

LOST RIVER STATE PARK

CONCEPT PLAN AND DESIGN BRIEF

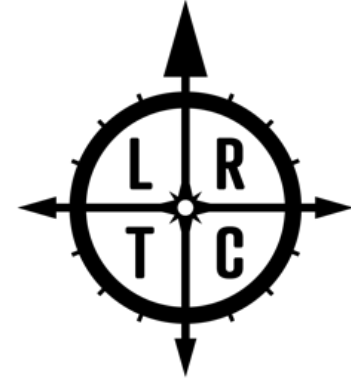
MATHIAS, WEST VIRGINIA
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ACKNOWLEDGMENTS

PREPARED FOR:
**LOST RIVER TRAILS
COALITION**



PREPARED BY:
**INTERNATIONAL MOUNTAIN BICYCLING
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INTRODUCTION

IMBA Trail Solutions

IMBA Trail Solutions is the international leader in developing trails, with experience in over 750 projects in North America, Europe, and Asia. Our staff excels at planning, design, and construction of trail systems that provide high-quality experiences for local riders and destination visitors while simultaneously minimizing environmental impacts.

Trail Solutions is a fee-for-service based arm of the International Mountain Bicycling Association (IMBA), a 501(c)(3) nonprofit organization. IMBA's mission is to create, enhance, and protect great places to ride mountain bikes. Based in Boulder, Colorado, and with staff distributed across the country and the world, IMBA meets its goal to create great mountain bike experiences through its Trail Solutions program. Trail Solutions employs approximately twenty professional trail planners and builders. In addition to being industry professionals and exceptional mountain bike riders, Trail Solutions staff hold a broad base of applicable skills and knowledge from planning, landscape architecture, and environmental sciences to GIS systems, CAD, and graphic design.

Our wealth of experience has allowed us to develop the gold standard guidelines for the creation of both sustainable and enjoyable singletrack trails. These guidelines have influenced all major federal land management agencies and a large number of state and local parks departments. We pride ourselves on the positive experiences Trail Solutions has provided to the millions of active trail users around the world and on the economic independence that communities have achieved through the development of destination trail systems.



Lost River Trails Coalition

The Lost River Trails Coalition (LRTC) is a dedicated group of outdoor enthusiasts who share a passion for mountain biking and promoting sustainable, universally designed trail development. Their mission is to establish a world-class MTB trail system within the beautiful Lost River State Park, in the heart of rural Hardy County, West Virginia.

With over 265 members in their thriving Facebook community, the Coalition is a dynamic force for change. Their 15-20 volunteers work tirelessly to raise awareness of the sport and its benefits, while also encouraging youth involvement and advocating for access to riders of all abilities.



PROJECT BACKGROUND

IMBA Trail Accelerator Grant

A Trail Accelerator Grant offers awardees professional trail planning and consultation services to launch their trail development efforts, which can often leverage additional investment from local, regional, and national partners.

In 2022, the LRTC applied for and was awarded a Trail Accelerator Grant from the IMBA to advance their identified mission of promoting the development of a sustainable MTB trail system in Lost River State Park by raising awareness of the activity, encouraging youth involvement, and assuring access to riders of all abilities.

Lost River State Park

Lost River State Park (LRSP) is a beautiful outdoor destination located in the Potomac Highlands region of West Virginia. It encompasses over 3,700 acres of lush forests, rolling hills, and breathtaking mountain vistas with some structures dating back to the early 19th century. The historic log cabins, sturdy stone shelters



and walls, and meandering trails, all identified on the National Register of Historic Places, were built by the Civilian Conservation Corps in the mid 1930's.

The park offers a wide range of recreational opportunities, including hiking, mountain biking, and horseback riding. With over 26 miles of trails, visitors can explore the stunning landscape and enjoy panoramic views of the surrounding mountains. Horseback riding is also a popular activity, with guided tours and rental horses available.

Camping and cabins are available for overnight stays. The park has 27 cabins, including the original log structures ranging from cozy one-bedroom cabins to cottages that can accommodate up to 14 guests. Limited primitive tent camping is also available.

The terrain at LRSP is varied, with deep valleys, unique geological features, high ridges, and steep slopes.



Mathias, WV

Mathias, the closest town to LRSP, is an unincorporated community located in Hardy County, West Virginia. It is situated in the eastern part of the county, near the Virginia state line. As of 2020, the population of Mathias was estimated to be around 700 people.

Hardy County is a rural county located in the eastern part of West Virginia, bordered by Virginia to the south and east. As of 2020, the population of Hardy County was estimated to be around 14,500 people.

The economy of Hardy County is driven primarily by agriculture, poultry, and manufacturing with a growing tourism presence. The county is known for its fertile farmland, with many residents involved in the production of crops such as corn, hay, and wheat. The tourism industry in Hardy County is centered around outdoor recreation, including hunting, fishing, hiking, and camping. The county is home to Lost River State Park and the George Washington National Forest, which attract visitors from around the region.

The landscape of Hardy County is characterized by rolling hills and valleys, with the Appalachian Mountains with higher peaks visible in the distance. As a major portion of the Potomac Watershed, four rivers run through the county's valleys with numerous inputs providing opportunities for fishing, floating, and paddling.

Existing Recreational Opportunities

Northeast West Virginia is a mecca for outdoor activities, offering an incredible range of experiences for visitors and locals alike. With its picturesque state parks, national forests, and outdoor recreation areas, the region is a perfect destination for nature lovers.

Hiking and camping are among the most popular activities in the area, including Lost River State Park, George Washington National Forests and Seneca Rocks offering a wealth of opportunities to explore the great outdoors. Mountain bikers



will find plenty to enjoy too, with many trails throughout the region offering an exciting way to experience the natural beauty of West Virginia.

Horseback riding is also a popular activity, with numerous stables and trails available to explore the area on horseback. Additionally, the region's lakes and rivers provide a range of fishing, boating, and swimming options for those seeking water-based activities.

When winter arrives, Canaan Valley Resort State Park and Snowshoe Mountain Resort become popular destinations for skiing, snowboarding, and other winter sports.

Cultural enthusiasts can explore the region's rich history and heritage at sites such as the Harpers Ferry National Historical Park or on a ride on the Potomac Eagle Scenic Railroad through The Trough, the canyon of the South Branch of the Potomac River. For those looking to explore further, Shenandoah National Park is just a short drive away, offering stunning views, hiking trails, and wildlife sightings.

Small towns throughout this region of West Virginia offer unique shopping, dining, and cultural experiences, making it a perfect destination for a weekend getaway or longer vacation.

Regional Trail Offerings

West Virginia is known for its rugged terrain and scenic beauty, making it a popular destination for outdoor enthusiasts. In particular, the state offers a variety of mountain biking trails that attract riders from all over the country.



Cacapon Resort State Park

Cacapon Resort State Park is a popular recreational area located in eastern West Virginia. The park features a range of outdoor activities, including hiking, fishing, and golfing. In recent years, the park has also been expanding its mountain bike trail system to attract more riders.

The mountain bike trail system at Cacapon Resort State Park currently includes about 18 miles of mountain biking trails. These trails are designed for beginner to advanced riders, with challenging climbs and technical features.

The expansion plan includes adding another 5-6 miles of beginner and intermediate trails to the existing system. The new trails will offer a range of riding experiences, from flowy singletrack to more technical terrain. The park is also planning to build a skills area and pump track to help riders develop their skills.



Canaan Valley Resort State Park

Canaan Valley Resort State Park in West Virginia is a popular destination for mountain biking enthusiasts. The park boasts over 18 miles of picturesque trails that cater to different skill levels, meandering through forests, meadows, and streams. Notably, the park has partnered with the National Interscholastic Cycling Association (NICA) to offer a comprehensive youth development program that focuses on creating responsible and skilled riders. The program includes training, coaching, and competitions for middle and high school students, helping to promote a love for mountain biking among young people. Additionally, the park offers bike rentals and guided tours for visitors who want to explore the trails with a knowledgeable guide. Some of the popular trails in the park include Dark Hollow, Blackwater Canyon Trail, and Rocky Point.

Harrisonburg, VA

Harrisonburg, VA is home to some of the best mountain biking trails on the East Coast. The region boasts a variety of terrain, from smooth and flowy singletrack to technical rocky descents.

The Shenandoah Valley Bicycle Coalition maintains and expands the local trail system, which includes more than 200 miles of trails for all skill levels.



Some of the most popular trails in the area include the Massanutten Western Slope, which offers 30 miles of lift-accessed downhill trails, and the Harrisonburg Reservoir Trail, a scenic and challenging ride around the city's water supply.

Other notable trails include the Narrowback Mountain Trail, which winds through a mix of hardwood forest and open meadows, and the George Washington National Forest, which has miles of backcountry singletrack.

Bryce Resort Bike Park, VA

Bryce Resort in Basye, VA is a popular destination for mountain biking enthusiasts of all levels. The resort offers a variety of trails ranging from beginner to expert, including the Lake Laura Loop, Bootlegger Trail, Homestead Trail, Downhill Flow Trail, and Short Track DH course.

In addition to the diverse trail offerings, Bryce Resort operates as a bike park with a skills development area for practicing techniques and lift access to roundtrip the downhill trails. The experience of riding at Bryce Resort is unique in that it offers the opportunity for riders to enjoy a range of terrain and obstacles in a controlled environment.

Seneca State Forest

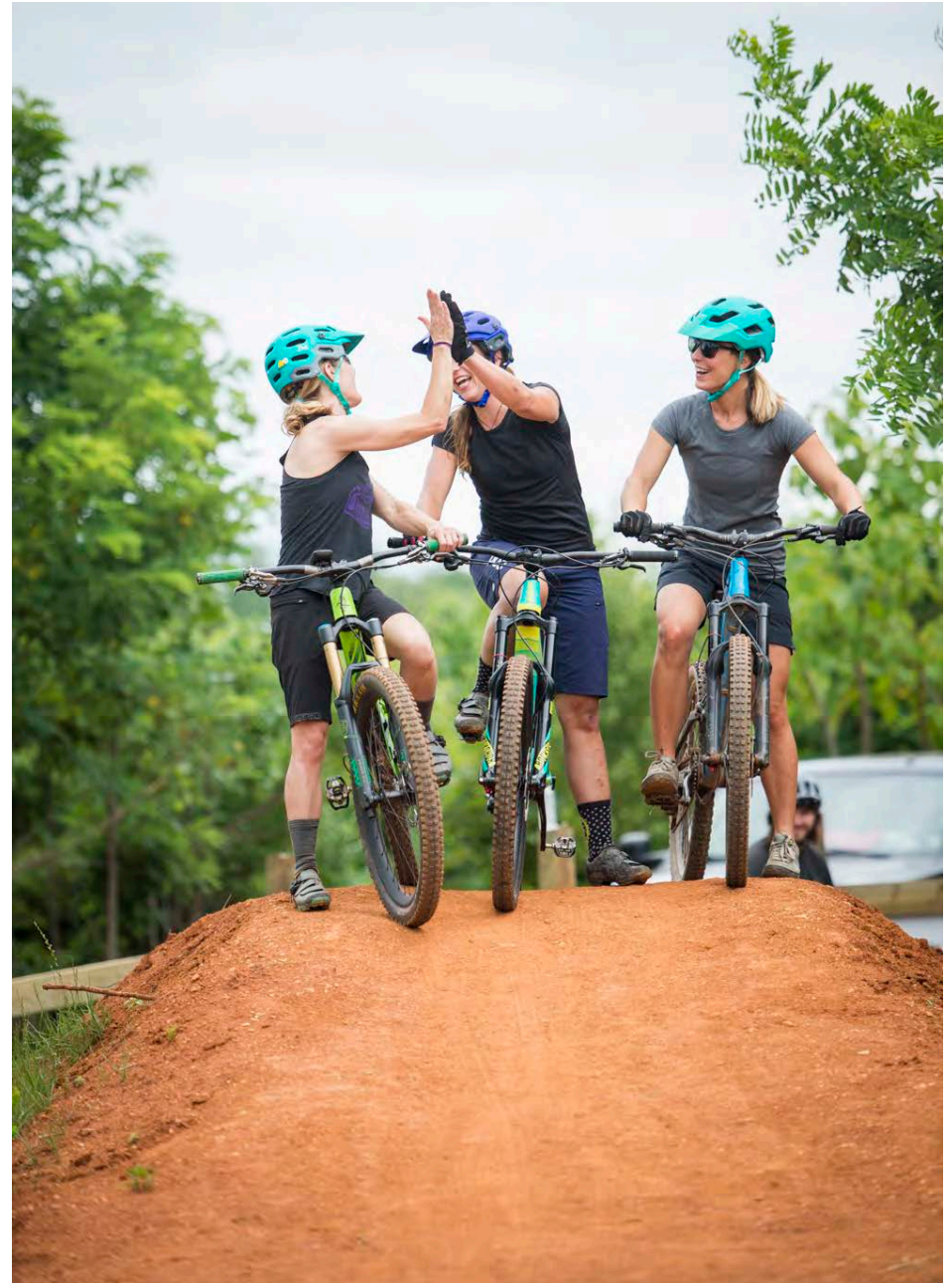
Seneca State Forest in West Virginia offers a variety of mountain biking trails ranging from beginner to advanced levels. The trails are well-marked and maintained, and provide riders with scenic views of the forest and surrounding mountains. Some of the popular trails include the Yellow Birch Trail, which is a beginner-level trail that winds through the forest and features several easy climbs and descents. The Blue Spruce Trail is a more advanced trail that offers steep climbs and technical descents, and is best suited for experienced riders. The Seneca Creek Trail is another popular trail that follows the creek and provides riders with stunning views of the waterfall.

PROJECT GOALS

The trail concept plan is intended to achieve several goals identified by LRTC and LRSP. First and foremost, significant consideration is being given to creating fully accessible trails for riders of all abilities with the initial focus being the development of beginner and intermediate trails. Riders will have the opportunity to learn and advance while experiencing the exhilaration of the sport. Additionally, the project aims to establish a dedicated NICA training area, supporting youth development in mountain biking and fostering a love for outdoor recreation among students. By creating riding opportunities for the local community, the project aims to encourage active and healthy lifestyles while fostering a sense of community engagement. Lastly, the project intends to spread out user groups within the park, diversifying recreational options and reducing congestion on existing trails, ensuring a sustainable and enjoyable experience for all visitors.

1 Develop trails and bike facilities that deliver high-quality experiences to the community

A main goal for the LRTC is to engage more area youth in trail activities, but the lack of beginner bike trails and nearby facilities for practice and race events make it difficult to retain participants. Most of the trails open to bikes within the community are too challenging for many users, especially kids and people looking for easier entry level experiences. Currently there are no trails in the area that are suitable for adaptive riders to learn how to navigate natural surface trails. The rugged terrain, steep grades, narrow tread, and user group restrictions on trails within LRSP offer few opportunities for riders to develop their riding abilities and bike handling skills which can discourage participation in the sport. The challenging nature of existing area trails are also a barrier to the development of



the local NICA team who need trails that are fun and engaging in order to retain participants.

NICA develops mountain biking programs for student-athletes and coaches across the United States. In 2017, the West Virginia Interscholastic Cycling League was formed as a project league of NICA. Currently there are 18 teams across the state. The Hardy County Composite Team was formed in 2023 and is looking to expand its membership.

