Trail Master Plan

Moore Park

Klamath Falls, Oregon

Winter 2017/18

Prepared For

City of Klamath Falls

Prepared By

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Special Thanks To

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Contents

Background

Located at the south end of Upper Klamath Lake, Moore Park is an important part of the City of Klamath Falls' park network. It includes soccer fields, tennis courts, play fields, picnic areas, restrooms, and an extensive four-season non-motorized trail system, including a portion of the Klamath Ridgeview Trail. The park is also managed for woodland habitat through sustainable forestry practices. It is abutted on multiple sides by residential lands, both developed and undeveloped; several trails that are not part of the public network exist on adjacent private property.

In the fall of 2016, the city retained Sentieros Consulting, LLC, to assess the existing trail system and make recommendations to improve the social, fiscal, and environmental sustainability of the trails. This report and accompanying exhibits are the result of that investigation.

Existing Conditions

Prior to any planning actions a baseline must be established. This process identifies the level of service that the trails are providing, the benefits they are providing, and where deficiencies may exist. The following methodology was used to determine the existing conditions:

Stakeholder Interviews

Several formal mechanisms were utilized to capture the opinion of trail users, neighbors, local businesses, and tourism promoters.

- An online survey that generated 44 responses (an overview of which is provided in Appendix D)
- A combined meeting with residents of the Lynnewood neighborhood and Friends of Moore Park
- Individual meetings with vested business interests such as the local bike shop and running shop
- A public meeting at the South Portal Building that was attended by members of the Klamath Trails Alliance (KTA), Basin Outdoor Group (BOG), Linkville Lopers, local businesses, and other members of the public

These formal interviews were augmented with more than a dozen informal conversations with stakeholders about the trails in the park. These conversations helped confirm or augment salient points identified in the formal stakeholder outreach.

Parks Advisory Board

The assessment work and the draft trail plan were presented at two separate Parks Advisory Board meetings, during which times both the board members and the public-at-large asked questions and provided comments.

Staff Interviews

City staff were interviewed throughout the process to gather their opinions about the use and management of the trails specifically and the park generally. City staff typically had a broader view of the park, which is not surprising given the multiple mandates under which the park operates.

Document Review

Related planning and management documents were reviewed to better understand the opportunities and constraints regarding zoning, land use, and urban forestry management.

Peer Comparison

Moore Park was compared to other urban multi-use trail systems. The quality and variety of the trail user experiences, access, and sustainability of the singletrack were considered to frame the relative success of the park for pedestrians and cyclists.

Site Visits

The site was visited several times over the course of eight months to examine the field conditions. All of the trails in the park were evaluated by hiking, running, or cycling on them.

The majority of these visits were performed with the assistance of local trail users to ensure that relevant information regarding use patterns and seasonal conditions was transferred.

Sustainability

The information gathered from the field visits was used to assess the current sustainability of the trail network in the park.

Environmental sustainability

The environmental sustainability of the trails was mapped using a color-coded theme based on the follow criteria:

- Green = generally sustainable (grade is appropriate for the trail surface, minimal erosion is visible, user impact is confined to an obvious corridor)
- Yellow = generally maintainable (typical or extraordinary maintenance work can be implemented to slow erosion, user impacts are increasing but could be contained through improvements)
- Red = generally unsustainable (grade is inappropriate for the trail surface, erosion is actively occurring, user impacts are spreading because of unstable tread surface)

Fortunately, a majority of trails in the park are sustainable or maintainable, which is uncommon in an urban park. Most of the trails are aligned onto the contours of the hillside and shed water, reducing the likelihood of erosion. Many of the trails rated as maintainable will require modest and typical maintenance given the projected use levels. This is likely helped by users avoiding the trails when soil conditions are most susceptible to impacts, such as during freeze-thaw cycles.

Social Sustainability

Determining the social sustainability is a more subjective exercise than assessing the environmental sustainability of a trail network. It would be easy with nearly any system to point to overcrowded conditions, user-made trails, lack of access, and complaints of conflict. To balance these obvious deficits it is important to consider the opportunities that are present for users to obtain the experiences they desire, especially in an urban park where open space is at a premium. Users may ultimately wish for a world-class singletrack experience when they enter the park but will temper this with an understanding that they are able to access the trails from their homes located within a city that provides a multitude of other amenities.

The relative social sustainability of the Moore Park trails was determined based on feedback from users, other stakeholders, city staff, and a trail difficulty rating assessment (Appendix B).

As most of the trails are open to cyclists and pedestrians it is possible for users to obtain a variety of experiences either on foot or on bike. Unfortunately, most of the trails are rated as very difficult (black diamond) according the guidelines published by the International Mountain Bicycling Association (IMBA). These are most appropriate for enthusiast users who are skilled and confident in their abilities.

The ideal situation would be to have a majority of the trails be more difficult (blue square) with a portion of trails at either end of the skill level to accommodate a wide range of users. In this scenario, children and other less-skilled visitors to the park will be able to enjoy the trails as much as experienced everyday users who seek physical and technical challenges.

Fiscal Sustainability

If the trails require the expenditure of significant resources to maintain them they will slowly degrade. Ensuring the fiscal sustainability of the trails is therefore important to the longevity of the system. Fortunately, the majority of trails at the park are sustainable or maintainable. This is a good starting point, which, when augmented with the volunteer trail builder cadre present in KTA, makes it likely that it will be cost-effective to keep the trails in good shape for the foreseeable future.

Opportunities and Constraints

The assessment process identified a number of opportunities and constraints for the trail system at Moore Park. These help guide the recommendations for future development, as it is more efficient to pursue projects that take advantage of existing opportunities while avoiding constraints that will inhibit desired improvements.

