snowshoeing. The Tribe has received Safe Routes to Schools funding to connect a series of existing unofficial to create a long trail to allow children to access schools within the community. This is still in the planning phase. There are also designated snowmobile routes that cross the reservation that the tribe has agreed to. These were developed by off reservation trail groups (Sorget County Trails Group[?]) There is also a designated ATV route that goes through the reservation along a couple of gravel roads to connect the Tuscovia ATV trail to reservation businesses.
Rosebud Reservation, South Dakota		Emily Boyd	Nick	Biologist for the Game Fish and Parks Department Tribal Member (yes)	Record and use name	There are a couple of marked trails that the local chapter of the Boy Scouts has made. One of which is about a mile long and starts at a main road and goes through a forest area to a reservoir. Another is in a more remote place and they use it to get a lot of their badges. They are marked and signed by the boy scouts. Have plans to create more established trails for educational and recreational purposes. These would be to educate about the fish and wildlife and other natural resources in the area. They want to provide access to natural springs and stone bridges that are on the reservation.
Winnebago Tribe of Nebraska	Winnebago Tribe	Joy Johnson	Brittney	Quality Assurance Manager at Hochunk Inc.	yes. But please send all quotes to her first to make sure we got it right. BEFORE PUBLISHING	(1) Northern part of the town (2) Housing development south of town (3) BIA east of town
Winnebago Tribe of Nebraska	Winnebago Tribe	Fay Houghton	Brittney	Land Manager for the Winnebago Tribe of NE, yes	record use name	(1) development north of Winnebago there is a trail to that area. There is a dollar general to there. (2) South of town not yet completed. (3) Eastern trail goes out of trail to the BIA (funded by the state) (4) cabins timber area thinking about developing trails down there for hunting people (not developed though)
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	Minnesota Chippewa	n/a	Brittney	Fon du Lac Planning Director	yes. Remain anonymous	(1) Snowmobile trails
White Earth Indian Reservation, Minnesota	White Earth Band of Ojibwe tribe	Mike Swan	Brittney	Natural Resources Director	yes, use name	(1) Snowmobile trails (2) Walking trail- connects to North Country Trail ties in with other trails off reservation (3) Planning on doing some bike trails around communities

Reservation + Location	Existing Trails - Informal Trails Description	Existing Trails - Main Users	Existing Trails - Establishment
Lac Courte Oreilles Reservation, Wisconsin	There are many unofficial trails on the reservation that used primarily by snowmobiles and ORVs.	The primary users of informal trails are youth who use ATVs on them. These are not really hiking trails. The youth use them to go hunting and get to their activities.	<p>The snowmobile trail and the atv route that cross the reservation was allowed by the tribe to allow tourist to access reservation businesses. It made economic sense.</p> <p>The community college trail was established to connect people to nature as an educational tool. The recent extension was added to promote healthy and traditional lifestyles. The trail takes people from the college to the farm where workshops are hosted by the extensions department that promote traditional lifestyles.</p>
Rosebud Reservation, South Dakota	People use the network of fire roads on the reservation to access natural areas. Primary purpose is for emergency vehicles, but people use them for picking berries and other traditional practices. Some are gravel roads, but most are two track roads.	<p>Fire roads: The fire roads are used by hunters, and people who pick berries and traditional herbs.</p> <p>Boy Scout Trails: boy scouts, but other people may use them too.</p>	<p>Fire Roads: established by BIA Fire Department for wildfire access.</p> <p>Boy Scouts: recreation and merit badges.</p>
Winnebago Tribe of Nebraska		Everyone, they were trying to attract all members of the community to promote 'active living by design'	
Winnebago Tribe of Nebraska	On private land, used by owners of that land.	<p>Northern trail - transportation from/development community and dollar general out there.</p> <p>Southern trails- no users yet, not complete</p> <p>Local track at high school- a lot of people use</p> <p>Eastern trail- used to get to agency, by residents who live out there</p>	Northern Trails has been done for a while Southern Trail
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	Informal atv, walking trails	Biking, walking, ATV (informal trails). People of all ages using these trails.	N/A
White Earth Indian Reservation, Minnesota	Old logging roads are used a lot as snowmobile trails informal atv trails a lot of people are against these trails	(2) Restricted: no horses, motorized vehicles,	(2) developed with non-profit North Country Trails mainly for hiking and exercise