The development of beginner and intermediate level bike-optimized trails will create opportunities for area youth by providing close to home trails for the NICA team to train and build their skills. Purpose built trails need to adhere to a few specific design considerations to be compatible with adaptive mountain bikes (aMTBs). The beginner bike-optimized trails that were designed in the spring of 2023 will provide riders with a place that is suitable for a wide range of users and bike types including the larger wheelbases of aMTBs. See page 17 for more information on aMTBs.

2 Provide healthy recreational activities for residents with a focus on opportunities for area youth

Numerous studies on physical activity have indicated that proximity to outdoor recreational facilities, such as trails and bike amenities, is a predictor for physical activity level. If there are walking and biking trails nearby, then residents are more likely to use them and therefore be healthier. Physical health and access to nature also benefit mental health by, reducing stress and increasing happiness. Connection to nature is paramount to maintaining the health of the environment and making the outdoors relevant and accessible to all. In addition, individual and community health translate to economic benefits by decreasing healthcare costs. Public trails and bike facilities also provide outdoor community spaces that encourage public engagement. Bike facilities serve a diverse population and cultivate unity and stewardship in the community. By incorporating bike-specific

accessible amenities into area recreational spaces, LRTC and LRSP can help promote active and healthy lifestyles and promote social integration.

With today's distractions and the increasing amount of time indoors and in front of screens, children are spending less time outside. Many times, programmed play equipment doesn't provide the challenge and reward that children are seeking. By incorporating a range of trails and bike-specific play features, LRSP can provide engaging activities that will encourage kids to get outdoors, increase socialization, and build confidence.

3 Introduce progressive mountain bike experiences, skills development, and bike amenities to Lost River State Park

An important factor for a successful community trail system is its capacity to support a range of ability levels and provide opportunities for progressive skills advancement. Today's mountain biker is looking for purpose-built trails that optimize the riding experience. Bike-optimized trails are constructed with features to enhance that experience. Features may include rock gardens, berms, grade reversals, cambered turns, and modest jumps. They should be designed for a range of users from beginner to advanced skill levels. To progressively



build skills necessary for more difficult trails, cyclists are looking for features to increase bike handling and balancing skills. Technical Trail Features (TTFs), such as wooden rollers, bridges, rock skinnies, etc. provide the challenge and skill-building opportunities that riders are seeking. These features can be located on a designated skills trail or can be provided on the side of trails as optional features. Adequate space must be provided to allow riders to exit the feature and gradually merge with the main trail and other riders. Many of the planned traditional cross country style trails will have the required space and ideal grades to locate optional technical trail features.

The focus of this design is to create a system that allows beginners to learn and advance their bike handling skills while also providing intermediate and advanced riders with an engaging riding experience that they will enjoy riding repeatedly. Many of the sites within this plan offer the opportunity to develop contemporary bike-specific singletrack trails and bike-focused infrastructure.



4 Create a model for adaptive mountain bike use in West Virginia State Parks

Adaptive riders are looking for the same range of experiences and challenges as other mountain bikers, with users possessing a wide spectrum of skills and ability levels. Forethought in the design phase can help ensure compatibility with minimal effort. The biggest obstacles for aMTBs are often pinch points, bridges, and off camber sections. While there are no universally accepted trail standards for adaptive mountain bikes many purpose-built beginner and intermediate trails are aMTB compatible with some minor adjustments. Signage with detailed trail information is another important factor for the adaptive rider allowing them to make decisions about their ability to navigate a particular trail.

The development of modern purpose-built trails at LRSP takes aMTB design considerations into account and will support a diverse community of riders. New riders will have a place to learn how to navigate their bike in an adaptive friendly environment. As the activity grows and evolves continued collaboration

with adaptive riders is needed to ensure that trails are designed and maintained in a way that accommodates diverse abilities. This system will be a draw for aMTB riders and hopefully provide other parks with a model for more universal recreational development.

5 Develop trails and bike facilities that deliver destination-quality experiences for the community and surrounding region

Mountain biking is a growing activity in West Virginia with its exceptional natural beauty, diverse terrain, and a range of trail experiences. LRSP is no exception offering incredible views, historic CCC cabins and infrastructure, and open hardwood forests. An initial design phase took place in the Spring of 2023. The IMBA Trail Solutions team laid out approximately 3 miles of trail that will provide new recreational opportunities for area residents and visitors. Having a range of diverse trail experiences with options for a range of ability levels or linking together multi-day rides is important for both attracting visitors but also providing the community with a place to experience nature, build skills, and challenge themselves. Building off Phase 1 trails, this 3,700-acre site has the potential to support a much larger trail network, especially in the less visited north end of the park. LRSP could support an additional 40+ miles of trail. Many mountain bike enthusiasts will travel significant distances for riding destinations. Sites with options for younger or newer riders are particularly attractive as they provide families with options for all members no matter their experience level, to have an enjoyable experience. LRSP is situated within a 2-3 hour drive of some large population centers including Washington D.C., Pittsburgh, Baltimore, and Richmond. The addition of bike amenities and trails will help promote the region as a riding destination. The diversity of trails will invite riders of all abilities from families and beginners to advanced riders looking for more challenging experiences.



BIKE FACILITIES & TRAILS

The types of mountain bike trails and facilities considered in this feasibility study are explained below. These narratives are meant to provide a brief description of the envisioned experience, intended user, construction considerations, and approximate ranges of construction costs. The construction costs reflect the cost of retaining a professional trail contractor and are provided for financial planning purposes only. The cost ranges do not include planning, design, and permitting needed to develop the facilities, typically estimated at 10-20% of construction costs. It is important to consider ongoing maintenance costs of trails and bike facilities; these can range from 5-25% of the installation cost.

Trail Types

Modern trail systems use specific trail types as a way of managing users and providing them with the best possible visitor experience. Extensive planning and



design should be dedicated to the goal of maximizing a visitor's trail experience while simultaneously balancing the demands of physical, environmental, and social sustainability. This list is not exhaustive.

Traditional Shared-Use Singletrack

These trails can serve walkers, hikers, runners, cyclists, and equestrians. Trails should be constructed and maintained according to sustainable trail construction practices and employ techniques that minimize user conflict. Multiple user types travel these routes; therefore, care should be taken to avoid obstacles such as jumps or water bars which may lead to undesirable trail experiences for some. Turns are constructed sustainably, but are generally not cambered like bike-optimized turns that improve cornering traction. Keeping trail grades within certain ranges ensures both a positive trail experience for users and enables proper stormwater drainage with minimized erosion. Depending on soil conditions, these trails may need surface hardening techniques to provide a durable four-season trail.

Approximate Construction Costs: \$40,000-\$70,000 per mile



Mountain Bike-Optimized Singletrack

These trails are purpose-built to optimize the experience of riding a mountain bike. The trails can either be unidirectional or bidirectional depending on the type of trail, preferred circulation of users, and management decisions. This type of trail is constructed with features such as rock gardens, berms, grade reversals, cambered turns (typically wider than turns on traditional singletrack trails), and modest jumps. These trails should make use of gravitational forces and, where possible, be managed to enhance trail flow for descending riders. These trails may need surface hardening to provide a durable four-season trail. They should be designed for a range of users from beginner to advanced skill levels. Optional advanced features can be located along the side of the trail to provide challenges for intermediate and advanced riders. This allows many skill levels to experience the full trail mileage, while providing for skill progression within a smaller trail footprint.

- Approximate Construction Costs: \$50,000-\$100,000 per mile



Tot Track and Bicycle Playground

A tot track is designed for smaller bicycles and beginner ability level users. The track is comprised of reduced-sized rollers as well as low-angle bermed turns that can accommodate balance bicycles as well as regular bikes with short wheelbases. These are essentially small versions of pump tracks, both of which can be constructed with dirt or hardened surfaces. Asphalt is the recommended surface material for tot tracks. Asphalt is more expensive to install, but greatly reduces maintenance costs. Most importantly, asphalt provides a consistent high-quality experience for the users.

Bicycle playgrounds incorporate play features such as prefabricated structures, rocks, berms, tunnels and other challenges to create a fun loop for children to practice skills and improve bike handling. The bicycle playground can range in size and configuration to best fit the site and desired features.

Approximate Construction Costs:

- \$10-\$30 per square foot (tot track)
- \$9-\$13/linear foot for trail surface (bicycle playground)
- \$1,000 - \$5,000 for prefabricated features (bicycle playground)



Mountain Bike Skills Trail

These are trails that have been specially designed for mountain bikers to develop the skills necessary for enjoying more challenging trails. This type of trail is built with different routes and features for a range of skill levels, allowing users to progress their skills with repetition and experience over time. Beginner riders and kids are especially fond of this type of purpose-built bike facility. They are typically constructed on nearly flat or gently sloping terrain and take up relatively little space. Features may include rocks, bridges, drops, rollers, and more. Typically, installed features include a mix of prefabricated structures and those built on-site with locally sourced materials.

Approximate Construction Costs:

- \$9-\$13/linear foot for trail surface
- \$1,500 - \$10,000 for prefabricated features



Pump Track and Pump Parks

A pump track is designed to encourage cyclists of all skill levels improve their riding skills in a manner that is fun and repetitive. Pump Tracks are typically a bidirectional closed circuit or series of closed circuits made up of rollers and berms. Pump parks have an open design with a larger area of hard surfaces that allow users to create their own multidirectional routes through the rollers, berms, and jump features. A pump park will foster more organic and creative riding that stimulates both novice and skilled riders. Riding these facilities is an extremely anaerobic activity, so it is recommended that suitable seating and shade structures be installed for users to rest between sessions. Like the tot track, pump tracks and pump parks are recommended to have asphalt surfaces. With an asphalt surface, the track will allow users to enjoy year-round. Contracting with a specialty designer and builder for the pump track is strongly recommended to ensure the quality and enjoyable riding experience of the track. With all pump tracks, necessary drainage infrastructure is necessary.

- Approximate Construction Costs: \$25-40/square foot



Adaptive Mountain Bike Trails

Adaptive mountain bike trails are natural surface trails that feature specific design parameters to accommodate aMTBs while providing a high-quality experience for “different-abled” riders. aMTBs are equipped with the proper positioning and geometry to allow the millions of Americans with a mobility disability to enjoy the outdoors. The bikes have three wheels (trikes) or four (quads) and may position the riders in a laid back, recumbent position for most crosscountry style bikes or face-forward with the riders back to the sky which is common for all-mountain style bikes. The style and make of the bikes vary, but all are wider, larger, and heavier than traditional mountain bikes which results in significant changes to acceleration, deceleration, and the ability to change direction and corner.

aMTB trails combine an appropriate combination of width, radius, and grade to create an accessible layout and design of the trail. In general, the aMTB trails must be wider, uphill gradients decreased and less abrupt, turning radius increased, bridges and trail features widened, and access to trails must be barrier free with shallow grade climbs. Riders are positioned lower to the ground which must be accounted for when creating clear sightlines. When a trail traverses steep slopes, the tread width should be increased and tread outslope must be greatly lessened or removed to uphold clear passage in landscapes with high exposure. Rollers and undulations in the trail must be gradual and require adequate spacing between each to allow riders to coast through without pedaling. Pull-outs along the side of the trail should be installed to allow riders to rest along the trail and allow other riders to pass. Trails must be free of obstacles for easy (green) aMTB trails, but can feature obstacles, such as rocky sections, on more advanced trails.

Planning and designing for these trails at the beginning of a project is necessary to create trail specifications and a layout that delivers the intended experience. Due to the tread width of aMTB trails, the most feasible way to build these trails is with the assistance of machines.



NICA Training and Racing Facilities

NICA develops mountain biking programs for student-athletes and coaches across the United States. Over 19,000 student-athletes in junior high and high school participate in 31 state and regional leagues supported by over 9,000 volunteer coaches and 10,000 additional volunteers. Participant numbers continue to grow. In the last ten years, student-athlete participation has averaged 48% annual growth, and coach participation has averaged 75% annual growth.

The league's mission is to build strong minds, bodies, character, and communities through cycling with the values of fun, inclusivity, equity, respect, and community. Unlike some youth programs, there are no bench warmers. Every athlete participates, and the league offers a multitude of benefits: getting kids outside; promoting healthy lifestyles; exposing kids to cycling and outdoor advocacy; and providing social interaction, leadership opportunities, and life lessons such as self-awareness, discipline, success, failure, empathy, humility, and sportsmanship. In 2018, NICA launched GRiT (Girls Riding Together), a program focused on engaging more girls and women as student-athletes, volunteers and coaches. They also updated their Teen Trail Corps advocacy program to promote

stewardship of the trails. Some leagues include Elevate programs for student-athletes with mental and physical challenges, making the sport more inclusive and integrated than many other high school activities. NICA is also helping to fuel more collegiate varsity cycling programs and clubs.

Beyond the many benefits for student-athletes, NICA leagues provide significant economic stimulus to their communities. As participation grows, so does the demand for trails and bike amenities. Teams need trails for training and racing. NICA racecourses require 4- to 6-mile loops of combined singletrack and double track with 300–600 feet of climbing per lap. Throughout the country, communities are building NICA racecourses from scratch or modifying existing trails. Along with the trails, the racecourses require venues that can accommodate, in some cases, thousands of spectators and participants who generate business in lodging, travel, restaurants, bikes stores, and other retail sales and services. This economic activity can support jobs, provide sustainable growth in rural communities, and produce tax revenue. The bottom line: Growth in NICA leagues doesn't seem to show any signs of slowing down, and that means an abundance of benefits for individuals and communities.



Lifted and Tilted Tread Type

A new trail construction method, “lift and tilt,” is a way of raising the tread above the existing grade while simultaneously lowering the grade of areas off the trail that act as natural drains. This enhances tread drainage while increasing the fun factor for mountain bikers. Borrow basins are dug to harvest suitable mineral soil to lift and tilt the tread. Woody debris is used to replace the soil taken from the borrow basins, which are then masked and blended with organics to create natural-looking low points for drainage. This technique holds the rider on the trail while directing water off the tread into the basins.

This method can be implemented on any scale, using smaller machines to provide a singletrack feel or larger machines to create wide trails with a true bike park flow. Visitor numbers, rainfall, and soil type may require the use of culverts and sumps to keep trails rideable while providing drainage. The trails can have an increased emphasis on fun, flow, and airtime depending on the designated trail user. For shared-use trails, which generally cater to beginner riders, the dial can be turned down with mellower grades, less undulation, and feature frequency. For advanced trails, the dirt features can be more dynamic with larger rollers and jumps, bigger drops, and steeper banked turns, giving riders play in the vertical plane. Flatter areas that may have been avoided in the past can now be designed to provide an exciting riding experience. The lift and tilt method is often used for pump tracks, flow trails, jump trails, and other bike-optimized amenities.



EXPERIENCE ZONES & PREFERRED-USE TRAILS

Experience zones and preferred-use trails are showing up in trail systems around the world. Experience zones divide management areas into special-use zones designed around specific activities: one zone may be preferred for mountain biking and another for accessible, interpretive trails. Implementation of such zones can provide a variety of visitor experiences and recreational opportunities that reduce conflict between differing user groups while providing sustainable, long-lasting trails.

Single use challenges the notion that all trails must be all things to all people. In this case, land managers designate certain trails as “preferred” for certain activities. For example, a trail that is single use for mountain bikers might be designed to be fast and flowing through open terrain, with swooping turns and dips. Hiking-preferred trails, meanwhile, may be more about travel efficiency with stairs, tight switchbacks, short distances, or other qualities that would be less attractive to bikers and equestrians. Visitors will be drawn to routes that match their desired experience.