Opportunities

- The trails community, as embodied by such organizations as KTA, Friends of Moore Park, and the Basin Outdoor Group, cares deeply about the trails and devotes considerable volunteer hours to maintaining the trail network. Within this community there was a strong desire that most of the trails remain open to all non-motorized users.
- An active Parks Advisory Board ensures that one single interest cannot dominate the development of the park, as it must serve a variety of recreational needs. The board meetings also serve as a mechanism for members of the public to voice their opinions on park management.
- The land manager is willing to invest staff resources to improve the trails, whether it is through writing grant requests, purchasing materials for trail work, engaging with volunteers, or funding deliverables such as this master plan.
- Existing infrastructure in and around the park supports trail users. Restrooms, parking areas, and signs all make it easier to enjoy the trails.
- The park's proximity to neighborhoods and to downtown Klamath Falls means that a large number of the city's residents can easily access it. There is a specific opportunity to improve the non-motorized access from downtown by improving the connectivity to the Link River Trail.
- The trail system is not only an amenity for residents but also for visitors to Klamath Falls. With Spence Mountain just outside the city and other trail opportunities nearby, Moore Park can provide either a quick respite for a downtown conventioneer or be part of a multi-day trip for visiting mountain bikers.

Constraints

- The public is currently using adjacent, undeveloped private property. In some cases, there is an implicit acceptance of the trails by private property owners but even this is a precarious situation. Without notice, private property owners could fence their boundaries and greatly diminish the trail network.
- The trail density if fairly high, with multiple, parallel routes in some areas. While this is not unusual for an urban trail system is does mean that there are few options for developing new trails.
- Other management objectives, such as habitat protection, will influence new trail development. The area available for trails is further constrained by the need for the park to provide a variety of recreational opportunities, such as play fields and disc golf.

- The transitions between seasons, combined with the soils present in much of the park, make them susceptible to damage during freeze-thaw cycles. Even sustainable contour trail alignments cannot solve this problem.

Recommendations

Overall, the trail system is in good condition and provides a variety of quality experiences to a range of users. There are a few targeted areas for improvements but no urgent actions are required, such as closing hazardous trail segments. Generally, the recommendations intend to:

1) Reduce the likelihood of erosion, and therefore reduce future maintenance work.
2) Create more beginner-friendly routes at the north end of the park to encourage families and children to use the trails.
3) Designate directionality for some trails to reduce potential future conflict as trail use increases.
4) Eliminate redundant and confusing routes. This will serve three specific objectives:
    a) Reduce the physical impact of the trails;
    b) Reduce the maintenance load on volunteers and city staff; and
    c) Create more logical trail connectivity, thus reducing the likelihood that new visitors will get disoriented.

Private Property Trails

In many cases, rerouting trails off of private land has been identified as a long-term priority. Instead, the near-term action for these trails is to gain access from the private landowners through formal agreements. If these efforts fail then the reroutes identified in this plan can be quickly implemented to ensure there is minimal disturbance to the use of the public trail system. Adoption of these proposed recommendations will facilitate the creation of the reroutes if and when this step becomes necessary.

Directional Trails

Descending-direction trails provide a desired experience that cannot be replicated on trails in which cyclists must yield to all pedestrians and to ascending cyclists. Having the right-of-way on a descending trail is prized experience for cyclists, regardless of skill level. Both Enduro and upper Tank were developed with this experience in mind and it is therefore recommended that the directionality be codified to provide the desired experience and reduce the likelihood of negative interactions between trail users.

Other users are to be discouraged from using the identified descending-direction trails, whether they are ascending cyclists or pedestrians moving in either direction. All intersections of the descending trail must be marked with signs making it clear that descending-direction cyclists have the right-of-way and that other users assume that they must yield the trail to cyclists who may be descending at a speed higher than they would on a multi-use, bi-directional trail.

The recommended improvements are prioritized in the following way:

A = Near-term implementation with volunteer labor.

B = Mid-term implementation by a professional trail builder and/or by volunteer labor led by a professional trail builder.

C = Long-term or conditional implementation. This category includes improvements that will only be implemented if access to private property is restricted; otherwise, the improvements may not be needed.

Item numbers correlate to the Trail Master Plan (Appendix C).

1	Unnamed	Eliminate the existing unsanctioned trail and create a sustainable alignment connecting the Moore Park network with the Link River Trail.	B
2	Unnamed	Eliminate unsustainable trail segment and replace with new, sustainable green trail.	A
3	Eulalona	Improve the surface to make the trail passable year-round. This will serve as the primary four-season, non-motorized link between the northwest neighborhoods and downtown.	B
4	Hayride	Reroute the eastern end of the trail to reduce the grades and widen the turns. Remove obstacles. This will create a green circle trail. Utilize raised tread to eliminate muddy spots.	B
5	KRVT	Widen the trail tread and remove obstacles to make a green circle trail at least until the intersection with Tank.	A
6	Blueberry/KRVT	Reroute intersection off of private land and onto hillside for better drainage. Close old sections of trail.	A
7	Southie	Widen the trail tread and remove obstacles to make a blue square trail. Reroute trail off of private land and close old sections of trail. The rerouting of the trail should be a priority if private property access is restricted. The existing segments that cross onto private land can remain until that time.	C
8	Sunrise/Boom	Reroute trail off of private land. Close old sections of trail. The rerouting of the trail should be a priority if private property access is restricted. The existing segments of trail that cross onto private land can remain until that time.	C
9	Various	Redevelop intersection (Five Gallon, Noname, Archery, Gooseberry) to improve user flow and reduce confusion. Close Archery south of intersection.	C
10	Archery	Reroute west end of Archery to be more sustainable by soften the grade. Eliminate segment between KRVT and Noname. Close old section of trail.	A
11	Noname/ unnamed	Eliminate redundant and confusing trail segments. Widen the trail tread and remove obstacles on Noname to make a green circle trail.	A
12	Bike Park	Create a small bike park that focuses on the development of beginner and intermediate skills for riders.	B
13	Enduro/ Tunnel of Love	Reroute the trails off of private land. Close old sections. Designate Enduro as a descending-direction bike trail. The rerouting of the trail should be a priority if private property access is restricted.	C
14	Junker	Reroute the trails off of private land. Close old sections. Install raised tread where trail is seasonally wet. The rerouting of the trail should be a priority if private property access is restricted.	C
15	Express Lane	Close existing trail and create a new, sustainable blue square trail. This action is only necessary if existing private property trails are closed to public access.	C
16	Tank	Redevelop upper Tank to be slow-speed, technically challenging trail with chokes, rocky texture, and exposure. This will reduce the speed of descending mountain bikers and allow all users to climb from the intersection of the revised Express Lane to Tunnel of Love. This action is only necessary if existing private property trails in the area are closed to public access.	C
17	Endo	Close existing trail and create a new, sustainable blue square trail. This trail will be open to pedestrians and cyclists in both directions but will be optimized for descending-directions cyclists through the use of moderate grades, bermed turns, grade reversals, and open sightlines.	B
18	Unnamed	Create new blue square trail to connect rerouted Endo to Klamath Ridgeview Trail. If adjacent private property owner agrees, extend the trail to the west to allow for future expansion and potential rerouting of the Klamath Ridgeview Trail off of doubletrack west of the park.	B