Reservation + Location	Trail Use - Main Purpose	Trail Use - Outside Visitors
Lac Courte Oreilles Reservation, Wisconsin	Tourism (snowmobile + ATV trail) Health/Recreation (College trail) Cultural Preservation (College trail) Transportation (Safe Routes to School Connection)	The Snowmobile and ATV trail that pass through the reservation are advertised for outside visitors, but not by the Tribe Natural resource areas (logging) on the reservation are not open to the public to access. Non-Tribal members are allowed to enter the reservation via water through the Chipewa Flowages which is a large reservoir on the reservation. There is some contention about non-members accessing reservation lands this way. The Tribe does maintain campgrounds along the flowage for non-members to use and they pay a fee to camp there. It is likely hypothetical hiking trails would be treated the same way, but that would be decided by the Tribal Board.
Rosebud Reservation, South Dakota	The main purpose of the fire roads is for emergency vehicle access to forest fires, but the dual purpose is to access traditional cultural sites. The purpose of the boy scout trails is to have access to the natural areas and a reservoir. They also use them to get merit badges. They are working on establishing trails that would be for educational and recreation as well as for preservation.	No trails are currently advertised for outside visitors, but that is the intent in the future. "All trails that would go to our campsites, picnic grounds, and park, recreational trails, we would like to have advertised eventually." Off reservation people come onto the reservation to hunt and pay a fee for a "habitat stamp."
Winnebago Tribe of Nebraska	Worked with Robert Wood Johnson foundation to put together new urbanism design on the north-side of town. Trails plan was a part of this. Having a safe place to walk Quality of life transportation health promotion safety issues access to support commerce	not really focused on this audience
Winnebago Tribe of Nebraska	Northern trail - transportation to and from community. For safety they go along the highway Southern trail- not built yet but would probably be for transportation. Will go along the highway for safety Eastern trail- to the agency	no (4) yes for the outside hunters they hope to attract
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	(trails they are planning) Economic Development and safety- people currently walk on the shoulder of the highway to the administrative hub of the reservation	Yes, focused on this audience. Trying to connect to the St. Louis system as well as the Munger system. They hope
White Earth Indian Reservation, Minnesota	(2) Constructed for people to use for hiking	snowmobile trails are advertised through state cause connected to their trails. North country trails advertised by non-profit. Tribe doesn't advertise trails

Reservation + Location	Trail Use - Tribal Use Only	Trail Planning & Development - Description
Lac Courte Oreilles Reservation, Wisconsin	There are some sacred sites where uninvited visitors would not be welcome.	<p>The Sawyer County Snowmobile Trail that crosses the reservation was developed by an off-reservation trail group that was granted permission by the Tribe.</p> <p>The ATV route that connects tribal businesses to the Tuscovia trail was developed as a partnership between off reservation organizations and the Tribal Governing Board</p> <p>While there is a lot of undeveloped land on the reservation areas where the Tribe is currently planning on putting trails are near residential development.</p> <p>A recent community college nature trail addition was developed as away to promote healthy/traditional lifestyles.</p>
Rosebud Reservation, South Dakota	<p>"There are certain areas such as sundance grounds that we would want to identify for our purposes only but not for any other visitors."</p> <p>"All trails that would go to our campsites, picknick grounds, and park, recreational trails, we would like to have advertised eventually."</p> <p>"There is a big difference between tourism and selling your culture, yes we have recreational opportunities and would like to entice people to come to the area but we don't want them disturbing our sacred sites."</p> <p>Currently manage the use of the fire trails for outside visitors, mostly hunters, but they do not advertise them off of the reservation.</p>	<p>Fire roads are planned and maintained by the BIA fire department.</p> <p>The Boy Scouts (a local chapter) have planned and created their trails through their own fund raising efforts.</p> <p>Any future trails that we develop for recreational purposes would be done by the Game, Fish, and Parks Department.</p>
Winnebago Tribe of Nebraska	n/a	HCDC headed planning process
Winnebago Tribe of Nebraska	No, mostly people from outside the reservation use the trails.	<p>Mainly done by HCInc.</p> <p>Piggybacked off of highway development so they didn't have to do right of way stuff.</p> <p>(3) Eastern trail- Just planned out by the state, state funded</p>
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	N/a	<p>Community members have input through public meetings (1 at start 1 at end) working with local county (cause trail will be on their road)</p> <p>Eventually city the trail is leading to will be involved.</p>
White Earth Indian Reservation, Minnesota		(2) Non-profit used a lot of volunteers and sent people to service people to help build that trail. Not much of a cost just mostly signs and marking out the trail.

Reservation + Location	Trail Planning & Development - People and Institutions	Trail Planning & Development - Community Involvement
Lac Courte Oreilles Reservation, Wisconsin	<p>Sawyer County Snowmobile Club (possibly)</p> <p>Lac Courte Oreilles Ojibwa Community College (Extension Department and Ag and Natural Resources Department) -Lead by a Natural Resource Specialist at the Extension Department -Work was done by student interns</p> <p>Lac Courte Oreilles Natural Resources Department (for the Safe Routes to Schools trails)</p> <p>The Tribal Governing Board collaborated with an off reservation trail group for the ATV trail.</p>	Community input was taken when applying for the USDA grant that funded the college trail extension. During one of their meetings community interest was stated for a trail.
Rosebud Reservation, South Dakota	The Fire trails are planned and developed by local people who work for the BIA Fire Department.	NA
Winnebago Tribe of Nebraska	Natural resource district in NE (they look to them for additional funds) HDCD	She believes there were HC community development corporation, reps from the tribe, HC Inc. but this was before she was working there.
Winnebago Tribe of Nebraska	Headed by Ho-chuck an economic development corporation owned by the Winnebago Tribe of Nebraska. Affiliated with tribe, enterprise of the tribe.	(1) ?? (2) Southern trail: not sure not her area (3) Eastern not many people involved with the planning of this trail/walkway
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	Fond du Lac Resource Planning Department will handle the NEPA side of the planning (will hold separate meetings for NEPA)	
White Earth Indian Reservation, Minnesota	North Country Trails	North Country trail held a lot of different public meetings in the area, talking with state, tribe, trying to educate people. Advertising it, to try to get people to leave comments of concerns