Each trail system should, of course, include a variety of trails. One way to include numerous types of trails is to have shared-use trails at the beginning of the network near parking lots, with preferred-use trails branching off farther along. The number of trails designated for each mode of travel should be based on the habits and needs of the user groups being managed.



EXISTING CONDITIONS

Lost River State Park

Located in West Virginia, LRSP encompasses a vast expanse of 3,700 acres, offering a diverse and captivating terrain to explore. The park's landscape is characterized by its rugged beauty, featuring a combination of rocky ridges, ravines, open ridge tops, and intriguing rock outcrops along Big Ridge, the uppermost spine along which LRSP extends.

As you venture into the park, you will encounter ravines that add an enchanting element to the landscape. These natural formations were carved by centuries of erosion, creating deep, narrow valleys that meander through the forested terrain. The ravines offer a sense of seclusion, tranquility and views of the surrounding countryside.

Another highlight of Big Ridge is the presence of captivating rock outcrops. These geological formations expose layers of ancient rocks, showcasing the park's geological history, adding an element of adventure and discovery to your journey.



Site Assessment

IMBA Trail Solutions conducted an on-site assessment in the spring of 2023. The site was evaluated for potential trail suitability, trail types, access points, connections to existing trails and infrastructure, environmental constraints, and visitor experience goals.

The majority of services and infrastructure are located in the southern end of the park with Howards Lick Road and Dove Hollow Road separating the major access points from Big Ridge. Lodging is available at the 27 historic CCC cabins. Additional amenities include a gift shop, administration building, pool, playground, campsites, ball field, tennis courts, picnic area, disc golf, and the historic Lee House. A fire tower, rental cabin, and campsites can be found along the crest of Big Ridge. The stables located on Dove Hollow Road are operated by a concessionaire and provide guided rides to several points of interest within the park. The southern section of the park has 12-miles of trail. Currently, bike use is allowed on 3-miles of trail - East Ridge, Covey Cove, and Red Fox trails along with the Big Ridge Access Road. The existing bike trails are typical of legacy CCC



trails and include many steep rugged sections with unsustainable grades leading to pleasant ridgetop sections. The existing trails are challenging for many riders and no opportunities exist for beginner or intermediate riders.

The remaining trails at LRSP are designated for hiking or equestrian use. Another 9 miles are found along Big Ridge but West Virginia State Parks does not allow bikers and equestrians to share trails. The White Oak Trail is widely used by equestrians with guided rides to Cranny Crow, one of the most popular destinations at LRSP. Access to the northern most section of the park, where incredible views of the valley can be seen, is limited to Miller’s Rock Trail, the sole link to that end of the park.

Parking is constrained with spaces filling up during the busier summer months. The two main parking lots are located near the entrance to the park along Howard’s Lick Road. Trail users are often forced to park along the narrow roadsides when the lots are full. A few spaces are available near the Fire Tower access road and East Ridge Trail along Howard’s Lick Rd. The circle at the end of the park road provides additional space for 3-4 vehicles. Terrain and



infrastructure constraints limit options for additional parking or trailhead access along the southern end of LRSP.

There is no access along the eastern edge of the park boundary. A few private roads and old skidder paths leading into the park from this side could provide emergency access but are not suitable for a trailhead or public access. The western edge parallels Dove Hollow Road. A small triangle of land at the northern end of the site connects to Dove Hollow Road. There are a few small structures here including a picnic shelter with bathroom and small shed. A well and septic system are present on site, but testing needs to be done to ensure their usability. The site also has access to electrical service. Parking for 10 or so vehicles could be accommodated here and is suitable for a small trailhead. An old access road climbs somewhat steeply toward the ridge crossing onto private property near the top. There is no direct vehicular access to the ridge or Miller's Rock. Just past the access road gate is a relatively flat bench that could be developed as a larger trailhead with capacity for 40-50 vehicles.

The northern end of LRSP provides the best opportunity for new trail development. Gentler slopes, minimal terrain constraints, and trailhead access provide suitable conditions for developing beginner bike-optimized trails.



Site Access

As the popularity of LRSP grows among recreational users, especially with the expansion of mountain biking trails in the northern, more remote areas of the park, ensuring access to these newly developed zones becomes increasingly crucial. This accessibility is not only important for regular trail maintenance but also plays a role in facilitating emergency personnel access/egress.

In contrast, the southern area of the park has relatively good access, primarily because the majority of park infrastructure is concentrated in this area. When approaching Big Ridge from the southern side of the park, visitors encounter a steep four-wheel drive park service road leading to the ridge's summit from Howards Lick Road. Continuing along the ridge top, the service road continues, stopping just short of the cabin and fire tower. This road is the main route for maintaining the facilities and camping sites along the ridge. While vehicle access is feasible up to the cabin via the Miller's Rock trail, it becomes impractical for larger vehicles beyond that point due to the trail's narrowness.

Conversely, the northern portion of the park presents more limited access options. However, there is a maintenance road that can accommodate side-by-side UTVs, providing a viable route for construction, maintenance, and emergency access. This road extends to the private property boundary just before reaching the ridge. Beyond this point, the road traverses private lands, necessitating prior permission for its use, whether for park-related activities or as an emergency access route.

Additionally, to the south near Miller's Rock, another maintenance road exists. While it has received improvements over the years, it may require further clearing, tread, or drainage work by park staff to ensure its reliability. This particular road commences from Rusty Lane, situated to the east of the park, and ascends a ridge top, ultimately reaching the summit of Big Ridge. Access should be verified by LRSP as this route may cross private land. Access along this road will be useful for the construction of trails within Zone 3 of the concept plan.



RECOMMENDATIONS AND CONCEPT PLAN

Overview

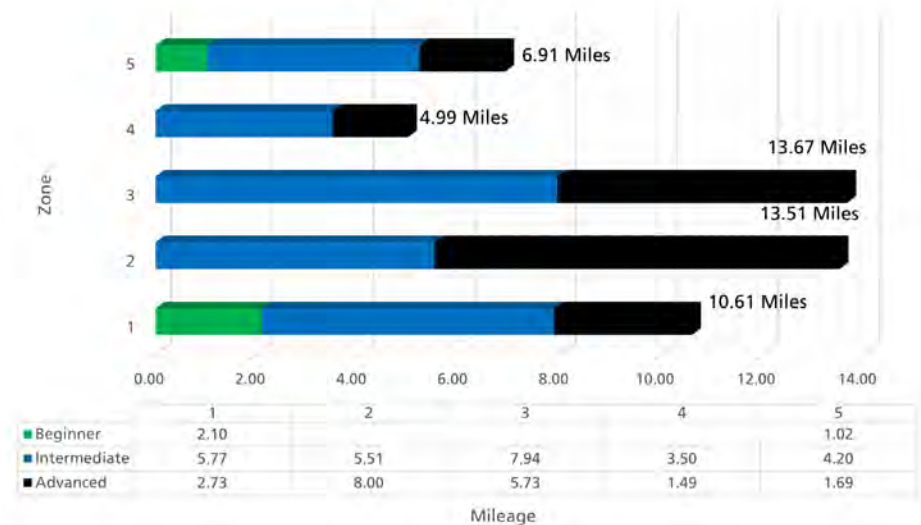
With over 40 miles of planned trails, this concept plan serves as the foundation for establishing a high-quality, destination worthy system of natural surface trails at LRSP in Mathias, West Virginia. Through the valuable insights from this report and the associated maps, LRSP’s directors, staff, and the passionate Volunteers from LRTC can pursue further funding opportunities and development of the trail system and ultimately create a trail system that is sought after by a wide range of users.

The site assessment conducted during this project has revealed exciting prospects for developing more than 40 miles of new shared-use and bike-optimized trails. By strategically spreading the trails across the park’s expanse and embracing sustainable practices, LRSP has the potential to evolve into a central mountain biking and outdoor recreation hub, both for local enthusiasts and visiting adventurers alike.

Diversity is key, with a wide range of trail types and difficulty levels catering to various trail users, ultimately enhancing the park’s recreational amenities to appeal to a broader range of visitors. Accessibility is a major goal for the LRTC and this plan has been developed to provide access to traditional mountain bikes, along with a range of aMTB. The recommendations for trail development are thoughtfully divided into distinct zones, each characterized by similar landscape features, thus providing a clear roadmap for the park’s trail expansion initiatives.



Trail Concept Breakdown





LOST RIVER STATE PARK - OVERALL CONCEPT



Trail Type Inventory

Lost River State Park Concept Plan

Trail Type	Unit	Directional	Feature Frequency ¹	Constructed Tread Width ^{2,3}	Ave Trail Grade per 100' ⁴	Max Trail Grade: climbing ⁴	Max Trail Grade: descending ⁴	Proposed Flagline Corridor Width	Corridor Width (4' above tread)	Corridor Height Minimum ⁵	Exposure (without railing)	Avoidable Obstacles (over 50% of tread or less)	Rollable Feature Height (jumps, berms, etc.) ⁶	Rugosity (surface texture) ⁷	Tread and trail features	Experience Notes
Beginner Shared-Use	Linear Feet	Bi-directional	Low	60" or more	5%	7%	7%	50'	60"-72"	8'	N/A	N/A	N/A	Low	Firm trail surface. May include rock surfacing.	Typically specified for easiest trail difficulties. Trail grades are gentle and set on shallow cross slopes with little to no exposure to trail side risks like steep slopes, cliffs, or external influences that require advanced bike handling moves to avoid. In general, the trail surface is relatively smooth with little to no obstacles (rocks and roots). Tread width, turns, bridges, and pinch points need to be accommodatig to Adaptive Mountain Bikes.
Beginner Bike-Optimized	Linear Feet	Bi-directional	Low	54" or more	5%	10%	15%	50'	60"-72"	8'	N/A	less than 8"	12"-24"	Low	Semi-firm trail surface. May include rock surfacing.	Typically specified for easiest trail difficulties. Trail grades are gentle and set on shallow cross slopes with little to no exposure to trail side risks like steep slopes, cliffs, or external influences that require advanced bike handling moves to avoid. In general, the trail surface is relatively smooth with little to no obstacles (rocks and roots). Feature frequency is appropriate for the shared-use nature while keeping it engaging for intermediate riders advancing their skills. Tread width, turns, bridges, and pinch points need to be accommodatig to Adaptive Mountain Bikes.
Intermediate Shared-Use	Linear Feet	Bi-directional	Medium	48" or more	7-10%	15%	20%	50'	30"-42"	8'	less than 48"	less than 16"	24"-48"	Medium	Semi-firm trail surface. May include rock surfacing.	This trail type will have the look and feel of traditional shared-use singltrack. Trail grades are moderate and set on moderate to steep cross slopes. In general, the trail surface is semi-firm with some natural obstacles (rocks and roots). Feature frequency is appropriate for the shared-use nature while keeping it engaging for intermediate riders advancing their skills. Tread width, turns, bridges, and pinch points need to be accommodatig to Adaptive Mountain Bikes.
Intermediate Bike-Optimized	Linear Feet	Bi-directional	Medium	48" or more	7-10%	15%	20%	50'	30"-42"	8'	less than 48"	less than 16"	24"-48"	Medium	Semi-firm trail surface. May include rock surfacing.	Specified for the intermediate trails. Trail grades are moderate and set on moderate to steep cross slopes with some exposerate such as steep slopes or cliffs. In general, the trail surface is semi-firm with some natural obstacles (rocks and roots). Feature frequency is appropriate for the shared-use nature while keeping it engaging for intermediate riders advancing their skills. Tread width, turns, bridges, and pinch points need to be accommodatig to Adaptive Mountain Bikes.
Advanced Shared-Use	Linear Feet	Bi-directional	Medium	18"-30"	10%	20%	40%	50'	30"-42"	8'	less than 48"	less than 16"	24"-48"	High	Unpredictable trail surface. Will include rock surfacing. Rocks will be uneven.	This trail type looks and feels like traditional singltrack with narrow tread and the presence of rocks, roots, and other obstacles. Grades are steeper than beginnerand intermedeiate and steep and may exceed the physical climbing/descending limits of some hikers and riders. Highly unpredictable trail surface with high rugosity is expected.
Advanced Bike-Optimized	Linear Feet	Bi-directional	Medium-High	30"-42"	15%	20%	50%	50'	48"-72"	8'	less than 48"	less than 16"	No restrictions	Medium-High	Semi-firm to loose trail surface. Will include rock surfacing. Rocks will be uneven.	Specified for the advanced bike-only trails. Trails are bike-optimized. These trails traverse side slopes ranging from 20%-120%, therefore users are exposed to steep hills and rocky drop offs. The trail surface is variable with the presence of rocks and roots. Feature frequency is determined by specific trail narratives.
Advanced MTB Downhill	Linear Feet	One-way (Downhill)	High	36"-60"	15%	30%	50%	50'	48"-72"	12'	less than 48"	No restrictions	No restrictions	Medium-High	Semi-firm to loose trail surface. Will include rock surfacing. Rocks will be uneven.	Specified for the advanced bike-only directional trails. Trails are gravity-specific, with use in the downhill direction. These trails expose users to steep grades, rugged terrain, and rocky drop offs. The trail surface is variable with the presence of rocks and roots. Feature frequency is determined by specific trail narratives.

1. Feature Frequency is averaged over long distances. Per 100': "low" = 2-3 features, "med" = 3-5 features, "high" = 5-10 features.
2. Constructed tread width may narrow over short distances to 50% of spec. Examples include rock or tree gateways.
3. Tread width also applies to bridges and boardwalks. Check with local regulations for overriding guidelines on width or any other requirements (height restrictions, railings, etc.).
4. Max grades climbing and descending refer to extremely short segments, 10 feet or less.
5. Turnpad grade measures the rise/fall across the turning surface at the base of any inslope.
6. Max camber is measured at the top of the inslope. Turns can not be outsloped.
7. Corridor height should be reduced in thick laurel or rhododendron where appropriate to provide a more natural "tunnel experience".
8. Rugosity attempts to capture average tread coarseness. Tread area with obstacles: "low" = less then 5%, "med" = less then 20%, "high" = over 20%, "very high" = over 50%.