Next Steps

The following actions are proposed to accelerate the implementation of the recommendations:

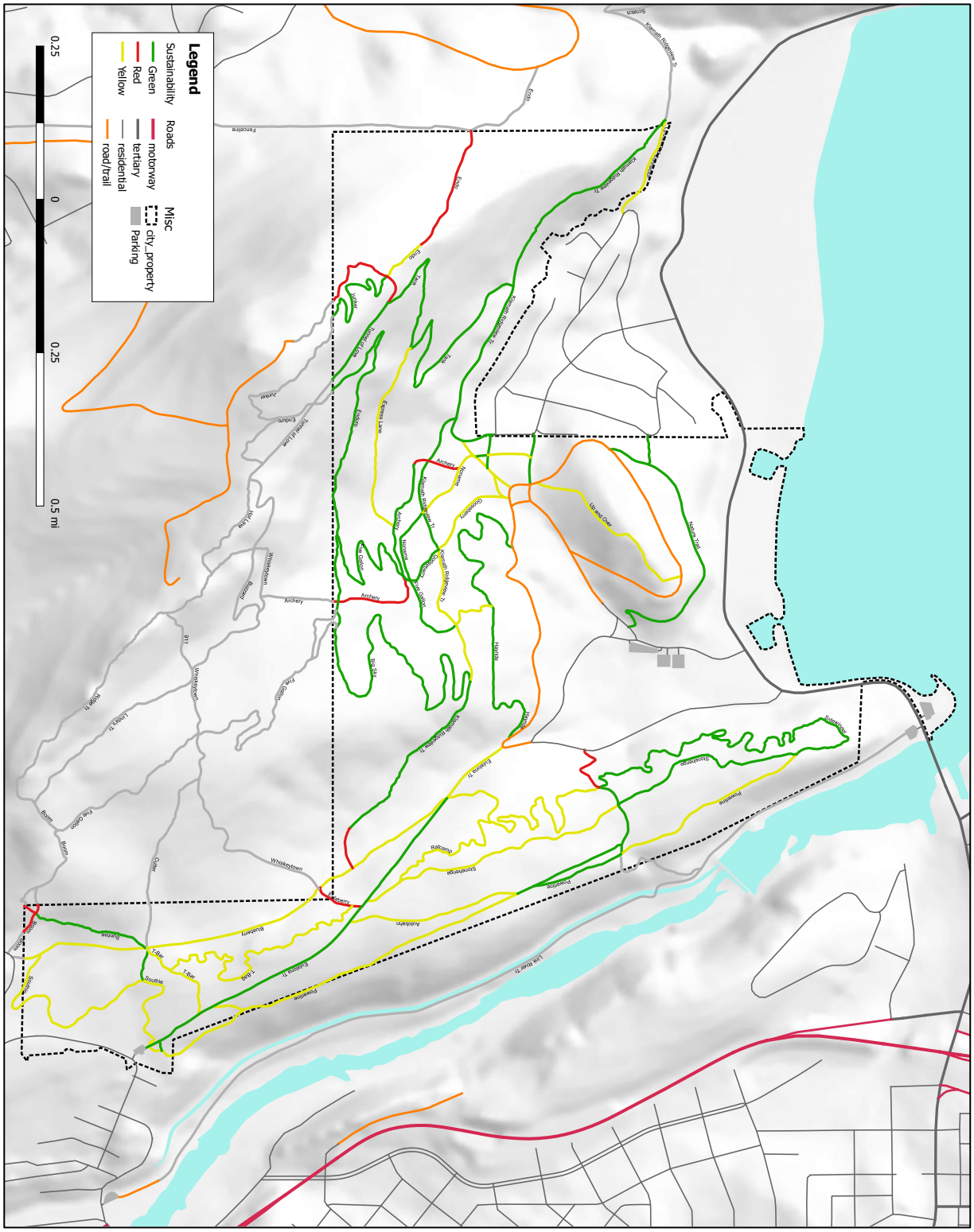
1) Work with volunteer trail builders to execute "Priority A" projects (items #2, 5, 6, 10, 11, and 14). In addition, the city and volunteers should work together to fix seasonally wet segments of trails and brush the trail corridors to improve sightlines.

2) Seek funding to implement "Priority B" projects. There are several grant opportunities for new trails, either transportation- or recreation-based. Item #3 (all-season surfacing for Eulalona Trail) may be eligible for non-motorized transportation improvement grants as it provides a valuable connection between the northwest neighborhoods and the central city. Recreational Trail Program (RTP) grants can be requested for the other projects in this category.