Reservation + Location	Obstacles to Trail Planning & Development
Lac Courte Oreilles Reservation, Wisconsin	<p>Much of the reservation would be considered undeveloped, however, much of this undeveloped land is in timber use and would not be appropriate for recreational trail use.</p> <p>There are difficult tribal politics surrounding ATV use on unofficial trails. The tribe has passed an ordinance banning ATV use on unofficial trails and roads, but has not provided trails for youth to use ATVs. It would be hard to promote a recreational trail without also addressing ATV use.</p> <p>People don't have the money or time to take away from earning income and caring for children to pursue leisure activities.</p> <p>"Finding funding can be pretty tricky and it takes multiple sources."</p>
Rosebud Reservation, South Dakota	<p>The terrain would be a major obstacle, they would have to bring in engineers and other experts to be able to create safe trails that would not cause erosion.</p> <p>Would have to hire off reservation expertise because they would want to create trails that would cause minimal damage and have the lightest footprint on the land</p> <p>Upkeep and maintenance would be an issue if trails are developed. They would have to make a decision about the trail surface and what type of upkeep would be necessary</p> <p>Another issue would be separating recreational use where visitors would be welcome from areas that would be considered off limits</p> <p>Would potentially create problems with vandalism and abuse of resources such as poaching and illegal tree harvesting...vandalism.</p>
Winnebago Tribe of Nebraska	<p>Accessing funding in a timely manner. You don't want to have to wait for funds (her tribe had to wait 4 years)</p>
Winnebago Tribe of Nebraska	<p>Multiple land and right-of-way issues (many of the rights owned by the BIA), allotments, private</p>
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	<p>Railway right-of-way issue</p> <p>Maintenance</p> <p>Complying with grant requirements: for example, their funding is for a non-motorized trail, how are they going to enforce that (and pay for that enforcement) to ensure people don't use these kind of vehicles on the trail.</p> <p>Grants do not cover these costs.</p>
White Earth Indian Reservation, Minnesota	<p>(3) Really lack the funding to develop such resources</p> <p>May have to do a NEPA</p> <p>perception of ATVs are an obstacle</p>

Reservation + Location	Trail Funding Sources
Lac Courte Oreilles Reservation, Wisconsin	<p>Some Tribal funds did go towards the motorized trails that cross the reservation but he did not know the amount.</p> <p>The College trail extension was almost all funded through USDA grant money. The Community college is a land grant institution and they applied for and received 1994 Land Grant funding. The college has to apply for 1994 Land Grant status. They have to outline it on a 4 year cycle. However, they could not directly fund the construction of the trail through that program. Because this grant does not support the construction of anything. Interns that worked on the trail were paid through a state program and some shuffling to get it done." They were able to buy some of the equipment with the grant.</p>
Rosebud Reservation, South Dakota	<p>For future trails they would likely start with County and State sources for recreation or trails grants. Then they would try federal grants. Whatever was left they would try and cover with revenue from their habitat stamp program that hunters have to pay.</p> <p>The revenues from the Fish, Wildlife, and Parks department would be considered an in-kind donation.</p>
Winnebago Tribe of Nebraska	<p>HCDC found many of the grants that were used to develop these trail systems.</p> <p>Robert Wood Johnson Foundation- used for laying out newer urban design in N part. Active living by design funding</p> <p>Diabetes funding Health and human services center for disease control. HIPDIP Health promotions and Diabetes prevention. she thinks these funds were targeted towards tribes.</p> <p>Community Transportation Enhancement Program</p> <p>Funding from the State Natural Resources District (Nebraska)</p> <p>Not sure about funding for second trail</p> <p>American Recovery and Reinvestment Act stimulus funds through state of NE. Supplemental funds come from Natural Resources District</p> <p>State may have a formal trails association (she thinks there is a national push for trails)</p> <p>Safe-Routes to school</p> <p>May be a trails/bicycling effort they may be able to get funding from</p>
Winnebago Tribe of Nebraska	<p>Mostly out-sourced, most of the stuff was funded by HC Inc.</p>
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	<p>They got a grant from: Minnesota Department of Transportation Enhancements through the Northeastern Minnesota Area Transportation Partnership (http://www.nemnntp.org/ not CTEP) it is a separation of the federal highway money Minnesota gets (like this). Apply for the grants. Based on economics and connectivity to other trails</p> <p>Tribal funds are not used</p> <p>Costal Zone program which helps with issues in the coastal zone of Minnesota. They have grant programs as long as your project falls into the watershed. They have their own trail program in place.</p> <p>If they receive BIA funds they can allocate funds to trails if they would like.</p>
White Earth Indian Reservation, Minnesota	<p>(2) Non-profit funded the project, did all work themselves.</p> <p>(3) Bike trails don't have funding yet.</p>

Reservation + Location	Trail Maintenance	Unintended benefits/consequences
Lac Courte Oreilles Reservation, Wisconsin	The college trail is going to be maintained by student interns who are funded through the USDA Land Grant funds.	
Rosebud Reservation, South Dakota	<p>BIA Fire Department maintains fire roads.</p> <p>The Boy Scouts maintain their trails.</p> <p>Any recreation trails that would be built would have to be maintained by the Fish Wildlife and Parks Department. They currently have staff that could fulfill that role or another position could be added.</p>	NA
Winnebago Tribe of Nebraska	No data...forgot to ask	see active living by design document
Winnebago Tribe of Nebraska	HCI has been doing maintenance on the one N of town. Southern trail they don't know who is going to be in charge of maintenance	N/A
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	Hasn't planned for this yet (too early in planning process) Would be handed off to the construction company	N/A
White Earth Indian Reservation, Minnesota	<p>(1) Snowmobile club maintains snow trails</p> <p>(2) Conservation officers patrol the trail once and a while to make sure no one is going out there and not hiking on the trail</p> <p>Non-profit and volunteers are the main people who maintain the trails.</p>	