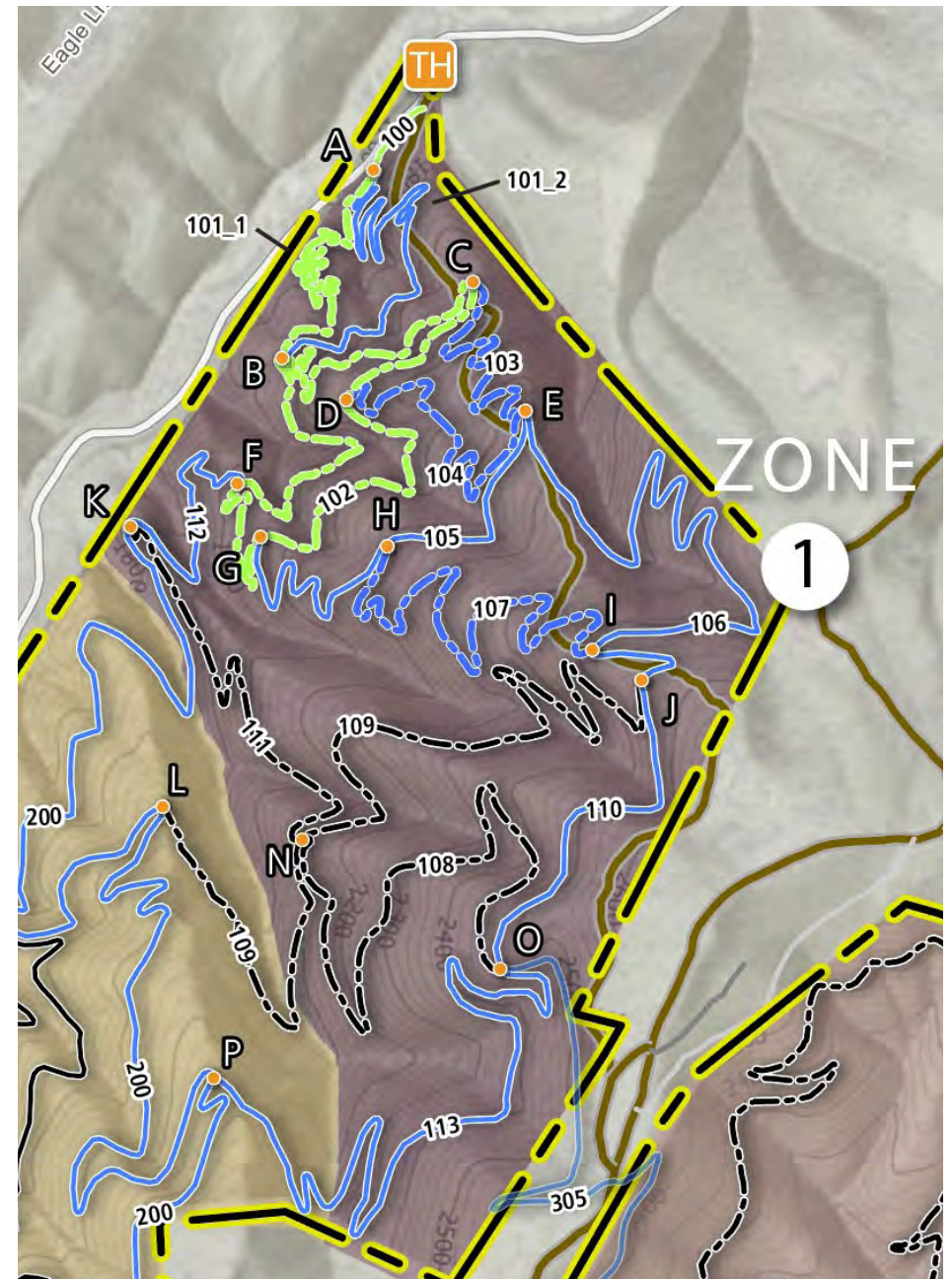
Sustainable trails guidelines provide the foundation for all design + construction decisions ("half rule", frequent grade reversals, max grades function of soils + use, etc.). All trails should have a minimum grade and camber (in/outslope) of 3% to ensure a well-drained tread.



Zone 1: Dove Hollow North

Zone 1, with 12 miles planned, is situated at the northernmost part of the project area, and serves as the primary access point for the LRSP mountain biking trail network. The terrain in this zone mirrors that of the rest of the park, characterized by the presence of hollows and ridges scattered across the hillside. Ascending the ridge tops, the landscape provides excellent opportunities for trails, boasting gentle side slopes, mixed hardwood forests, and expansive panoramic views. However, descending towards the bottom of the hollow, the side slopes become steeper and more rugged, with occasional rock ledges jutting out from the earth.

The primary objectives of Zone 1 are to function as the gateway to the trail network, provide opportunities for adaptive riders, and establish a foundation for bike-optimized trails within LRSP. Consequently, it is essential to provide recreational trail options catering to users of all skill levels. To achieve this, a series of beginner loop trails are planned, starting from the new trailhead they ascend to a viewpoint along the ridge near the northeastern edge of the property. These beginner trails will allow users to assess their skills before venturing onto the intermediate and advanced trails further up the hillside, ultimately connecting to the summit of Big Ridge. Approximately three miles of beginner and intermediate bike-optimized trail (segments 101_1, 101_2, and 102) were flagged as part of the phase 1 design process. Taking advantage of the relatively gentle terrain found lower on the hillside, these trails were laid out to accommodate a wide range of aMTB's and provide easier trails for the local NICA team to practice. Ascending the slope a series of intermediate traditional and bike-optimized loops are planned that will allow for opportunities of playful progression along the open ridges. A few deeper valleys with steep side slopes and rock outcrops are found moving southwest from the trailhead. These valleys limit the development of additional beginner trails but provide a great opportunity for more advanced riders. Segments 108, 109, and 111 create

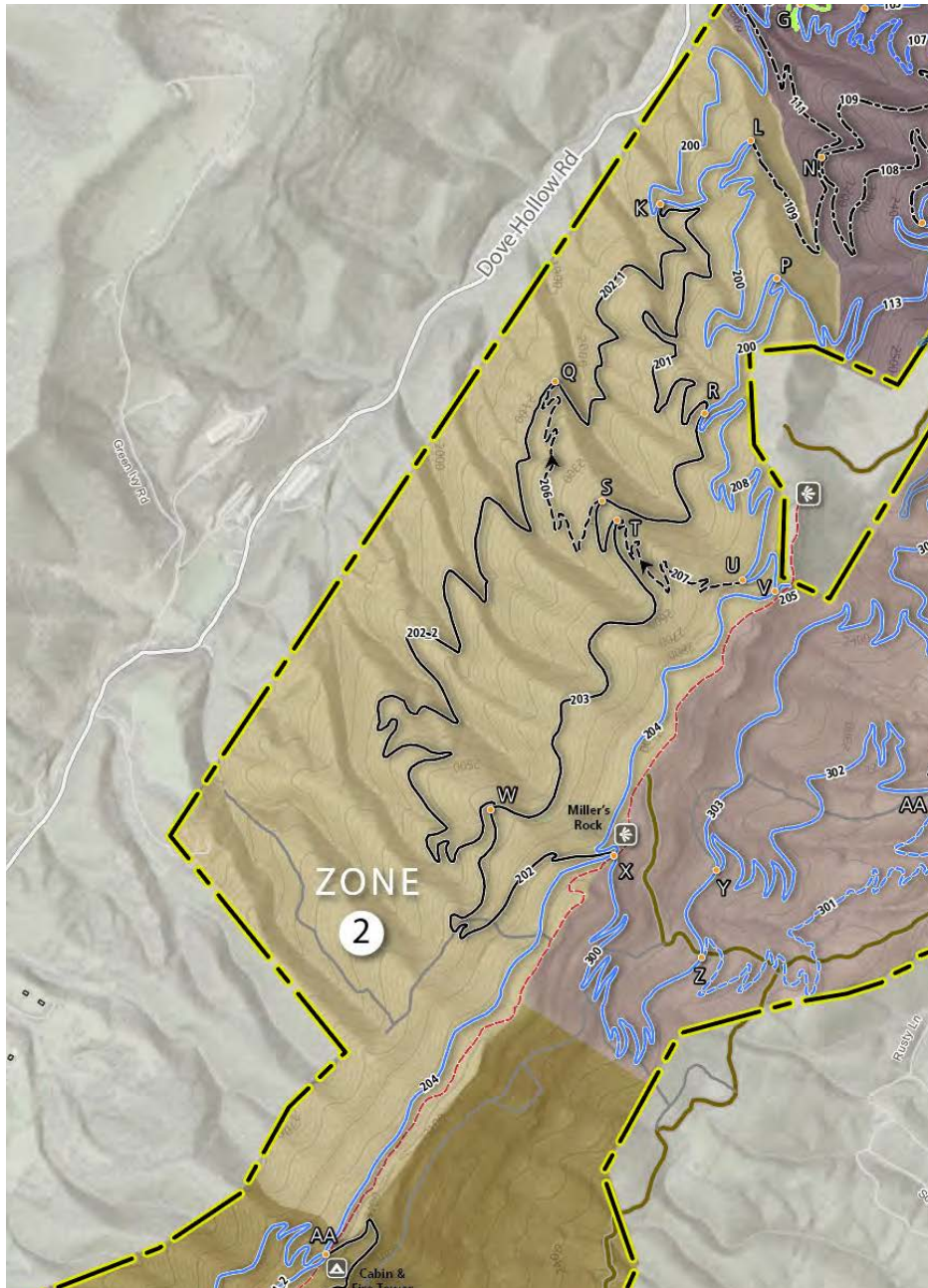


multiple loops that will round out the offerings available in zone 1 providing riders of all ability levels easy to access trails with an appropriate amount of challenge to keep them engaged. Adaptive riders will also find trails suitable for a wide range of aMTB's with progression opportunities for a range of ability levels. During future design phases care should be taken to locate corridors that will allow for a trail tread width average of 48" with minimums of 40" to facilitate access of aMTB's. Not all trails within this plan will be able to maintain the wider tread widths needed by aMTB's but all trails should be assessed and signed, once constructed, with appropriate trail descriptions and constraints to allow for informed decisions by riders. Trails intended for aMTB access are identified in the trail table on page 47. These trails include a route up to and along Big Ridge with a link to Howards Lick Rd.

Currently, there exists an access point off Dove Hollow Road on the east side, complete with parking potential, a pavilion equipped with tables, and a maintenance road leading south into the LRSP property. While this lower lot can currently accommodate a moderate number of vehicles, there is potential for expansion, with room for approximately 10-15 additional cars. It's important to note that this area is constrained by a septic drainage field, steep side slopes, and adjacency to private property.

To address the increasing demand as the trail network expands and attracts more users, there is a significant opportunity to enhance the trailhead and parking capacity. This could be achieved by establishing an additional parking lot adjacent to the maintenance road and creating a cut into the Western hillside. This proactive approach to expanding the parking infrastructure will be vital to sustaining the growth of recreational opportunities at LRSP.





Zone 2: Dove Hollow South

Zone 2, with 15 miles planned, extends the trail network further south into the park, opening up access to Big Ridge and Miller's Rock. It offers riders seeking more challenging experiences the opportunity to test their skills. The terrain in Zone 2 mirrors that of Zone 1, with sweeping ridges and hollows shaping the landscape.

As you ascend towards Miller's Rock, you'll notice a prominent cliff band near the summit. This cliff band presents a unique challenge when it comes to trail construction. The area below the ridge accumulates more rock and boulder debris due to the eroding cliffs.

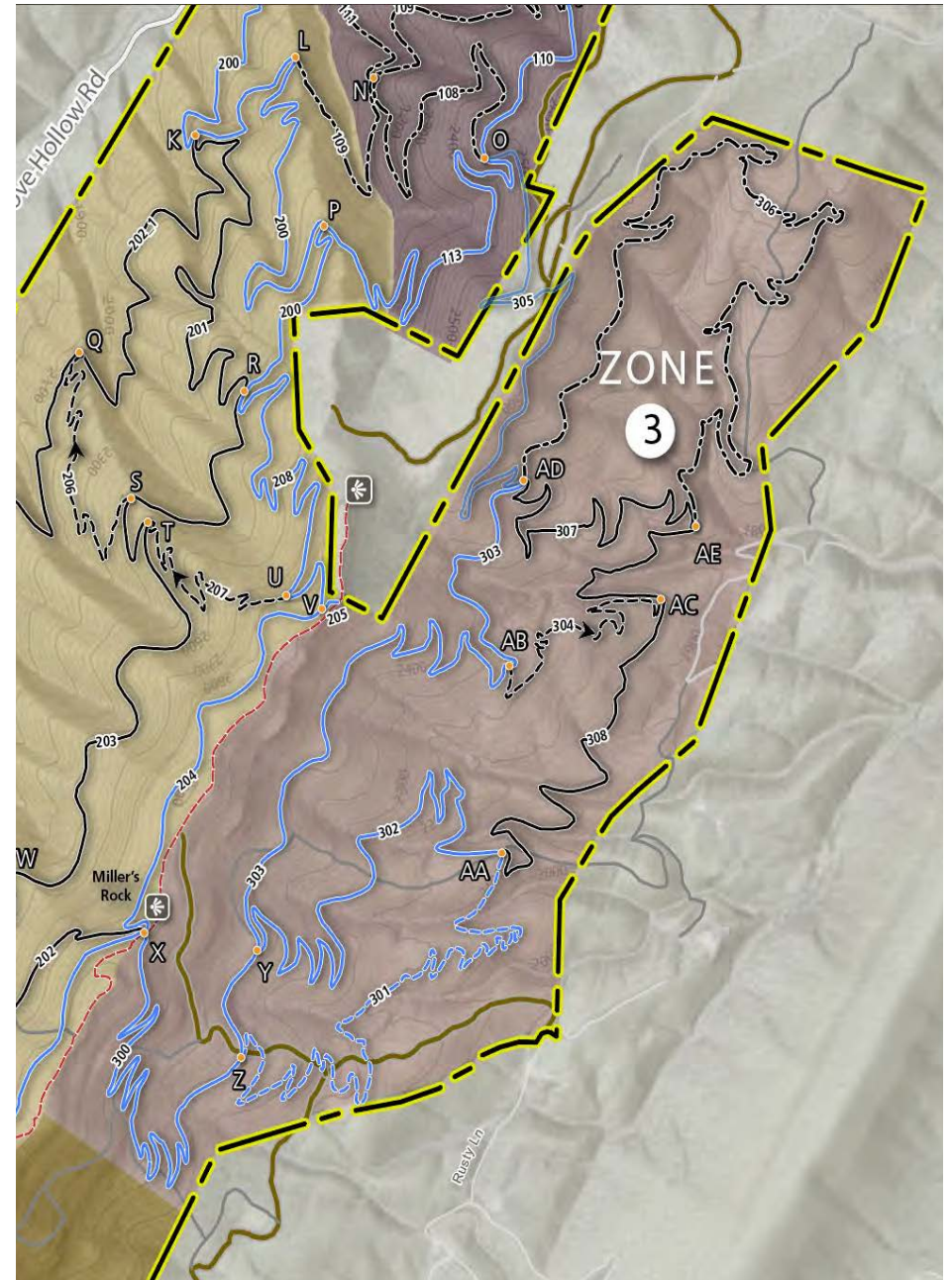
Given the terrain's natural restrictions and the distance from the trailhead, most of the trails in this zone are rated as intermediate or advanced. Riders have the flexibility to create their own loops and connections to tailor their riding experience. Trail segments 208 and 202 serve as crucial connection points leading up to Big Ridge, while also providing access to Zone 3. Design and construction of segments 200, 208, and 204 should be executed to accommodate aMTB's. Segment 204 parallels the Miller's Rock Trail just below the grade break along the hillside providing visual separation between the trails. Use of the existing Miller's Rock Trail is prohibited due to its designation as a horse trail. From the Ridge, users can choose to venture south towards Zone 4 and Zone 5 or reach the southern parking areas.

Zone 3: Over The Ridge

Zone 3, in the project site's remote northeast corner, features a network of technical intermediate and advanced trails. Approximately 14 miles of trail are planned for this Zone. These trails have been designed to immerse users in a backcountry experience. The terrain in this area mirrors the familiar ridges and hollows found throughout the site. However, on the eastern side of the ridge, the imposing Big Ridge cliff band adds an extra layer of challenge when it comes to developing a trail that leads to the more accessible ridge tops and side slopes further down the hillside.

Trail segment 300, is set to provide access to this eastern side of the ridge. This segment carves a path through the rocky cliff side, granting users the opportunity to explore the rugged terrain to the east. Another potential access point was identified to the north, creating a shorter route with connectivity to Zone 1 and the trailhead on the west side of the ridge. However, a short stretch of private land interrupts the flow between the hillsides to the north. To overcome this challenge, it's advisable to engage with the landowner, exploring the possibility of securing an easement across their property.