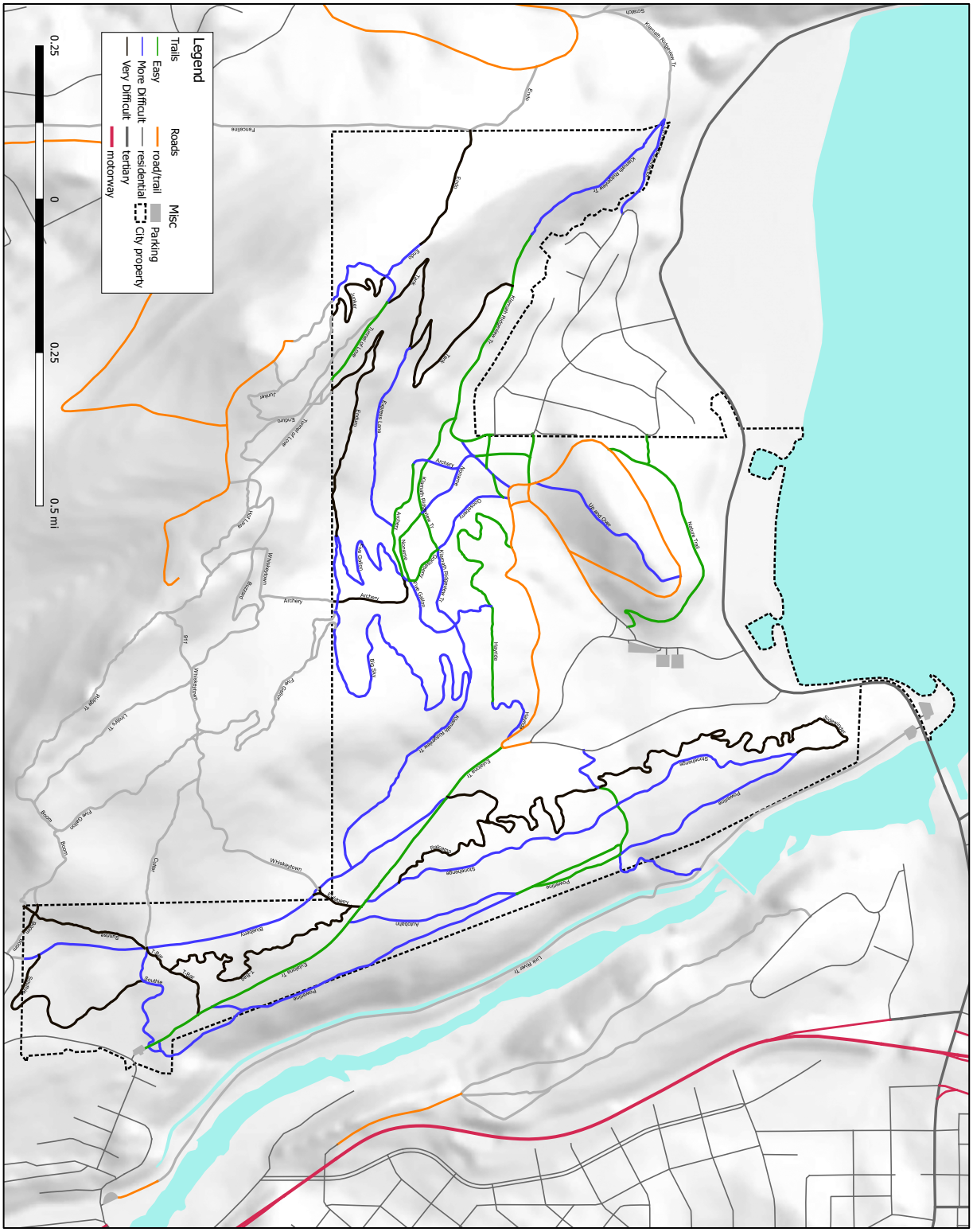
3) Formalizing public access to trails on private property will greatly increase the riding, hiking, and running opportunities for visitors to the park. Although a sustainability analysis of the private-property trails was not part of this effort the trails were given a cursory examination and found to generally be in good condition. It would therefore be worthwhile to include them in the public trail network. Recent enhancements to Oregon's recreational immunity statutes give private landowners greater protection from lawsuits and may encourage property owners to formalize access. RTP grants can be used to purchase trail access, be it through easements or fee-simple transactions. Otherwise, the city should pursue funding to implement the "Priority C" projects as noted on page 11.

4) The city and KTA should pursue continued trail construction and maintenance training to enhance their skills ahead of the work outlined in the above steps. Having these skills within the community will result in better and more efficient execution of trail planning, design, construction, and maintenance efforts.