Reservation + Location	Effects of Existing trails	Education	Cultural Use
Lac Courte Oreilles Reservation, Wisconsin	<p>There are members of the tribe that did not like youth using snowmobiles and ORV on existing unofficial trails. An ordinance was passed banning the use of snowmobiles and ATVs on unofficial trails and on roads. Yet they have not provided any official trail, in effect making it illegal to have drive ATVs anywhere.</p> <p>The illegal trails are a big problem because they cause erosion. If they maintained established ATV trails it could really cut down on erosion.</p>		
Rosebud Reservation, South Dakota	The fire roads provide important access to traditional resource areas and even people's homes	<p>I see education being the greatest asset that trails could bring. I remember as a child you would have to travel to have access to [outdoor education], Trails would be a way to get people to be more aware of their surroundings.</p> <p>They are really interested in developing trails for outdoor educational purposes.</p>	They use the fire roads on the reservation to access traditional areas to pick berries and medicinal herbs.
Winnebago Tribe of Nebraska	Access to support commerce	no	no
Winnebago Tribe of Nebraska	N/A		
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	ATV snowmobile trails (people don't like them in general) but people recognize the need to have these trails. You know people get out and exercise.		
White Earth Indian Reservation, Minnesota	<p>Erosion damage from ATV trails</p> <p>Hiking trails, horse trails are not seen as a problem because it is not seen as a lot of damage to the environment</p>	N/A	<p>On the reservation they have a couple of state forests, the state went through a process of designating certain trails as limited, restricted or not used. And a lot of tribal members use these old trails for fishing. Sometimes non-authorized ATVs go on these trails (tribal members are allowed to use ATVs on these trails if they are pursuing their treaty rights, hunting fishing ect)</p>

Reservation + Location	Historical Trails
Lac Courte Oreilles Reservation, Wisconsin	Does not know. Should talk to Jerry Smish at the Tribal Offices.
Rosebud Reservation, South Dakota	All of the current roads on the reservation were originally trails. They were built on the former trails.
Winnebago Tribe of Nebraska	no
Winnebago Tribe of Nebraska	No.
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	He is going to email person about these trails and email you back. Probably not an option in the future (depends on trail designation). If they were culturally/historically significant we would not put them on the trail system, just to keep them from being damaged
White Earth Indian Reservation, Minnesota	The area their reservation is on is not really their native area, they were put there so they don't really have any historical trails on their reservation.

Reservation + Location	Important Quotes	Other Notes
Lac Courte Oreilles Reservation, Wisconsin	<p>"You cannot ignore the fact that the youth are going to use their ATVs. I mean really, if you are going to talk about recreational trails there are going to have to be trail where they can ride them. Otherwise they are going to use them anyways or they are going to make their own. Not everyone has the healthy lifestyle in mind and is going to want to go hike on a trail. Some people do some people don't and you can't force them."</p> <p>"It is hard to convince people that they should be out exercising or hiking." I don't know how on a reservation you can expect people to be out exercising or hiking when their income levels are so low that they have to spend a lot of their time working or generating income just so that they can provide food. We plan a lot of activities like canoeing, and a lot of people can't go because they have children at home and making the time equates to money. They have to find someone to watch their children and while it would be good for them to go out and be active they can't do it."</p>	
Rosebud Reservation, South Dakota	<p>"I see education being the greatest asset that trails could bring. I remember as a child you would have to travel off reservation to have access to outdoor educational opportunities, Trails would be a way to get people to be more aware of their surroundings."</p>	<p>Have plans to create more established trails for educational and recreational purposes. These would be to educate about the wildlife and habitat as well as other natural resources in the area. They want to provide access to natural springs and stone bridges that are on the reservation. They are in the process of identifying areas where they would like to have trails.</p>
Winnebago Tribe of Nebraska	<p>"With the second trail we're seeing people use that leg to get to work and then also to access human services"</p>	
Winnebago Tribe of Nebraska		<p>There is a big issue with loose dogs on this reservation so the high school track is particularly attractive for people who want to walk because it is fenced in, and keeps the dogs out.</p>
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	<p>What is the main purpose of the trails you are planning? "Economic development and safety"</p> <p>"We had actually written a grant and were successful...but we could not get right-of-way clearance... and so we basically had to abandoned the project"</p> <p>Hoping to connect our system to existing systems outside the reservation, if we do that then we can start bringing people to the reservation, to our casino, to our businesses we have here.</p> <p>What kind of statistical information did you use in your grant applications "For the trail that we are hoping to start here, I used statistics on traffic counts as well as accident data, we use that data to back up the safety portion of this project"</p> <p>"If they were culturally/historically significant we would not put them on the trail system, just to keep them from being damaged or changed drastically"</p>	<p>There is an expansive network of trails surrounding the reservation and they are hoping to connect with those trails.</p> <p>DoT broke up the state of Minnesota into several districts, (7) each district has and 'area transportation partnership' meet 2x a year to go over transportation issues. State transportation initiation plan (they review the this doc at these meetings) can get money through this channel.</p>
White Earth Indian Reservation, Minnesota	<p>"The whole land ownership here is checkerboard, some tribal, some state, some private, some county, some federal, so it really has a mix of ownership, so when you do a trail you have to meet with other parties"</p> <p>"The more players you get together to work on something like that the better off your going to be, partnership together, because if only one entity is going to do it, and they don't get the support of the other ones it can be a barrier"</p> <p>"Not all ATVs are bad, I'm just saying a small percentage are bad and those are the ones people see"</p> <p>On trails for tourism "If it is done sensibly, and respectfully we would have no problem with it, it would help with the local tourism" There are a lot of resources that people enjoy here..."</p> <p>In regards to trails as a potential for income he said yes, "For example, the snowmobile trails hook up with our tribal casino and hotel, and people stay right there and then get on the trails and go out for the day."</p>	<p>Large part of their reservation is wilderness</p>