Additionally, the use of the existing maintenance road could significantly enhance the accessibility of this Zone, particularly for construction, maintenance and emergency responders.



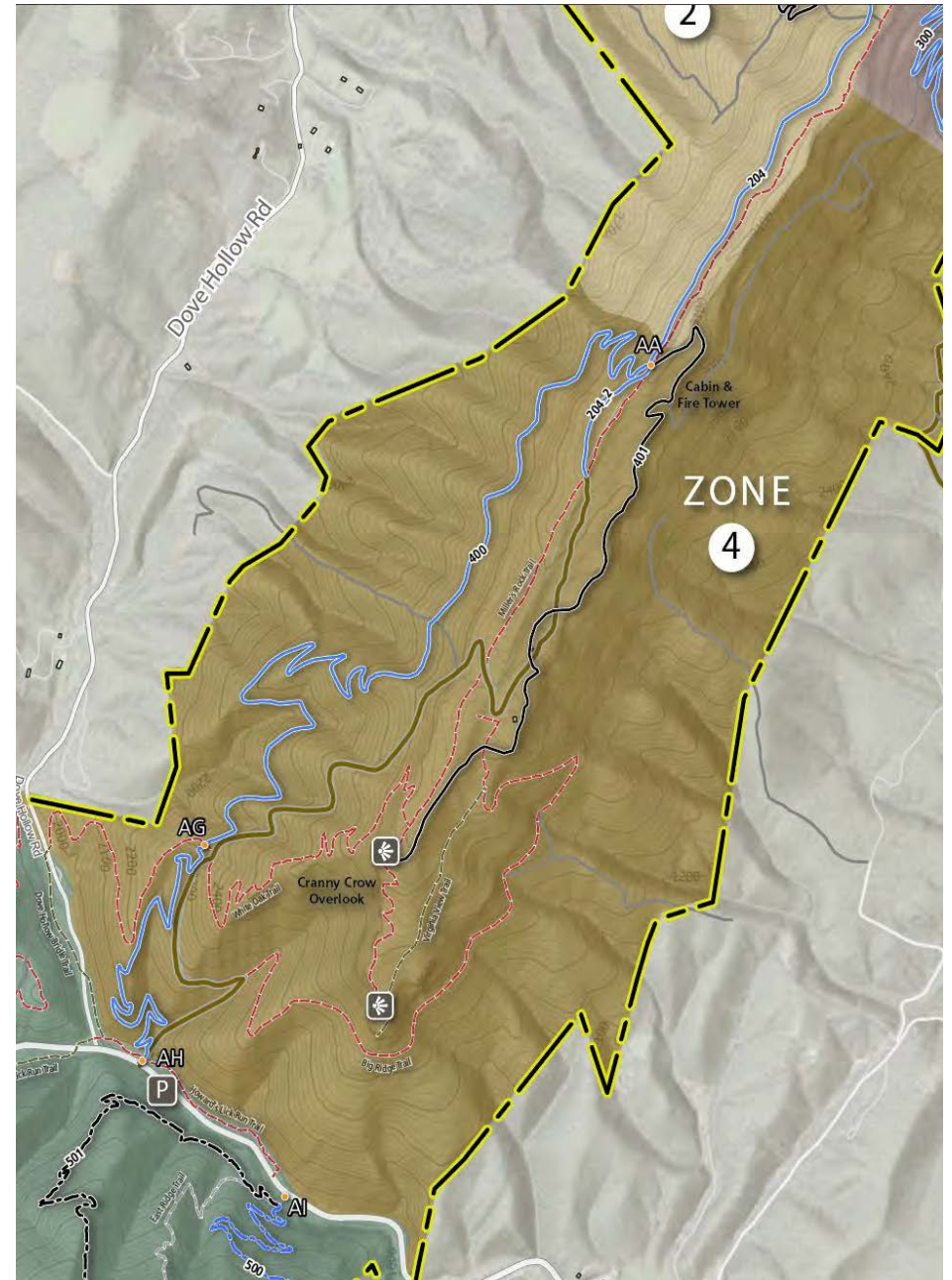


Zone 4: Big Ridge Connector

Zone 4, has 5 miles of planned trails. Situated north of Howards Lick Road, this Zone is a favorite area of the park's visitors. A primary objective of this plan is to establish a seamless link between the existing infrastructure to the south and the planned trail expansion in the park's northern region. Users can access this connection by utilizing trail segment 204, which connects to segment 400, both intermediate trails at the ridgetop cabin and fire tower. Segment 400 subsequently guides people to Howards Lick Road, where exploration of trails in Zone 5 and connectivity to park cabins and other amenities can be found.

Segment 204_2 creates an extension to the maintenance road from the fire tower to allow for additional access options. For those who prefer to stay on the ridge's high ground, trail segment 401 provides an out and back option for users to explore panoramic vistas from the Cranry Crow overlook, enjoy a picnic at the ridge-top cabin, or even spend the night in one of the campsites atop the ridge.

However, Zone 4 presents some unique challenges due to the presence of existing horse/hiking shared-use trails, where mountain bikers are not permitted. To access various park sites, mountain biking trail segments will need to cross these trails. Implementing comprehensive signage will be vital in mitigating any potential conflicts among different user groups along the ridge. Intersections have been located to provide good sightlines for all trail users.

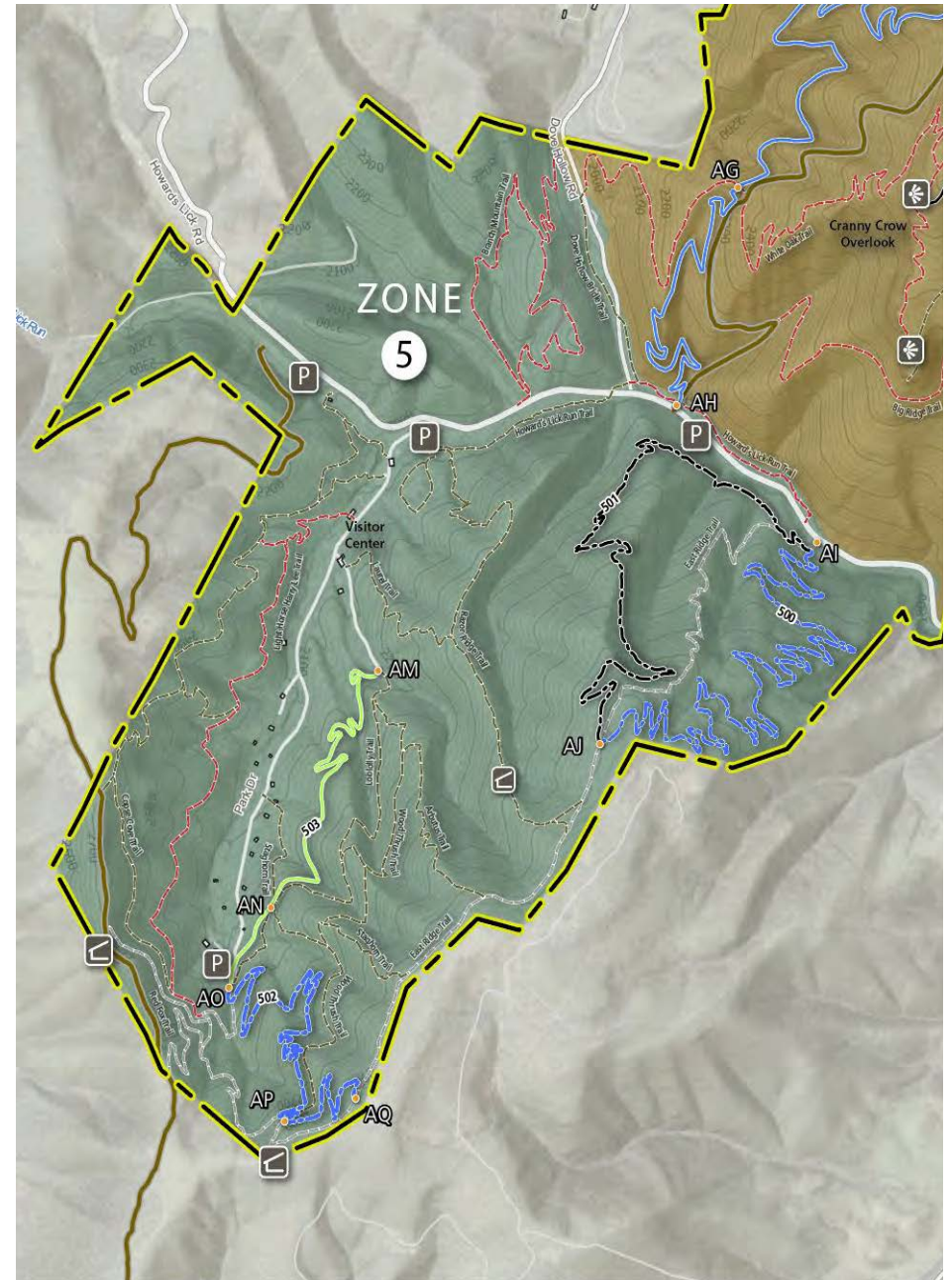


Zone 5: East Ridge Revamp

Zone 5, with 8 miles planned, situated at the southernmost part of the project area, hosts the majority of the park's infrastructure. Within this Zone, there's a notable concentration of recreation trails, primarily catering to hiking and equestrian enthusiasts. While some mountain bike trails do exist here, they suffer from unsustainable grades and conditions, rendering them unsuitable for all but the most experienced riders. Additionally, existing trails in the area, along with cabins, administrative buildings, utility infrastructure, and terrain limitations, pose constraints on potential new trail segments.

The primary goal in this region of the park is to establish new sustainable trail connections to East Ridge while providing user group separation to minimize conflicts.

The East Ridge trail, an already-established mountain biking route along the ridge's summit, offers a sought after trail experience. Planned trail segments 502 and 500 will provide a suitable route for mountain biking enthusiasts to access the ridge and savor the scenic descent. With the inclusion of trail segment 503, these trail sections offer a unique opportunity for park cabin occupants to enjoy an exhilarating mountain biking experience right from their doorstep. With few opportunities within the park for entry level riding experiences, Segment 503 with gentle grades suitable for beginners and young riders, will be a sought-after amenity for families staying at LRSP. Segment 503 will also provide additional entry level options for aMTB riders.





PHASE 1 DESIGN - SPRING 2023

Design Methodology & Approach

The methodology for this project included mapping data collection, desktop based site analysis, stakeholder and land manager discussions, field observations followed closely by field design and flagging of the Phase 1 corridors. These tasks supported the development of a sound design and the following document that guides the construction of Phase 1.

Desktop analysis included assessing existing trails and infrastructure in LRSP for sustainable expansion of the park's trail system and address visitor's needs. While sustainability and long-term durability of the trails is the primary focus of trail design, many other considerations were given during the field layout. The Phase 1 trails were designed to provide stacked loops of beginner and intermediate singletrack, with a focus on shared-use bike-optimized experiences intended be utilized by adaptive mountain bikes.

IMBA Trail Solutions worked with LRTC members, and LRSP staff during the site visit and field design to provide an efficient workflow and allow knowledge transfer.

Note: Just as planning sets the framework for design which refines conceptual trail corridors, design determines ground truthed trail alignments that inform permitting and procurement/contracting professional trail builders. Once trail builders are engaged and starting a project, continued design refinement is expected as the builder learns about site specific terrain/soils/hydrology and if unknown/underground constraints/opportunities are discovered.



Phase 1 (Flagged)

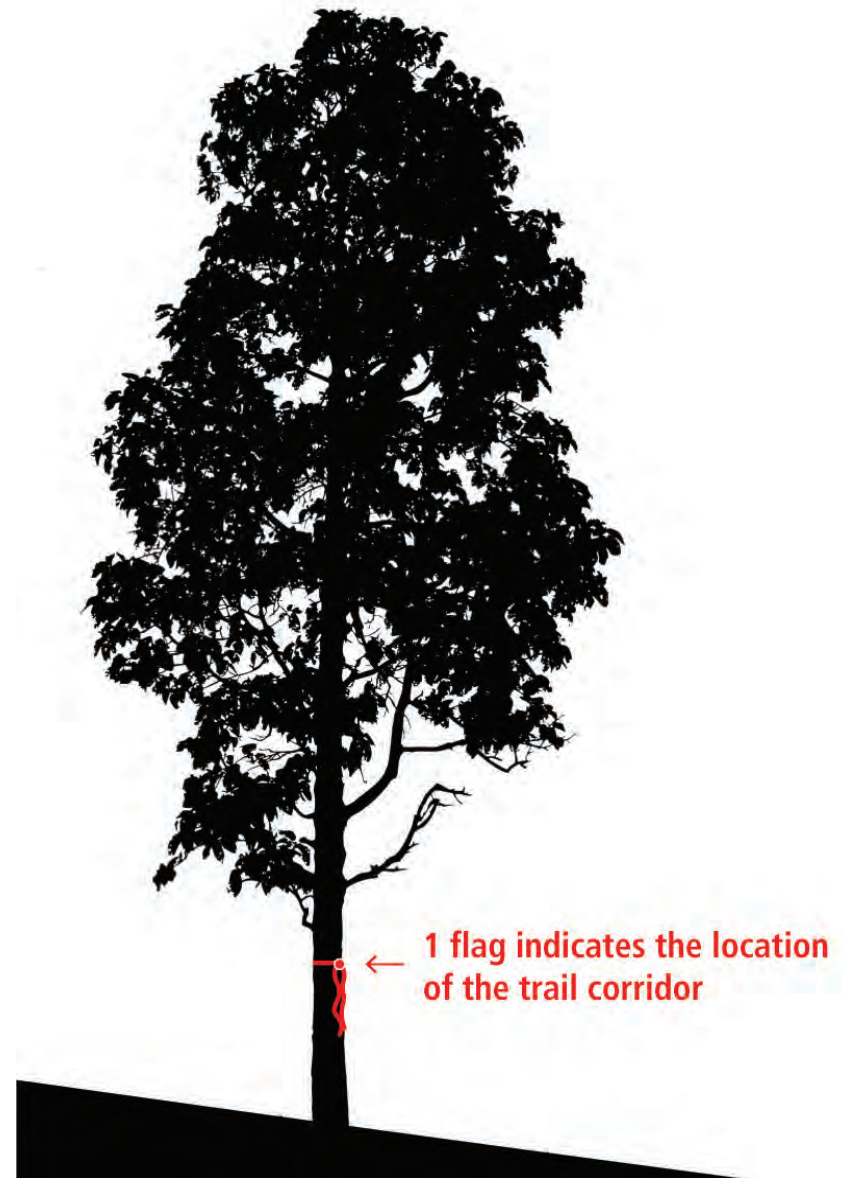
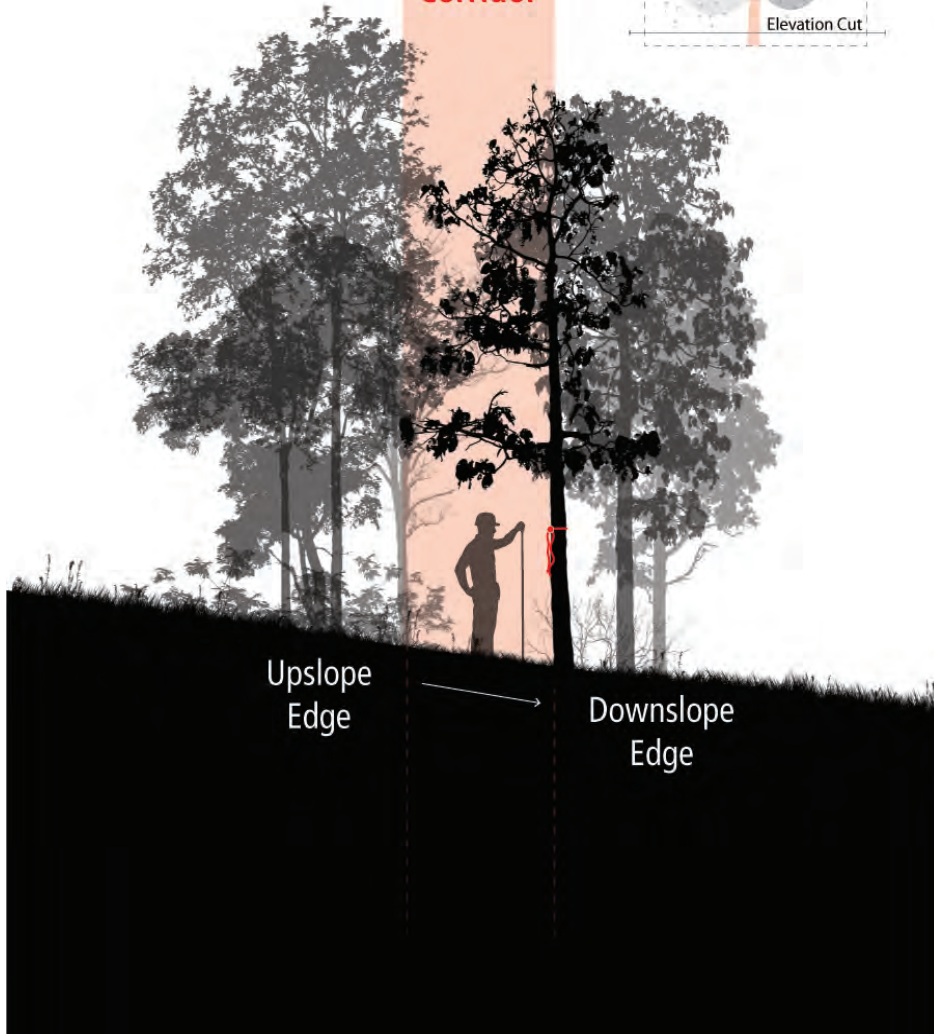
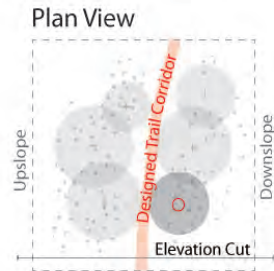
IMBA Trail Solutions marked the various trail segments of Phase 1 in blue, orange, and pink flagging. The following narratives describe each segment, a description of inventoried units can be found in Trail Inventory chart, and the detailed trail specifications can be found in Trail Specifications chart.