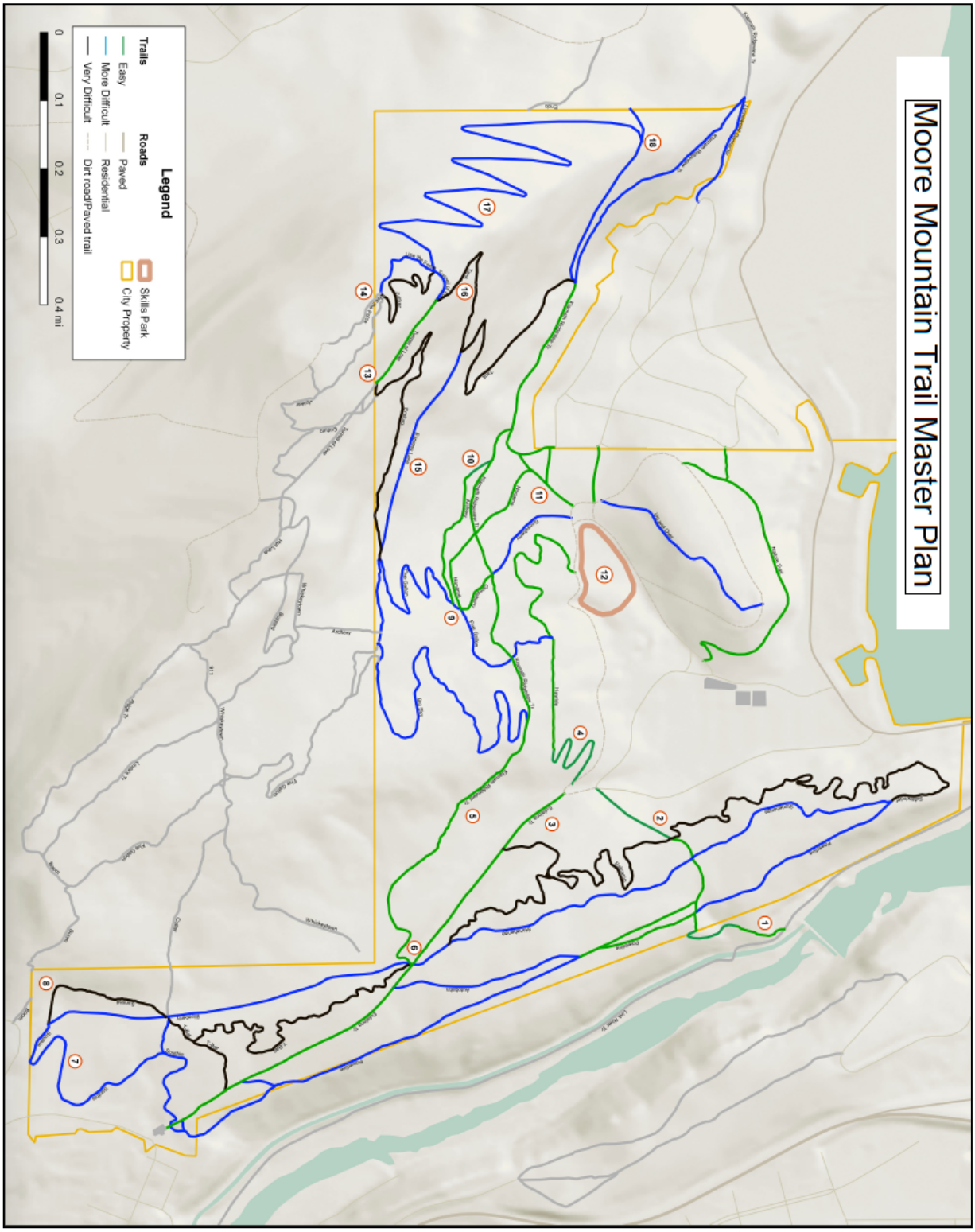
Appendix A – Environmental Sustainability Assessment



Appendix B – Trail Difficulty Rating Assessment



Appendix C – Trail Master Plan



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Appendix D – Online Survey

A survey about the draft Moore Trail Master Plan was available online after a presentation of the proposed changes at the Parks Advisory Board meeting on Thursday 14 September 2017. 44 people took the survey, the aggregated results of which are below (individual replies have been omitted to preserve the anonymity of the respondents).

How do you use the trails at Moore Park? [multiple selections allowed]

Hiking/walking = 77%
Trail running = 30%
Dog walking = 34%
Mountain biking = 70%
Nature/wildlife viewing = 32%
Other (please specify) = 14% [snowshoeing, XC skiing]

What do you like about the proposed changes to the trails?

Overall, people were supportive of the proposed changes. They liked the creation of more trails, with an emphasis on the beginner-friendly trails in the core portion of the park. Several people reacted positively to the elimination of redundant/confusing segments of trail.

What don't you like about the proposed changes to the trails?

There were conflicting comments in response to this question, with a balance between respondents who wanted more trails and those who wanted less. For the latter, it was to preserve the sensation of solitude or to reduce human impacts on the landscape.

What modifications would you recommend to improve the trails?

The responses to this question ranged greatly, with some people offering specific suggestions while others used it to reiterate comments from the earlier questions. Some of the recommendations were for management controls, such as reducing wet-weather use and installing more signs (these comments will influence the Moore Park Trail Management Plan). There were several requests for technical mountain biking trails, including optional lines where less-skilled users could share the same trail with more-skilled users.

Appendix E – Moore Park Trail Management Plan

Trail Management Plan
Moore Park
Klamath Falls, Oregon
Winter 2017/18

Prepared For

City of Klamath Falls

Prepared By

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Contents

Overview

The information in this document is intended to assist the City of Klamath Falls in managing the non-motorized, multi-use trail network at Moore Park. This management plan supports the long-term implementation of the Moore Park Trail Master Plan, including the daily, seasonal, and annual work needed to ensure the operation of the trails in a manner that is beneficial to the users, adjacent property owners, and the land.

This document should be periodically updated by the city to reflect current best practices and accumulated knowledge.

Sustainable Trail Building Practices

All planning, design, construction, and maintenance work should be done in accordance with accepted practices for developing sustainable singletrack trails. The best resources are currently:

Trail Solutions: IMBA's Guide to Building Sweet Singletrack, the International Mountain Bicycling Association (2004).

Managing Mountain Biking: IMBA's Guide to Providing Great Riding, the International Mountain Bicycling Association (2007).

Bike Parks: IMBA's Guide to New School Trails, the International Mountain Bicycling Association (2015).

Guidelines to a Quality Trail Experience: Mountain Bike Trail Guidelines, the Bureau of Land Management and the International Mountain Bicycling Association (2017).

While these document may appear to be skewed towards mountain bike trail management that is only because IMBA is the leader in sustainable trail development, having invested significantly in the topic for more than two decades. The majority of the information is applicable to mixed-use trails and several jurisdictions have adopted these materials as resources.