Reservation + Location	Email, to send Final Report to
Lac Courte Oreilles Reservation, Wisconsin	
Rosebud Reservation, South Dakota	emily-boyd@hotmail.com
Winnebago Tribe of Nebraska	jjohnson@hochunkcdc.org fay@winnabegotribe.com
Winnebago Tribe of Nebraska	
Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota	
White Earth Indian Reservation, Minnesota	mikes@whiteearth.com

Reservation + Location	Tribe	Contact Name	Interviewer Name	Contact Position- (also, tribal member?)	Consent	Existing Trails - Formal Trails Description
Blackfeet Reservation Montana	Blackfeet	Don White	Brittney	Transportation Planner	yes, use name	(1) Two pedestrian bike paths they developed (1 from outskirts to outlying communities) (2) 1.7 miles in a walking park
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	Navajo	n/a	Meredith	Fee Collector Supervisor	No, remain anonymous	12-15 recreation trails in this area
Menominee Nation, Wisconsin	Menominee	n/a	Meredith	Forest Monitoring Specialist	No, remain anonymous; did not record	No formal trails.
Lummi Indian Reservation, Washington	Coast Salish	Robert Pell	Robin	yes, project manager	yes to record but email any quotations to him first	Hackson way pedestrian trail: 2 miles paved pet pass bike route solar lighting boardwalk Have one trail that will connect a development to a high school, and it passes through some sensitive areas, nesting areas for bald eagles, there is a whole host of challenges we have with that trail" Lummi view sidewalk* (see culturally sig areas)
Lake Traverse Indian Reservation, South Dakota	Sisseton-Wahpeton Oyate , a branch of the Sioux	Charnel Hill	Robin	yes Transportation planner	Yes, use name	no
Rocky Boy, Montana	Chippewa-Cree	n/a	Meredith	Native American Studies Instructor-- Cree language at Stone Child College (not tribal member)	remain anonymous	Few formal trails at the clinic for exercise purposes
Santee Sioux Reservation, Nebraska	Santee Sioux	n/a	Nick	Land and Resources Manager Tribal Member of the Pine Ridge Reservation	record but anonymous	Formal trail on the N end of the village is not completed to what was planned slightly less than a mile... It is a cement trail
Tohono O'odham Reservation, Arizona	Tohono O'odham	n/a	Nick	Tohono O'odham Community College teacher	record but anonymous	There are both formal and informal trails that have been on the reservation since before it became a reservation. There are trails that go from community to community. There is asphalt down that connects people to bus stops. Some of the communities that were under development that had a few trailor paths that were put in, but were poorly maintains so there are only remnants now. These are the trails that connected people to bus stops. These were sidewalks in communities that had kids. Some of the communities no longer have kids.

Reservation + Location	Existing Trails - Informal Trails Description	Existing Trails - Main Users	Existing Trails - Establishment
Blackfeet Reservation Montana		(1) Kids who live in outlying housing areas (2) Park used by almost all the community.	(1) 1995-6 (2) completed in 2010
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)		diverse group; people come from all over to use the trails	
Menominee Nation, Wisconsin	None		
Lummi Indian Reservation, Washington		"I've seen a balance, about 60% walkers 40% bikers, yeah they use it quiet a bit, the tribe it really proud of the trail"	
Lake Traverse Indian Reservation, South Dakota			
Rocky Boy, Montana	informal trails; not used. Also trails that go up to sacred places (most sacred mountain--Baldy Butte/Heart Butte/Ochehaahscheseek)	diabetics advised to use trails; those with health issues; young people using the area recreationally (basketball mentioned)	~20 yrs ago?
Santee Sioux Reservation, Nebraska	The informal trail lead to different part of the ranch system but people use them for exercise and also for hunting and other activities like that. Some of these trails are big enough for people to drive on. These trail have been around for a long time since he has worked there (20 years) Also use fire breaks as walking trails. "Alot of peiple use the fire breaks for walking"	The main uses of the trail are for walking and for riding horeses, hunters will drive out on the trails during hunting season.	Informal trail have been around for a long time. As long as he can remember and he has been there for 20 years. The formal trail has been around for about ten years. It was established through a grant through an organization that he can't remember.
Tohono O'odham Reservation, Arizona	There are informal trails that are dirt that connect village sites to village sites. Mny trails were established as part of the ranching on the reservation.	The main users of the trails now may be the illegal traffickers that are crossing over from Mexico. This is one of the main problems on the reservation. There is a lot of horseback riding...he. He runs horseback riding activities for the kids. Horse riding was the most common way of travelng and doing work until about 14 years ago, but now people use more ATVs. Cattle made a lot of the trails. Peopkle use these trails to go out in nature. Because we are out in the dessert, there are not that many places that you can go out on high ground. People do use the trails to get from place to place. "The scare of health issues has gotten people to go out and walk for health reasons."	Cattle made a lot of the trails. Peopkle use these trails to go out in nature. Because we are out in the dessert, there are not that many places that you can go out on high ground.