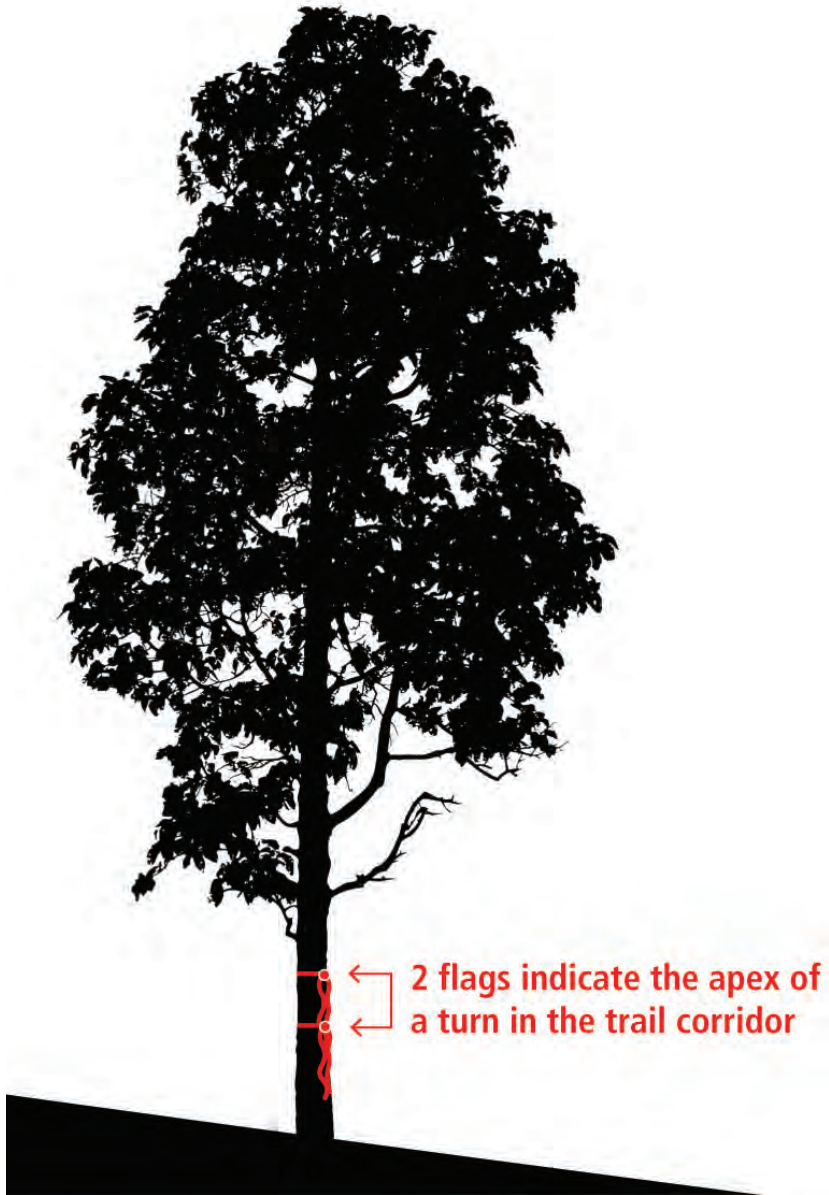
A construction/implementation cost opinion is provided for the flagged trail corridors (see chart p. 49). Phase 1 segments are labeled with the 100-series identifier, this numbering system is used to differentiate these segments from conceptual planning efforts.

Field marking includes intersection marking on corrugated plastic signs. These small signs are intended to provide detailed intersection layout in the field.



**Designed
Trail
Corridor**





Segment 100

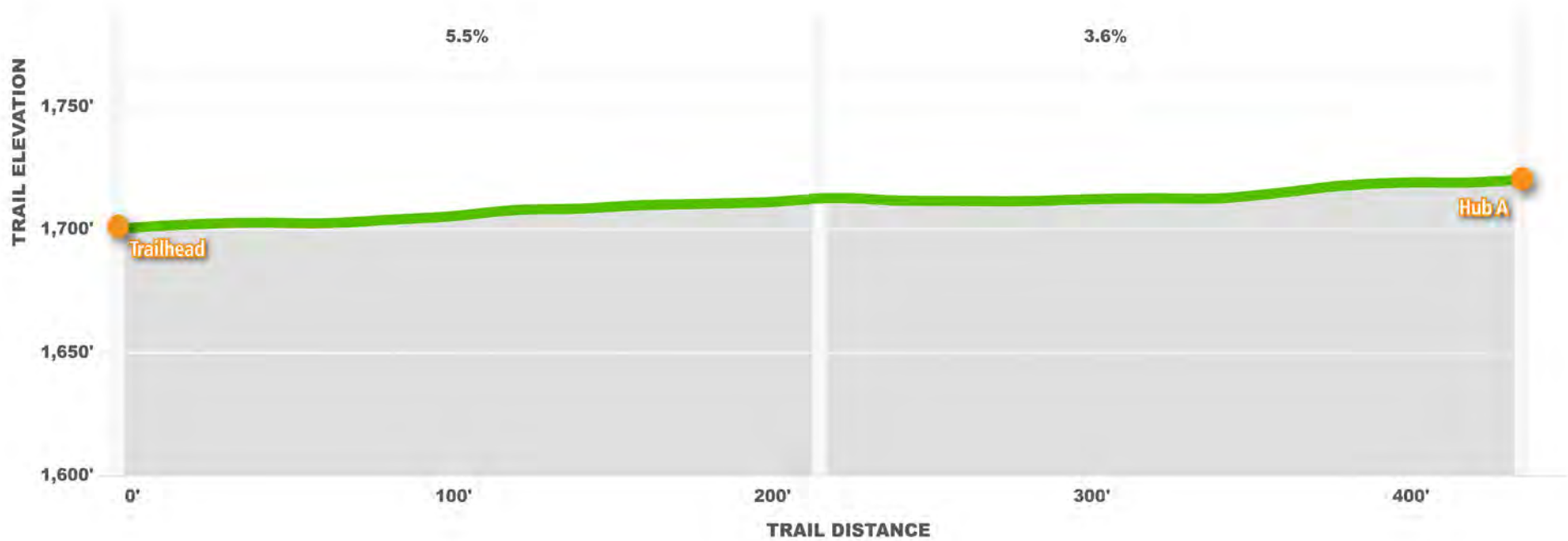
Length: 460 feet

Trail Type: Shared-Use, Beginner

Flagging Color: Blue

Average Grade: 4%

This bi-directional beginner trail segment provides an easy connection to Hub A from the existing trailhead off of Dove Hollow Road. This segment is intended to be temporary since the planned parking lot expansion and trail are in the same corridor.



Segment 101_1

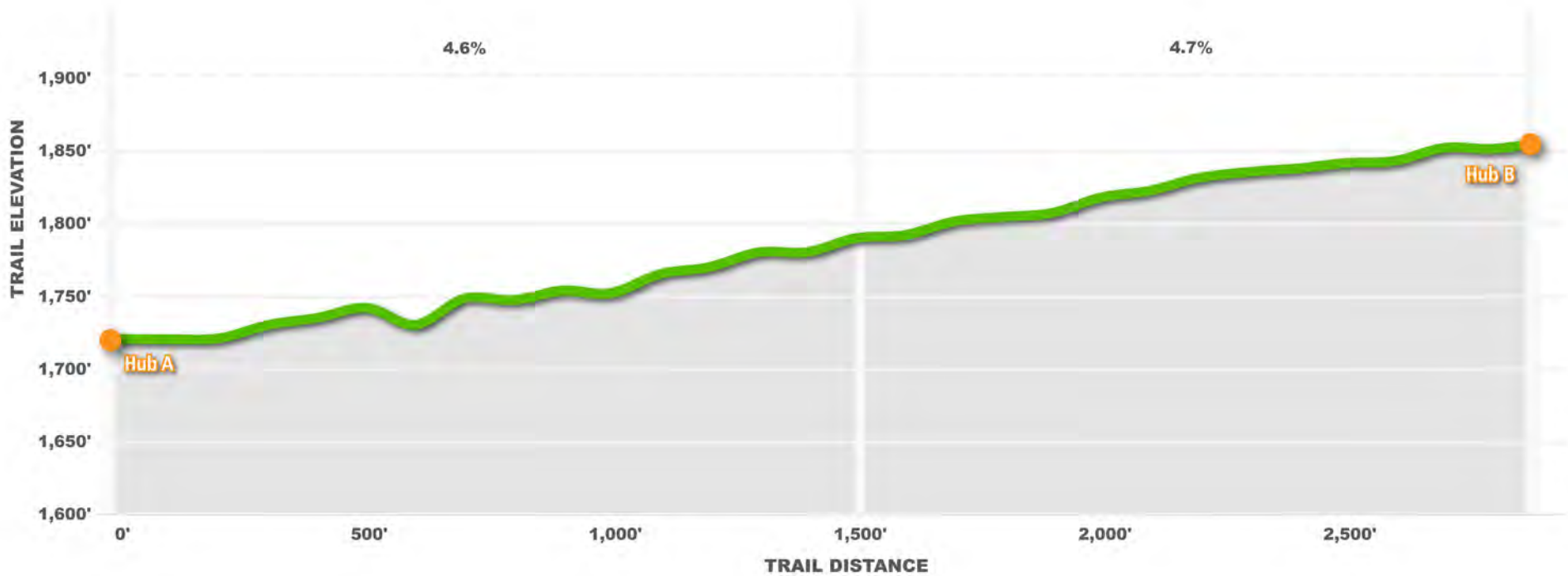
Length: 2,942 feet

Trail Type: Bike-Optimized, Beginner

Flagging Color: Pink

Average Grade: 5%

This bi-directional beginner level trail segment serves as the primary climb from Hub A to Hub B. Due to site constraints, the segment switchbacks its way up the ridge to gain elevation and avoid steeper side slopes to maintain a beginner trail feel.



Segment 101_2

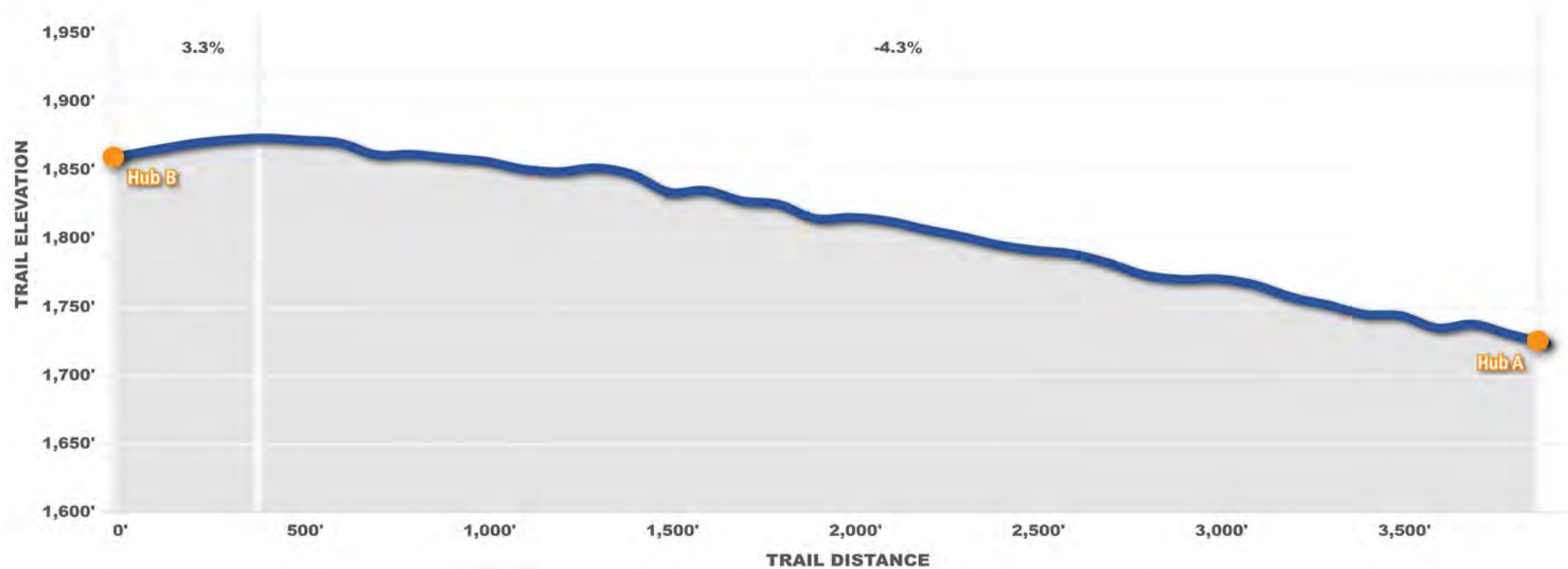
Length: 3,982 feet

Trail Type: Bike-Optimized, Intermediate

Flagging Color: Pink

Average Grade: 3%

This bi-directional intermediate level trail segment connects Hub A to Hub B. This segment was conceptualized as a beginner level trail, but due to site constraints, steeper side slopes, and a bridge crossing, an intermediate grade was deemed more appropriate for this segment.