Of particular relevance to Moore Park is the use of raised tread segments (also called causeways) in areas where topography and groundwater conspire to keep the trail wet. The details for this type of specialized trail work is noted in Appendix A.

Difficulty Rating

The city should refer to a trail difficulty rating system when making decisions about trail development, maintenance, and management. This will provide consistency as well as value to users who are interested in gaining information about the trails.

One such trail difficulty rating system was developed by IMBA (Appendix B). The system has the benefit of using the universally recognized symbols developed by the ski area industry (green circle, blue square, etc). No standardized pedestrian equivalent system is available but given this absence it is reasonable to assume that the IMBA guidelines could apply to all trail users.

The ratings are guidelines and not hard-and-fast rules. Variations will exist due to the natural and dynamic environment in which trails exist. When taken in aggregate, however, the difficulty rating system can offer guidance for trail development, maintenance, and signage (discussed in more detail below).

Directional Trails

The Moore Park Trail Master Plan recommends the designation of some trails as descending-direction mountain bike trails. These trails provide a desired experience that cannot be replicated on trails in which cyclists must yield to all pedestrians and to ascending cyclists. Having the right-of-way on a descending trail is a prized experience for cyclists, regardless of skill level. Several trails at the park were developed with this in mind, leading to the recommendation that the directionality be codified to provide the desired experience and reduce the likelihood of negative interactions between trail users.

Other users (e.g., pedestrians and ascending cyclists) are to be discouraged from using the identified descending-direction trails. The intersections of the descending trails must be marked with signs making it clear that descending-direction cyclists have the right-of-way and that other users must yield the trail to cyclists who may be descending at a speed higher than they would on a multi-use, bi-directional trail. A sample sign is provided in Appendix C.

The use of the descending-direction designation should be used sparingly so that this desired experience does not override the desired experiences of others, such as pedestrians and cyclists who seek physically challenging climbs. Providing a few, high-quality descents, primarily for more-skilled cyclists, should meet the need given the size of the park.

Signs

The current sign program consists of Carsonite posts with trail names. This is a cost-effective solution and one that is aesthetically appropriate given the urban nature of the system. It is important to not over-sign the system so that it looks cluttered. The signposts should have minimal information, such as trail name, difficulty rating based on the IMBA guidelines (Appendix B), and any directional recommendations.

The difficulty level rating for each trail should be noted on the signposts. These stickers (green circle, blue square, etc.) are inexpensive and can be purchased from various sign supply companies. Using the universally accepted color/shape stickers will help users avoid trails that are too difficult for their skill level.

As previously noted, some of the trails at Moore Park are recommended to be designated primarily for descending-direction cyclists. On trails with this designation the posts should be affixed with a sign indicating an atypical yield pattern where all other users yield to descending-direction bicyclists (Appendix C).

Kiosk signs should be placed at major trailheads. These signs, typically one- or three-panel, should contain an overview map and general trail information such as typical yield patterns, emergency contact information, and wet-weather use.

Routes

One of the concerns identified during the master planning process was the need to help visitors navigate the trail system: with its abundance of intersections the network can be confusing to guests. Given the proximity of the trail system to downtown where it is likely visitors will be staying it is important to have easy-to-follow routes for hikers, trail runners, and cyclists.

The routes should be color-coded (avoiding green, blue, or black, as these are reserved for the difficulty rating) and visible on signposts from a distance. A colored arrow sticker can be applied at trail intersections to show the recommended travel direction of the route.

Information would be provided at the trailheads that indentifies the distance and difficulty rating of the route so that people can select their desired outing. Maps that show the routes should be created for each one, on a downloadable PDF at a resolution that is small enough it can be used on a phone.

Possible routes include:

Yellow Route
A short, beginner-friendly route from the Eulalona trailhead that includes:

- Eulalona
- Klamath Ridgeview Trail
- Big Sky
- Five Gallon
- Hayride
- Eulalona back to the trailhead

Orange Route
A moderate-length intermediate route from the Eulalona trailhead that includes:

- Eulalona
- Klamath Ridgeview Trail
- Five Gallon
- Hayride
- Eulalona
- Stonehenge
- Powerline
- Autobahn
- Blueberry
- Southie

Trail Closures

Some trails will need to be closed because they are unsustainable, trespass onto private property, and/or are redundant. Given the open sightlines in much of the park this will be difficult as people can frequently see where they want to go and may head there regardless. It is therefore important to physically close the trail and make passage difficult. Decompacting the trail tread and installing check dams (using the surplus Juniper logs on the site) will reduce erosion. Replanting the tread with native vegetation will reduce the visual corridor. It will likely also be necessary to install small, ground-level signs asking people to avoid the closed trail in order to promote habitat restoration.