Reservation + Location	Trail Use - Main Purpose	Trail Use - Outside Visitors
Blackfeet Reservation Montana	Recreation and health. Connecting community. It does connect different housing projects that we have outside of town. It connects them.	not specifically advertised for outsiders but they can use it.
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	Recreation; walking, biking, horseback riding Cultural significance ecology studies	Outside visitors welcome to use trails
Menominee Nation, Wisconsin		
Lummi Indian Reservation, Washington	What was the purpose of this trail system? "Complete safety, utter safety, [was the reason for constructing this trail]...there has just been too many deaths on that road"	
Lake Traverse Indian Reservation, South Dakota		
Rocky Boy, Montana	health benefits for diabetics (mentioned specifically)/ritual use; not used so much any more (CULTURAL PRESERVATION)	Some visitors visit trails; get herbs that they can't get anywhere else. Would like to keep outsiders from visiting the top of Mount Baldy during the summer time when members fast.
Santee Sioux Reservation, Nebraska	The main purposes of the paved trail is for exercise and health reasons. The informal trails are used for recreation and just to get away from the village and be outside.	The trails are not advertised. Mostly just walking trails. It would be a good thing if outsiders would come. Horse riding groups do come to the reservation and use the trails. This is no fee, but they like them to check in with their headquarters before they go out.
Tohono O'odham Reservation, Arizona		The Babacue park is managed jointly by the reservation and the BLM and has a nationally renowned trail. This brings a little revenue for the reservation, but he is unsure. There may be a fee for non-tribal members.

Reservation + Location	Trail Use - Tribal Use Only	Trail Planning & Development - Description
Blackfeet Reservation Montana		(2) The park was tribal land, so that was easy. Used to be a gravel pit, before that it was a livestock dipping vat. Contaminated.
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)		most of them were built for people's livestock to walk down and drink from the river. Some were also built for people to cross from one side of the canyon to the other side to get home or go to the nearest town. So I am guessing all of these trails were made in the 1800's or earlier.
Menominee Nation, Wisconsin		
Lummi Indian Reservation, Washington		
Lake Traverse Indian Reservation, South Dakota		
Rocky Boy, Montana	Mostly tribal use	
Santee Sioux Reservation, Nebraska	"There are sacred sites, but when visitors come and ask we tell them which trails are and areas are out of bounds."	They applied for a grant and got it through the BIA roads transportation grant.
Tohono O'odham Reservation, Arizona	Yes, there are trails that it would not be appropriate for outside visitors.	The Baboquivre Park is a traditional sacred site, but the BLM has the East side of the mountain and we have the west side of the mountain. This was developed

Reservation + Location	Trail Planning & Development - People and Institutions	Trail Planning & Development - Community Involvement
Blackfeet Reservation Montana	<p>Don White's office headed the project (transportation planning staff) Local youth group Also Volunteers (Global Volunteers?) young people come in from church groups and built exercise space. http://www.globalvolunteers.org/</p>	<p>We did a couple articles in the local newspaper and hoped that the public would get involved. They got different offers people wanted to put up playgrounds, it is owned by the tribe. CTEP process requires a public meeting and advertise the project contract. They had local bearue people do NEPA but it was exempt cause they were improving the area.</p>
Navajo Nation, Arizona (little Colorado River Tribal Park Area)		
Menominee Nation, Wisconsin		
Lummi Indian Reservation, Washington	<p>Army Corps were involved because they worked within wetlands and because they got federal funds. "You need a great development team in regard to your engineers and your environmental team"</p>	<p>They had one guy who really spearheaded the trails projects especailly for the Hackson way trail. They had updates in the squal call (local newspaper) "There were a lot of personal conversations we had with the landowners and found out their stories, they had a lot of personal connections with deaths and lack of personal safety along those roads."</p>
Lake Traverse Indian Reservation, South Dakota		
Rocky Boy, Montana	<p>cultural groups; elders who speak the language</p>	
Santee Sioux Reservation, Nebraska	<p>The Economic Development brach of the tribal government headed up the development of the formal trail with the BIA roads and the state department of transportation.</p> <p>The tribal council was in chage of the process.</p> <p>Also worked with the Army Corps of Engineers. They meet with the ACOE once a year to talk about they development plans. The ACOE do provide some funding and materials. They paid for materioals for a bridge.</p> <p>There is a tribal roads committee that petitions the BIA Roads department for funding...trails would also be funded the same way.</p>	Unknown
Tohono O'odham Reservation, Arizona	<p>Thye recreation department would be the department that would be in charge of trails development on the reservation.</p>	