Segment 102

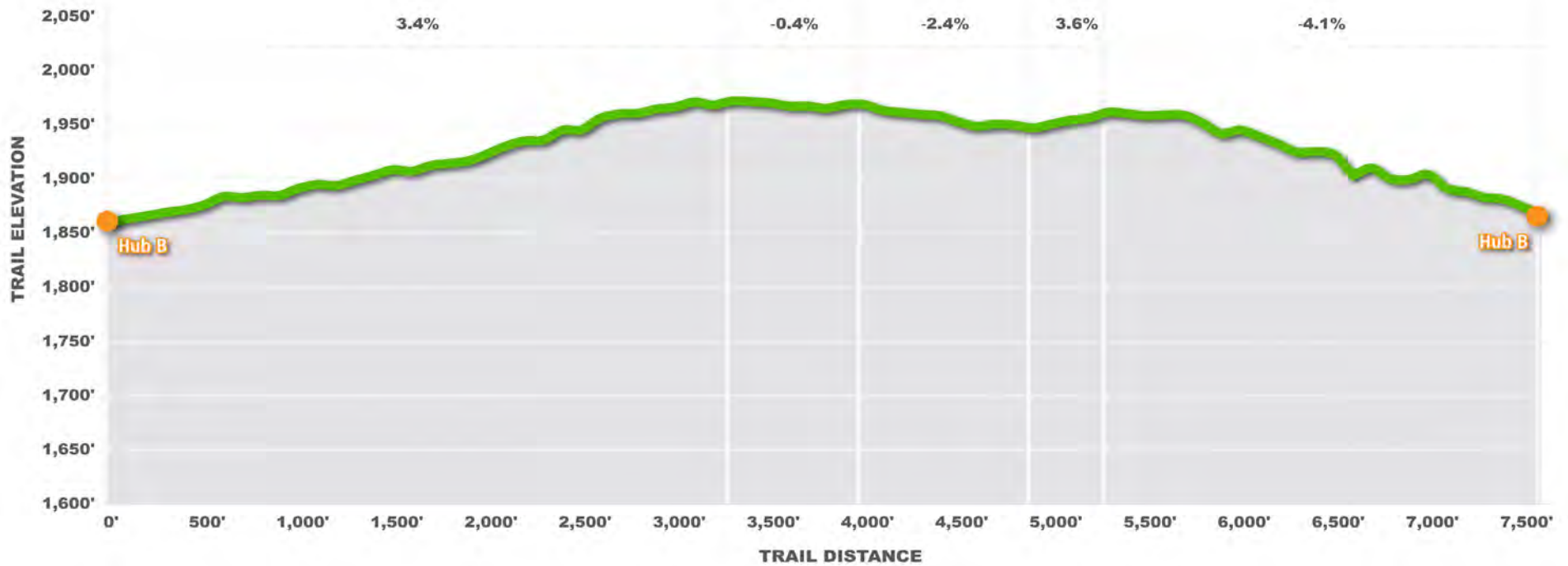
Length: 7,678 feet

Trail Type: Bike-Optimized, Beginner

Flagging Color: Orange

Average Grade: 3%

This is the longest segment of the Phase 1 design. Starting at Hub B, this bi-directional beginner trail traverses and climbs up the ridge tops before transitioning into a long contouring descent that returns to Hub B. This segment has several armored crossings and ravine overlook on the North end of the trail.



Trailheads and Amenities

Trailheads and access are vital to ensuring trail systems are used and loved by their visitors. A good trailhead can help create a sense of place and appropriate access means residents can feel connected to their open spaces. The existing trail system at LRSP have parking facilities for trailheads. It is advised that a trailhead is developed along with the planned trails at the north end of the park along Dove Hollow Road. A small parking area can be developed to accommodate approximately 10 vehicles. A larger potential parking area just above the access road gate has been identified on the concept plan and could accommodate over 30 vehicles.

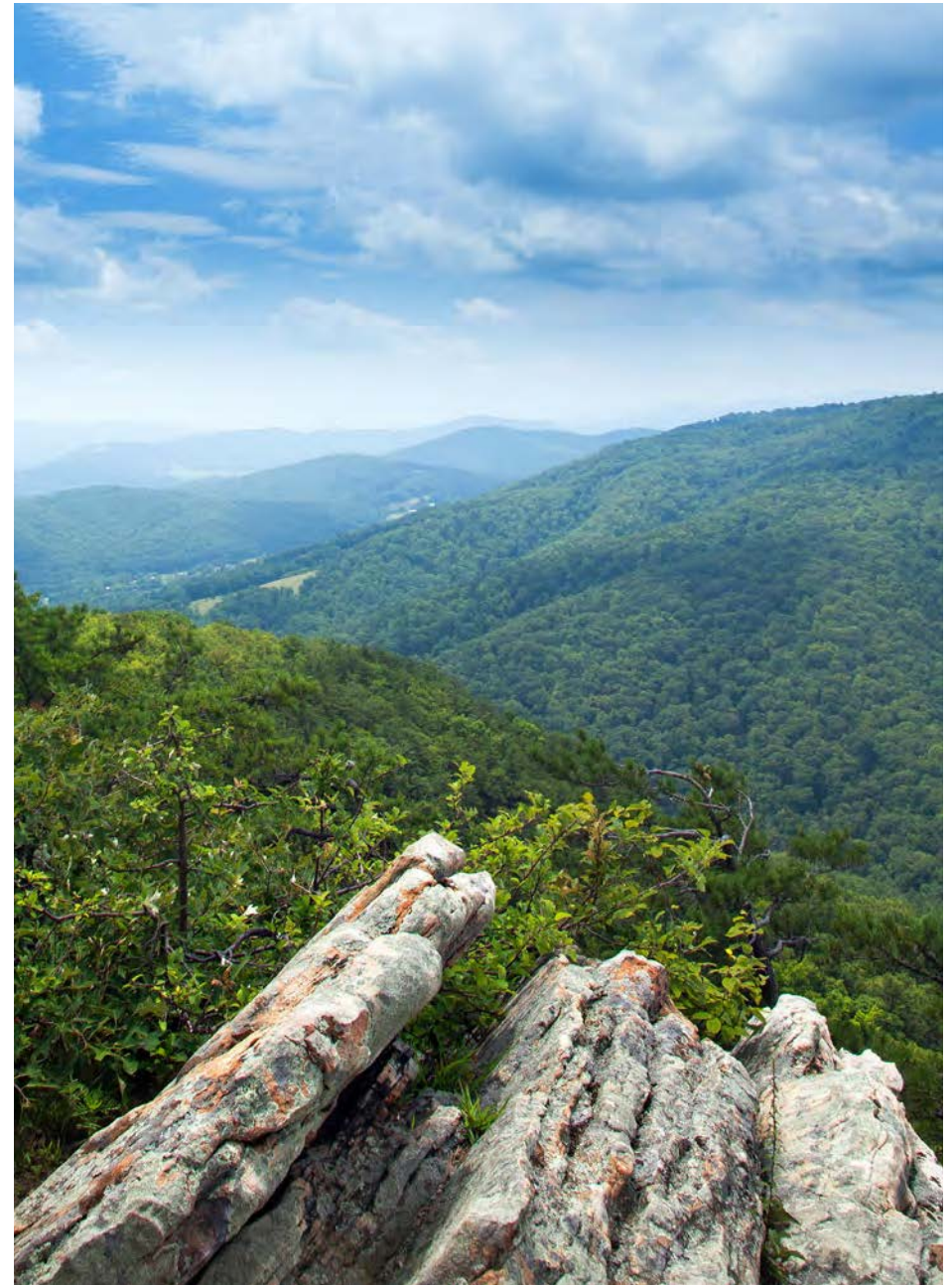
In addition to parking areas – restrooms, water fountains, changing stations, bike repair stations, informational signage, seating areas and other trailhead amenities welcome visitors while enhancing the trail experience. The site has an existing picnic shelter and restroom that can be utilized. Testing should be conducted to ensure the safety and workability of the well and septic system. Trailhead kiosks at all trailheads and key access points will be important to provide visitors with information about the trail network. Interpretive kiosks with trail maps should be provided and include route finding information, necessary safety information, user etiquette, and park rules. Wayfinding signage is recommended to guide users along the trails and include information on the different trail types, ability levels, directionality, and allowed user groups. It is also recommended that technical Trail Features be marked with warning signs. Please see the “Signage” section included in the Appendix for more information on recommended sign types.



PRIORITIZATION & COST OPINION

To provide sound financial investment and continue to build visitor excitement over time, a phased approach to construction is recommended. The trails should be constructed in phases to both allow access and help the community build their skills to enjoy more challenging segments.

IMBA Trail Solutions provides the following prioritization for the concept plan based upon staff and local feedback, professional guidance, and anticipated next steps. The phases are recommend sequencing and can be combined or split up as needed.



Lost River State Park - Trail Concept Cost Opinion

Segment Number	Zone	Style	Skill	User	aMTB Design	Phase	Direction	Status	Length (Feet)	Length (Miles)	Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
100	1	Traditional	Beginner	Hike, Bike	x	1	Bidirectional	Flagged	459.43	0.09	\$55,000.00	\$65,000.00	\$4,785.70	\$5,655.82
101_1	1	Bike Optimized	Beginner	Bike	x	1	Bidirectional	Flagged	2942.63	0.56	\$65,000.00	\$85,000.00	\$36,225.53	\$47,371.85
101_2	1	Bike Optimized	Intermediate	Bike	x	1	Bidirectional	Flagged	3982.54	0.75	\$65,000.00	\$85,000.00	\$49,027.43	\$64,112.80
102	1	Bike Optimized	Beginner	Bike	x	1	Bidirectional	Flagged	7678.24	1.45	\$65,000.00	\$85,000.00	\$94,523.78	\$123,608.03
103	1	Bike Optimized	Intermediate	Bike	x	2	Bidirectional	Concept	2154.23	0.41	\$65,000.00	\$85,000.00	\$26,519.90	\$34,679.88
104	1	Bike Optimized	Intermediate	Bike		5	Bidirectional	Concept	2418.67	0.46	\$65,000.00	\$85,000.00	\$29,775.28	\$38,936.90
105	1	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	3089.96	0.59	\$55,000.00	\$65,000.00	\$32,187.07	\$38,039.26
106	1	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	4508.07	0.85	\$55,000.00	\$65,000.00	\$46,959.06	\$55,497.07
107	1	Bike Optimized	Intermediate	Bike	x	2	Bidirectional	Concept	3908.30	0.74	\$65,000.00	\$85,000.00	\$48,113.54	\$62,917.70
108	1	Bike Optimized	Advanced	Bike		2	Bidirectional	Concept	4426.37	0.84	\$65,000.00	\$85,000.00	\$54,491.34	\$71,257.91
109	1	Bike Optimized	Advanced	Bike	x	3	Bidirectional	Concept	7104.15	1.35	\$65,000.00	\$85,000.00	\$87,456.37	\$114,366.02
110	1	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	20807.44	0.53	\$55,000.00	\$65,000.00	\$29,244.11	\$34,561.22
111	1	Bike Optimized	Advanced	Bike		2	Bidirectional	Concept	2874.95	0.54	\$65,000.00	\$85,000.00	\$35,392.35	\$46,282.31
112	1	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	1752.36	0.33	\$55,000.00	\$65,000.00	\$18,253.75	\$21,572.61
113	1	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	5869.79	1.11	\$55,000.00	\$65,000.00	\$61,143.64	\$72,260.67
200	2	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	10700.20	2.03	\$55,000.00	\$65,000.00	\$111,460.25	\$131,725.75
201	2	Traditional	Advanced	Hike, Bike	x	4	Bidirectional	Concept	5846.43	1.11	\$55,000.00	\$65,000.00	\$60,900.35	\$71,973.14
202_1	2	Traditional	Advanced	Hike, Bike		3	Bidirectional	Concept	4500.63	0.85	\$55,000.00	\$65,000.00	\$46,860.00	\$55,380.00
202_2	2	Traditional	Advanced	Hike, Bike		5	Bidirectional	Concept	16867.40	3.19	\$55,000.00	\$65,000.00	\$175,670.00	\$207,610.00
203	2	Traditional	Advanced	Hike, Bike		5	Bidirectional	Concept	8155.80	1.54	\$55,000.00	\$65,000.00	\$84,956.29	\$100,402.88
204	2	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	9660.74	1.83	\$55,000.00	\$65,000.00	\$100,632.69	\$118,929.55
205	2	Traditional	Intermediate	Hike, Bike		2	Bidirectional	Concept	899.07	0.17	\$55,000.00	\$65,000.00	\$9,365.29	\$11,068.07
206	2	Gravity	Advanced	Hike, Bike		3	Bidirectional	Concept	3726.15	0.71	\$65,000.00	\$85,000.00	\$45,871.14	\$59,985.33
207	2	Gravity	Advanced	Hike, Bike		3	Bidirectional	Concept	3157.64	0.60	\$65,000.00	\$85,000.00	\$38,872.50	\$50,833.27
208	2	Traditional	Intermediate	Hike, Bike	x	2	Bidirectional	Concept	7844.89	1.49	\$55,000.00	\$65,000.00	\$81,717.35	\$96,575.05
300	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	8873.68	1.68	\$55,000.00	\$65,000.00	\$92,434.16	\$109,240.37
301	3	Gravity	Intermediate	Bike		4	Downhill	Concept	9239.90	1.75	\$65,000.00	\$85,000.00	\$113,748.76	\$148,748.38
302	3	Traditional	Intermediate	Hike, Bike		4	Bidirectional	Concept	8175.51	1.55	\$55,000.00	\$65,000.00	\$85,161.58	\$100,645.51
303	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	9007.07	1.71	\$55,000.00	\$65,000.00	\$93,823.63	\$110,882.47
304	3	Gravity	Advanced	Bike		4	Downhill	Concept	3772.94	0.71	\$65,000.00	\$85,000.00	\$46,447.21	\$60,738.66
305	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	6636.92	1.26	\$55,000.00	\$65,000.00	\$69,134.59	\$81,704.52
306	3	Bike Optimized	Advanced	Bike		5	Bidirectional	Concept	13780.69	2.61	\$65,000.00	\$85,000.00	\$169,648.63	\$221,848.21
307	3	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	5087.37	0.96	\$55,000.00	\$65,000.00	\$52,993.43	\$62,628.60
308	3	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	7595.74	1.44	\$55,000.00	\$65,000.00	\$79,122.26	\$93,508.13
400	4	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	13100.21	2.48	\$55,000.00	\$65,000.00	\$136,460.53	\$161,271.54
400	4	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	5362.90	1.02	\$55,000.00	\$65,000.00	\$55,863.51	\$66,020.51
401	4	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	7875.47	1.49	\$55,000.00	\$65,000.00	\$82,036.15	\$96,951.82
500	5	Bike Optimized	Intermediate	Bike	x	5	Bidirectional	Concept	14098.79	2.67	\$65,000.00	\$85,000.00	\$173,564.65	\$226,969.16
501	5	Gravity	Advanced	Bike		5	Downhill	Concept	8914.21	1.69	\$65,000.00	\$85,000.00	\$109,739.38	\$143,505.35
502	5	Bike Optimized	Intermediate	Bike	x	5	Bidirectional	Concept	8083.14	1.53	\$65,000.00	\$85,000.00	\$99,508.29	\$130,126.23
503	5	Bike Optimized	Beginner	Bike	x	3	Bidirectional	Concept	5382.66	1.02	\$65,000.00	\$85,000.00	\$66,263.86	\$86,652.74
Total										49.68			\$2,936,355.34	\$3,637,045.26

Notes: cost estimates are for planning purposes only. This conceptual cost opinion provides ranges for the costs of construction and serves as a tool for planning purposes only. The cost opinion does not serve as a bid and does not include cost permitting, construction documents, and contractor mobilization or contingency

Phase 1: 2023 – 2024

The groundwork has been laid for the initial phase of trail development at LRSP. The IMBA Trail Solutions team field designed an initial 2.8 miles of trail during their spring 2023 site visit. This early design effort allowed LRSP members to apply for funding through West Virginia’s Recreational Trails Program (RTP) grant process. RTP grants are federal funded by the U.S. Department of Transportation’s Federal Highway Administration.