TRAIL CLOSURE

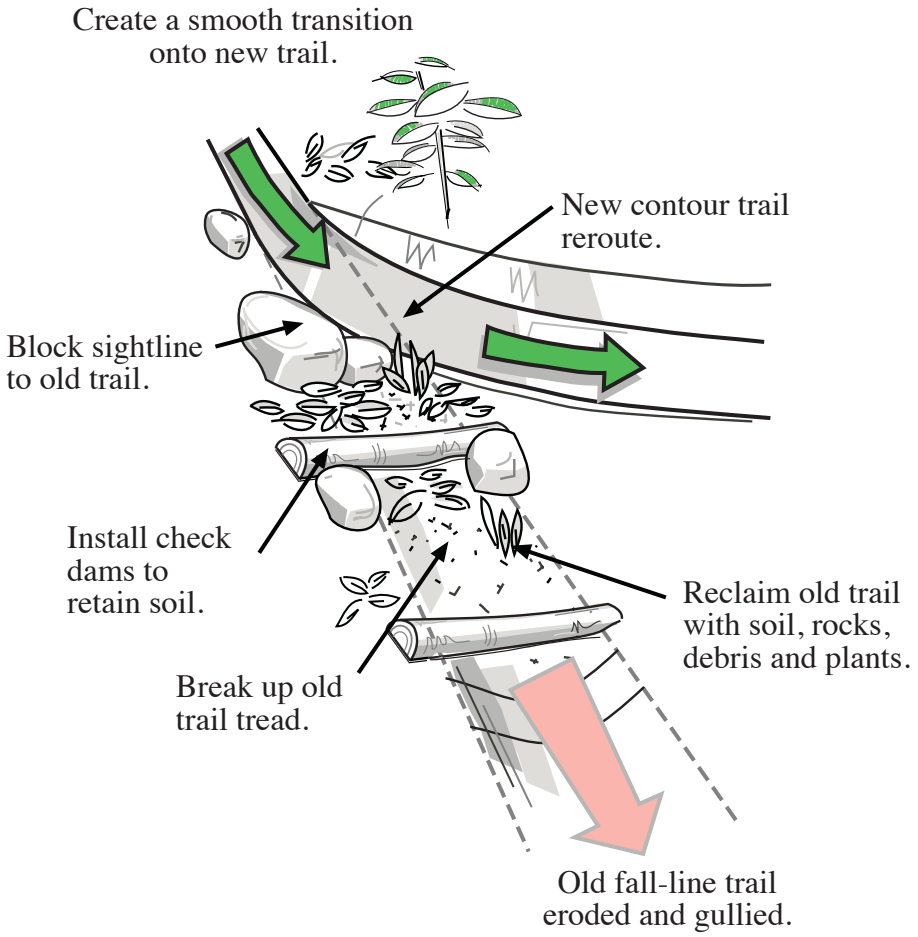
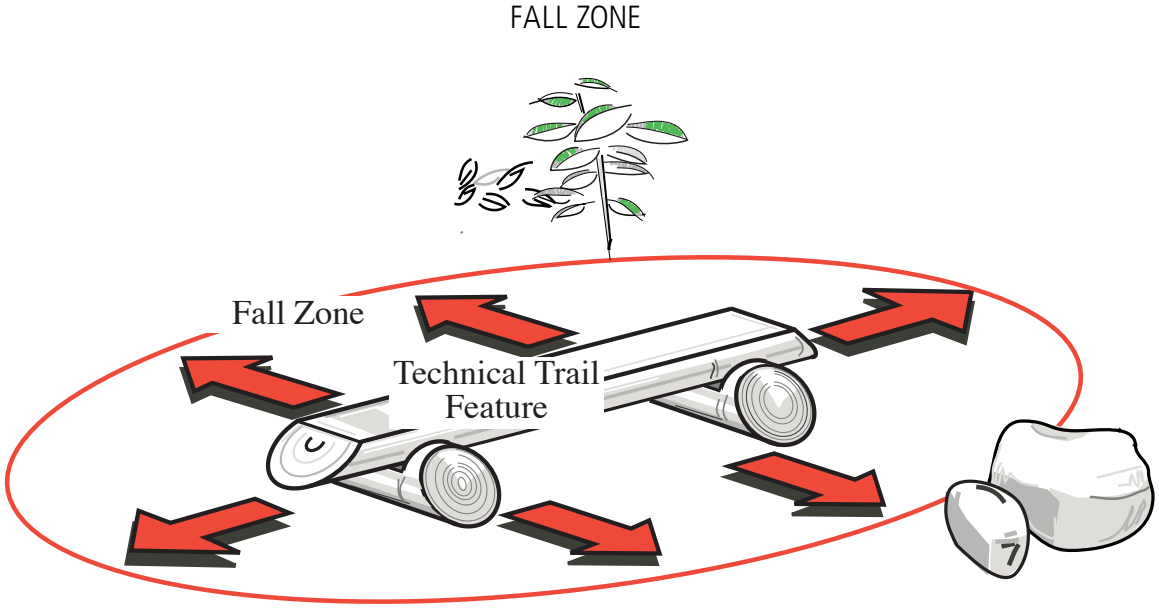


Image by IMBA

Technical Trail Features (TTFs)

TTFs are primarily for the enjoyment of mountain bikers although hikers and trail runners will occasionally use them. TTFs are either man-made or the trail is routed to a natural feature that is then used as part of the trail. TTFs should adhere to the IMBA difficulty rating guidelines (Appendix B); if they exceed the specifications for the trail rating then they can be placed out of the main flow of the trail, for example, off to the side. Given the general use typical of Moore Park it is recommended that TTFs not be placed in-line in any green circle or blue square trails.

Regardless of their placement, TTFs must have clear fall zones to reduce the penalty for failure to successfully navigate the feature.



Clear potentially hazardous objects from all areas where riders may fall (Fall Zone).

Image by IMBA

Flow is also important. If a TTF is best ridden at slow speed and the trail inherently promotes moderate speed then complications could occur. The reverse if also true, with a TTF requiring moderate speed on a trail that is typically ridden at a slow pace. Placing TTFs in a bike park is a recommended practice as it provides a discrete area where the risk of TTFs can be managed.

To reduce liability all TTFs should be installed by a trail contractor. The contractor should have sufficient experience to avoid typical mistakes and will also carry liability insurance. In all instances construction should use durable, rot-resistant materials attached with corrosion-resistant fasteners and brackets.

Training for Volunteers

As noted in the Moore Park Trail Master Plan, the city and KTA should pursue continued trail construction and maintenance training to enhance their skills ahead of the necessary trail work. Having these skills within the community will result in better and more efficient execution of trail planning, design, construction, and maintenance efforts.