Reservation + Location	Obstacles to Trail Planning & Development
Blackfeet Reservation Montana	<p>but they might have to worry about right-of-way, wetlands (avoiding them) His strategy was to bank the annual allocation for a few years until they had the money to front for the grants.</p>
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	
Menominee Nation, Wisconsin	
Lummi Indian Reservation, Washington	<p>"had to include a .5 mile of boardwalk" "We met road block after road block after road block" permitting and wetland issues Sometimes obstacles come from within the tribe, it just wasn't a priority...You have to really want it</p>
Lake Traverse Indian Reservation, South Dakota	
Rocky Boy, Montana	<p>"Before we can get to [the Sweetgrass Hills] we have to ask those private owners if we can go through their land to get over there. I often wonder, they say 'freedom of religion', but we have to ask to get to these places...that makes it hard on us Native Americans"</p> <p>"if it was up to me, I'd make sure there was a road that goes directly up there so we wouldn't be harassed by anybody when we want to pray to the creator in the places where our elders [prayed] before the coming of the visitors that come from different parts of the world...they should respect [our] sacred sites." NON-TRIBAL LANDOWNERS. land not allotted.</p>
Santee Sioux Reservation, Nebraska	<p>Funding was an issue for their formal trail because they had planned for more trail length, but the funding fell through and it was not completed (only about a mile)</p> <p>Funding is the major issue,</p>
Tohono O'odham Reservation, Arizona	<p>There would be a lot of issues.</p> <p>Politics on the reservation would be a big issue. Politics within the tribal government. "We have become like the dominant society we have begun to think about ownership of land, but from what I know of the traditional teachings that is not the way that we dealt with the land.</p> <p>Allotment is not really a problem, there is allotment, but it is not a huge problem.</p> <p>The illegal trafficking on the reservation is big business and would be an issue with trails development.</p> <p>Feels like trails are not a priority with the Tohono Oodham. Does not think that trails will help get people out and exercise.</p> <p>It is not safe to go out and walk because of illegal trafficking and border patrol. So people are afraid to go out and walk.</p>

Reservation + Location	Trail Funding Sources
Blackfeet Reservation Montana	<p>(2) Had some CTEP funding (state to the tribe) Doesn't know how the youth group got the funds to put in the benches or exercise stations probably grant. Volunteers (Global Volunteers?) young people come in from church groups and built exercise space. http://www.globalvolunteers.org/</p>
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	Funded by their own revenue
Menominee Nation, Wisconsin	
Lummi Indian Reservation, Washington	<p>"we had federal, state and county funding for that project as well as tribal dollars as well" "Part of the Indian roads funding, and then as well the ARRA dollars...the county contributed some money to the project as well" County situation: "Technically they lease the roads on the reservation from us, that way they are able to count them on their inventory road list, which allows them to receive more funding from the feds. So it is kinda a trade off they maintain our roads for free and we all they can get more dollars, so they had some vested interest" County contributed survey as well.</p>
Lake Traverse Indian Reservation, South Dakota	
Rocky Boy, Montana	<p>Funding an issue..."seems like we've been put on land that was not useful for anything...what can you grow on sand and rocks?" repatriation? Kennedy Foundation;</p>
Santee Sioux Reservation, Nebraska	<p>The Economic Development branch of the tribal government headed up the development of the formal trail with the BIA roads and the state department of transportation. The tribal council was in charge of the process. Also worked with the Army Corps of Engineers. They meet with the ACOE once a year to talk about their development plans. The ACOE do provide some funding and materials. They paid for materials for a bridge. There is a tribal roads committee that petitions the BIA Roads department for funding...trails would also be funded the same way. "I recommend contacting the state department of transportation because they have funding specifically for trails." They have no issues working with the state departments. The tribal council has worked with the state on a lot of projects."</p>
Tohono O'odham Reservation, Arizona	<p>There are a lot of funds for a lot of things. The good things are usually the hardest things to fund. We don't think that you should be spending money on trails, that we don't think that you should be spending money on.</p>

Reservation + Location	Trail Maintenance	Unintended benefits/consequences
Blackfeet Reservation Montana	They have some tax money to spray for weeds. People that walk clean the park all the time.	CTEP requires you to advertise it, put it out to bid. Living on reservations we have indian preference, issue they had with putting the project out to bid was why should we bid those projects out when we have a local bearue of Indian Services that has the ability and the enginners to build it. So they had the CTEP funds transferred to the local BI, they had manpower, equipment. This provided employment for the local workforce. Usually the road construction department runs out of money before the year is over and then they have to lay people off because they are out of money. By transferring the funds to the local BA Don White basically prevented these people from being laid off so soon cause he put them to work on park construction.
Navajo Nation, Arizona (little Colorado River Tribal Park Area)	We rarely maintain them because people use them all the time. So they don't need much maintaining.	
Menominee Nation, Wisconsin		
Lummi Indian Reservation, Washington	County does maintenance	
Lake Traverse Indian Reservation, South Dakota		
Rocky Boy, Montana	not really maintained; federal funds for transportation; doesn't know if they had to apply for those funds. Tribal government--roads division. Funded by fed govt	
Santee Sioux Reservation, Nebraska	The informal trails are not maintained. The fire trails are maintained by the economic development department. The formal trail is maintained using various sources, economic department, BIA Roads.	
Tohono O'odham Reservation, Arizona	Trails and sidewalks that were developed as part of planned communities on the reservation were not maintained and have fallen into disrepair.	We have boarder patrol running all over our nation on our trails using ATVs.