In particular, the volunteers who lead the trail maintenance efforts should be trained both in general trail development techniques, particularly planning and design, and trail construction techniques specific to Moore Mountain. A well-rounded curriculum would include the following topics:

- Desired experiences by trail user type
- Master planning
- Field design
- Trail construction (full-bench construction, partial-bench construction, raised tread)
- Trail maintenance (treadwork, vegetation management)
- Rock armoring and walls
- Specialty trails (gravity MTB trails, trails for families)

A professional trail builder who is experienced in teaching can provide the trainings. The trainings will likely include both an indoor classroom session and a practical outdoor workshop. The curriculum should be "stepped", with completion of general topic trainings a prerequisite for attending the specific construction coursework. Not each topic needs to be an individual training; several could be combined into a one-day or weekend-long session.

Equipment

Specialized trail building/maintenance equipment is probably not needed given the frontcountry location of Moore Park. Machines such as the Sutter TrailDozer or Singletrack ST-240 are more geared towards backcountry locations or production building. Small mini-excavators with retractable rubber tracks are more versatile and widely available. Small skid-steer loaders are also handy when large amounts of materials must be loaded.

Mechanized totters make the transportation of materials more efficient and have a narrow trackwidth that allow them to be used on singletrack. Because they are simple to operate they can be used by volunteers. Several volunteer trail groups in Oregon operate and even own totters.

A popular make/model is the Canycom BFP602 (http://www.canycomsales.com/products/bp-series/bfp602-2/).

Appendix A – Raised Tread

A situation that is common at Moore Park is seasonal seeps in flat-to-moderate terrain. These areas remain wet well into the summer, and are subject to trail widening as people attempt to avoid the mud. The best solution in these locations is to raise the trail tread and let the water move passively along its natural course.

RAISED TREAD

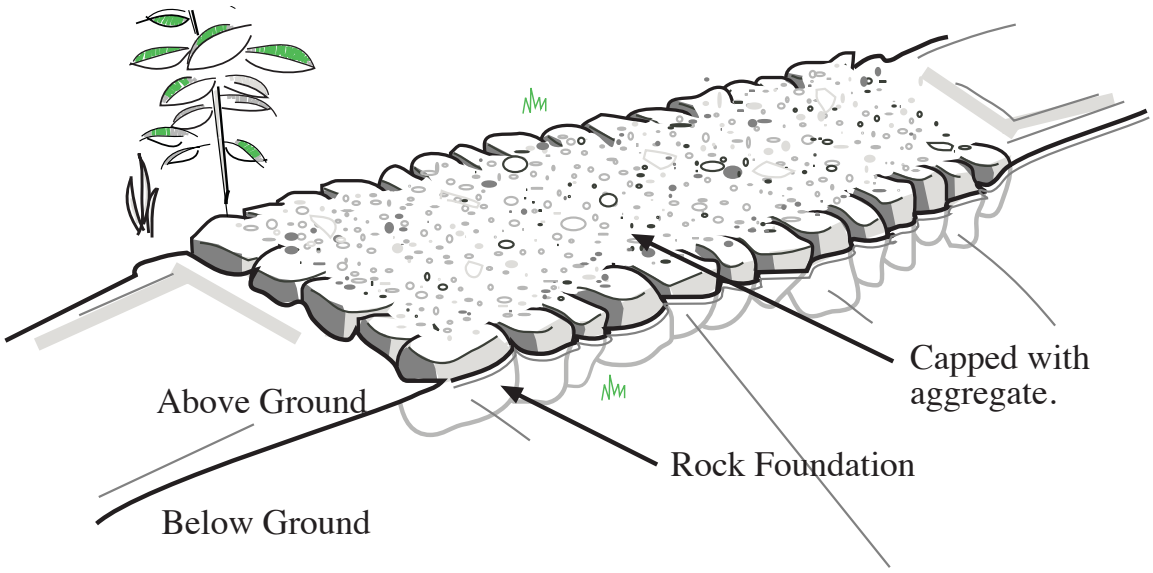


Image by IMBA

The above graphic shows the basic construction of a raised tread segment. Instead of rock, the side borders can be constructed using surplus Juniper logs from the site. These will have to be replaced more frequently than if the sides were constructed of rock but the Juniper does have natural rot-resistant characteristics that will increase its longevity over most other species of wood. The aggregate cap can be mixed with native soil to reduce the visual impact and to provide a more consistent trail surface.

Appendix B – IMBA Trail Difficulty Rating System

IMBA Trail Difficulty Rating System	EASIEST WHITE CIRCLE	EASY GREEN CIRCLE	MORE DIFFICULT BLUE SQUARE	VERY DIFFICULT BLACK DIAMOND	EXTREMELY DIFFICULT DBL. BLACK DIAMOND
TRAIL WIDTH	72" (1,800 mm) or more	36" (900 mm) or more	24" (600 mm) or more	12" (300 mm) or more	6" (150 mm) or more
TREAD SURFACE	Hardened or surfaced	Firm and stable	Mostly stable with some variability	Widely variable	Widely variable and unpredictable
AVERAGE TRAIL GRADE	Less than 5%	5% or less	10% or less	15% or less	20% or more
MAXIMUM TRAIL GRADE	Max 10%	Max 15%	Max 15% or greater	Max 15% or greater	Max 15% or greater
NATURAL OBSTACLES AND TECHNICAL TRAIL FEATURES (TTF)	None	Unavoidable obstacles 2" (50 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 36" (900 mm) or wider	Unavoidable obstacles 8" (200 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 24" (600 mm) or wider TTF's 24" (600 mm) high or less, width of deck is greater than 1/2 the height	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or wider TTF's 48" (1,200 mm) high or less, width of deck is less than 1/2 the height Short sections may exceed criteria	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or narrower TTF's 48" (1,200 mm) high or greater, width of deck is unpredictable Many sections may exceed criteria

Appendix C – Trail Yield Triangle for Descending-Direction Mountain Bike Trails