Reservation + Location	Effects of Existing trails	Education	Cultural Use
Blackfeet Reservation Montana		N/A	n/a
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	They have a good effect because it is bringing money on to the reservation, and a lot more people are interested in our reservation now.		
Menominee Nation, Wisconsin			
Lummi Indian Reservation, Washington			Lummi traditionally walk just about everywhere, so they [trails] enhances the culture really.
Lake Traverse Indian Reservation, South Dakota			
Rocky Boy, Montana	know where their sacred sites are; know what the uses of plants are	teach kids about historical uses of plants	Cultural trails; teach kids about traditional uses of plants. Medicinal plants, edible berries, edible roots. Share the knowledge of the elders; used trails to do this
Santee Sioux Reservation, Nebraska	"No, I don't think there is anything bad about it gives people the opportunity to walk and do other activities to make their life the way they want it."		
Tohono O'odham Reservation, Arizona		Silas runs rodeo and horseriding programs	

Reservation + Location	Historical Trails
Blackfeet Reservation Montana	Old North Trail but don't know exactly where it is on the reservation. Lewis and Clark Trail
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	Some but not incorporated into main trails
Menominee Nation, Wisconsin	
Lummi Indian Reservation, Washington	"That one actually went through culturally sensitive areas, so we had to alter our design...we couldn't put in a traditional catch basin type gutter sidewalks, we had to utilize a pervious type of asphalt for the sidewalk surface itself, and created a drain just below it....because we could only go down 6-8 inches...because it is an ancient cultural area, we didn't want to dig up cultural artifacts" (there is more he says about who he had to involve to make this happen within the tribe)
Lake Traverse Indian Reservation, South Dakota	
Rocky Boy, Montana Santee Sioux Reservation, Nebraska	No historical trail to his knowledge
Tohono O'odham Reservation, Arizona	There are some historical sites on the reservation, but they are difficult to see them. Also, there are trails on the reservation that have been there since before it was turned into a reservation.

Reservation + Location	Important Quotes	Other Notes
Blackfeet Reservation Montana	<p>"For the walking park it was basically a piece of waste-land that we turned into a walking park, we developed 1.7 miles of walking path. It's used by almost all the community, and we have a high riате of diabetes on the reservation. So it is just like an ideal place, out of the way, off of the road that you can get off to walk, instead of the side of the road where you would get run over. There is a parking lot."</p> <p>"The park took about two years to complete it, year and a half to develop it, you have to get a consultant on board, he has to put in a proposal, you have to have environmental work done, you have to have design work done, and all that type of stuff"</p> <p>He said that recreation and heath were major drivers for establishing the park, but also "connecting communities"</p> <p>"It's a public park, there is a public parking area and anyone can go in there and use it, but right now they are trying to promote community ownership in the thing. Trying to promote community ownership, we had a youth program put out benches, we a volunteer group that put a few exercise areas in there."</p>	The park is fenced in because of the dog problem
Navajo Nation, Arizona (little Colorado River Tribal Park Area)		
Menominee Nation, Wisconsin		would not be open to attracting outside visitors
Lummi Indian Reservation, Washington	"If you have good people around you, you will succeed" "It is key to get the right people in the right spot"	<p>Hackson way pedestrian trail</p> <p>"It has solar lights, smart technology. They communicate with one another via GPS and RF (radio frequency) signal and they have sensors - the whole bit"</p>
Lake Traverse Indian Reservation, South Dakota	In response to,"What factors have prevented your reservation from developing trails?" Charnel said: "fear of the unknown with the daily commitment required and expense to a yet unfostered customer base"	
Rocky Boy, Montana	"When the [cultural] trail was first built, one of the reasons was that they wanted to take kids and teach them about the cultural uses of plants...that was one of the main reasons."	used to advertise trails using brochures; put them in local gas stations. Not practiced anymore
Santee Sioux Reservation, Nebraska		<p>"I recomends contacting the state department of transportation because they have funding specifically for trails." They have no issues working with the state departments. The tribal council has worked with the state on a lot of projects."</p> <p>Natural area on the reservations accounts for 15,000ac</p>
Tohono O'odham Reservation, Arizona		<p>The reservation is huge 11,000 sq miles with 6 districs with an average of 6 communities per district.</p> <p>Not a particularly helpful interview...was negative and not very cooperative.</p> <p>The boarder issue was significant.</p>

Reservation + Location	Email, to send Final Report to
Blackfeet Reservation Montana	
Navajo Nation, Arizona (Little Colorado River Tribal Park Area)	
Menominee Nation, Wisconsin	
Lummi Indian Reservation, Washington	ROBERT PELL email: robertp@lummis-nsn.gov (360) 384-2307 called 3/1/2011 left message 2:13
Lake Traverse Indian Reservation, South Dakota	
Rocky Boy, Montana	
Santee Sioux Reservation, Nebraska	Alvin Twiss Land and Resources 52948 HWY 12 Niobrara, NE rights@gpcom.net
Tohono O'odham Reservation, Arizona	