Construction could begin in 2024 depending on the timing of the grant award, permitting, and contracting. Construction of these trails should be underway before future phases are developed as future trails will build off these initial layouts. Design of the phase 2 trails could begin before construction is complete.



Lost River State Park - Phase 1 Trails Cost Opinion							Permitting Cost Range		Signage Cost Range		Construction Cost Range		Estimated Construction Cost	
Segment	Route Type or Amenity	Style	Skill	User	Direction	Length Miles					Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
100	Singletrack	Traditional	Beginner	Bike/Hike	Bidirectional	0.09								
101_1	Singletrack	Bike Optimized	Beginner	Bike/Hike	Bidirectional	0.56	\$15,000.00	\$22,000.00	\$10,000.00	\$24,000.00	\$65,000.00	\$85,000.00	\$36,225.54	\$47,371.86
101_2	Singletrack	Bike Optimized	Intermediate	Bike/Hike	Bidirectional	0.75					\$65,000.00	\$85,000.00	\$49,027.42	\$64,112.78
102	Singletrack	Bike Optimized	Beginner	Bike/Hike	Bidirectional	1.45					\$65,000.00	\$85,000.00	\$94,523.65	\$123,607.85
	Parking Area	10 Vehicle Capacity									\$8,000.00	\$12,000.00	\$8,000.00	\$12,000.00
						2.85					Construction Sub-Total		\$192,562.31	\$252,748.32
												Total	\$217,562.31	\$298,748.32

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Trail Specifications

Lost River State Park Phase 1

Trail Type	Unit	Directional	Feature Frequency ¹	Constructed Tread Width ^{2,3}	Ave Trail Grade per 1000'	Max Trail Grade: climbing ⁴	Max Trail Grade: descending ⁴	Min Turn Radius	Max Turnpad Grade ⁵	Max Berm/Turn Camber ⁶	Proposed Flagline Corridor Width	Corridor Width (4' above tread)	Corridor Height Minimum ⁷	Exposure (without railing)	Avoidable Obstacles (over 50% of tread or less)	Rollable Feature Height (jumps, berms, etc.)	Rugosity (surface texture) ⁸	Tread and trail features
Beginner Shared-Use	Linear Feet	Bi-directional	Low	48" or more	5%	7%	7%	N/A	N/A	N/A	50'	60"-72"	8'	N/A	N/A	N/A	Low	Firm trail surface. May include rock surfacing.
Beginner Bike Optimized	Linear Feet	Bi-directional	Low	48" or more	5%	15%	15%	N/A	N/A	N/A	50'	60"-72"	8'	N/A	less than 8"	12"-24"	Low	Semi-firm trail surface. May include rock surfacing.
Intermediate Bike Optimized	Linear Feet	Bi-directional	Medium	24" or more	7-10%	15%	15%	N/A	N/A	N/A	50'	30"-42"	8'	less than 48"	less than 16"	24"-48"	Medium	Semi-firm trail surface. May include rock surfacing.
Elevated Platform Turn	Each	N/A	N/A	N/A	N/A	N/A	N/A	8'	20%	20%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Firm trail surface. May include rock surfacing.
Elevated Berm Turn	Each	N/A	N/A	N/A	N/A	N/A	N/A	8'	20%	25%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Firm trail surface. May include rock surfacing.
Non-Elevated Turn	Each	N/A	N/A	N/A	N/A	N/A	N/A	10'	10%	25%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Semi-firm trail surface. May include rock surfacing.

1. Feature Frequency is averaged over long distances. Per 100': "low" = 2-3 features, "med" = 3-5 features, "high" = 5-10 features.
2. Constructed tread width may narrow over short distances to 50% of spec. Examples include rock or tree gateways.
3. Tread width also applies to bridges and boardwalks. Check with local regulations for overriding guidelines on width or any other requirements (height restrictions, railings, etc.).
4. Max grades climbing and descending refer to extremely short segments, 10 feet or less.
5. Corridor height should be reduced in thick laurel or rhododendron where appropriate to provide a more natural "tunnel experience".
6. Rugosity attempts to capture average tread coarseness. Tread area with obstacles: "low" = less than 5%, "med" = less than 20%, "high" = over 20%, "very high" = over 50%.

- Sustainable trails guidelines provide the foundation for all design + construction decisions ("half rule", frequent grade reversals, max grades function of soils + use, etc.).

- All trails should have a minimum grade and camber (in/outslope) of 3% to ensure a well-drained tread.

- aMTB Trail Width: 40-48+ inch wide trails will accommodate most adaptive equipment. Water crossings and bridges should accommodate 54" width.

Trail Unit Inventory

Lost River State Park Phase 1

Segment ID	Working title	Difficulty Rating	Symbol ¹	Use	Beginner Shared-Use (LF) ²	Beginner Bike-Optimized (LF) ²	Intermediate Bike-Optimized (LF) ²	Elevated Platform Turn (EA) ³	Elevated Berm Turn (EA) ³	Non-Elevated Turn (EA) ³	Non-Elevated Berm Turn (EA) ³	Rock Armor (LF) ⁴	Bridge Crossing (LF) ⁴
100	Beginner Shared-Use	Beginner	Green Circle	Bike/Hike	459	0	0	0	0	0	0	0	0
101_1	Beginner Mountain Bike Optimized	Beginner	Green Circle	Bike/Hike	0	2942	0	8	0	0	2	27	0
101_2	Intermediate Mountain Bike Optimized	Intermediate	Blue Square	Bike/Hike	0	0	3982	9	0	0	0	15	24
102	Beginner Mountain Bike Optimized	Beginner	Green Circle	Bike/Hike	0	7678	0	2	1	0	6	160	0

1. Symbol refers to the IMBA Trail Guidelines, which correspond to generally accepted signing conventions.
2. Trail Type quantities are based on field flagged corridors from May 2023. Trail Type lengths may vary due to normal trailbuilding field fit construction.
3. Turns are field designed. Turn quantities should not alter without written permission of the Client.
4. Rock armor quantities are based on field analysis and trail design. Rock armor quantities may change during construction.

Phase 2: 2024 – 2026

Phase 2 will add additional trail types and ability levels to Zone 1 and add connectivity along Big Ridge just past the fire tower to the maintenance road. This phase will add an additional 11.3 miles of trail. The new trailhead along Dove Hollow Road will provide the main access point but the addition of segment 204, which joins with the maintenance road along the ridge, will create connectivity to Howard’s Lick Road and other park amenities.

An outer intermediate loop is created with segments 105, 106, 110, 113, 200, and 112. Segment 208 joins this loop at Hub P, providing access to Big Ridge. Segments 103 and 107 will add shorter bike-optimized loop options for short sessionable laps. Segments 108 and 111 traverse some of the more technical terrain adding opportunities for advanced riders.

The addition of a larger second trailhead could be developed during phase 2 or 3 depending on capacity needs. This site can be located on the Flagged Trails Map on p. 39.

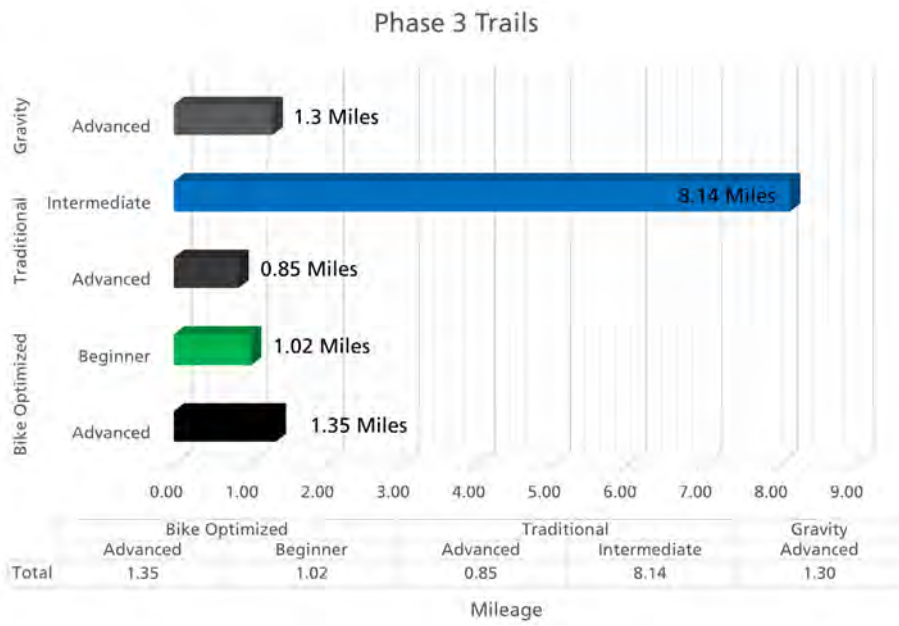
Depending on funding availability phase 2 may need to be broken down into sub phases for construction. Phase 2.1 construction could begin with segments 112, 200, 208, and 204. Phase 2.2 would include segments 103, 105, 106, 107, 110, 113, 108, and 111.



Lost River State Park - Phase 2 Concept Cost Opinion

Segment Number	Zone	Style	Skill	User	aMTB Design	Phase	Direction	Status	Length (Feet)	Length (Miles)	Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
103	1	Bike Optimized	Intermediate	Bike	x	2.2	Bidirectional	Concept	2154.23	0.41	\$65,000.00	\$85,000.00	\$26,519.90	\$34,679.88
105	1	Traditional	Intermediate	Hike, Bike	x	2.2	Bidirectional	Concept	3089.96	0.59	\$55,000.00	\$65,000.00	\$32,187.07	\$38,039.26
106	1	Traditional	Intermediate	Hike, Bike	x	2.2	Bidirectional	Concept	4508.07	0.85	\$55,000.00	\$65,000.00	\$46,959.06	\$55,497.07
107	1	Bike Optimized	Intermediate	Bike	x	2.2	Bidirectional	Concept	3908.30	0.74	\$65,000.00	\$85,000.00	\$48,113.54	\$62,917.70
108	1	Bike Optimized	Advanced	Bike		2.2	Bidirectional	Concept	4426.37	0.84	\$65,000.00	\$85,000.00	\$54,491.34	\$71,257.91
110	1	Traditional	Intermediate	Hike, Bike	x	2.2	Bidirectional	Concept	20807.44	0.53	\$55,000.00	\$65,000.00	\$29,244.11	\$34,561.22
111	1	Bike Optimized	Advanced	Bike		2.2	Bidirectional	Concept	2874.95	0.54	\$65,000.00	\$85,000.00	\$35,392.35	\$46,282.31
112	1	Traditional	Intermediate	Hike, Bike	x	2.1	Bidirectional	Concept	1752.36	0.33	\$55,000.00	\$65,000.00	\$18,253.75	\$21,572.61
113	1	Traditional	Intermediate	Hike, Bike	x	2.2	Bidirectional	Concept	5869.79	1.11	\$55,000.00	\$65,000.00	\$61,143.64	\$72,260.67
200	2	Traditional	Intermediate	Hike, Bike	x	2.1	Bidirectional	Concept	10700.20	2.03	\$55,000.00	\$65,000.00	\$111,460.25	\$131,725.75
204	2	Traditional	Intermediate	Hike, Bike	x	2.1	Bidirectional	Concept	9660.74	1.83	\$55,000.00	\$65,000.00	\$100,632.69	\$118,929.55
208	2	Traditional	Intermediate	Hike, Bike	x	2.1	Bidirectional	Concept	7844.89	1.49	\$55,000.00	\$65,000.00	\$81,717.35	\$96,575.05
Total									77597.30	11.29			\$646,115.05	\$784,298.97

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Phase 3: 2027 - 2030

Phase 3 focuses on building out more intermediate mileage in Zones 2, 3, and 4. Securing an easement across the top of the ridge at the north end of the park will be critical before the development of segment 305. Combined with segments 300 and 303 a longer loop to Miller’s Rock can be created. Zone 2 development should include segments 206 and 207. These trails introduce a downhill only gravity experience to the trail system. A short segment of 202, between hubs Q and K will be needed to complete the loop. Segment 400 will complete singletrack access from Howards Lick Road to the cabin and fire tower on the ridgetop. This is an important trail for connectivity and opens up access from the main park headquarters to a wider range of riders. While most of the focus has been on the northern end of the park, segment 503 in Zone 5, should be constructed during this phase. This will provide an easy to access trail for kids and families close to park amenities.

Lost River State Park - Phase 3 Concept Cost Opinion

Segment Number	Zone	Style	Skill	User	aMTB Design	Phase	Direction	Status	Length (Feet)	Length (Miles)	Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
109	1	Bike Optimized	Advanced	Bike	x	3	Bidirectional	Concept	7104.15	1.35	\$65,000.00	\$85,000.00	\$87,456.37	\$114,366.02
202_1	2	Traditional	Advanced	Hike, Bike		3	Bidirectional	Concept	4500.63	0.85	\$55,000.00	\$65,000.00	\$46,860.00	\$55,380.00
206	2	Gravity	Advanced	Hike, Bike		3	Bidirectional	Concept	3726.15	0.71	\$65,000.00	\$85,000.00	\$45,871.14	\$59,985.33
207	2	Gravity	Advanced	Hike, Bike		3	Bidirectional	Concept	3157.64	0.60	\$65,000.00	\$85,000.00	\$38,872.50	\$50,833.27
300	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	8873.68	1.68	\$55,000.00	\$65,000.00	\$92,434.16	\$109,240.37
303	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	9007.07	1.71	\$55,000.00	\$65,000.00	\$93,823.63	\$110,882.47
305	3	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	6636.92	1.26	\$55,000.00	\$65,000.00	\$69,134.59	\$81,704.52
400	4	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	13100.21	2.48	\$55,000.00	\$65,000.00	\$136,460.53	\$161,271.54
400	4	Traditional	Intermediate	Hike, Bike	x	3	Bidirectional	Concept	5362.90	1.02	\$55,000.00	\$65,000.00	\$55,863.51	\$66,020.51
503	5	Bike Optimized	Beginner	Bike	x	3	Bidirectional	Concept	5382.66	1.02	\$65,000.00	\$85,000.00	\$66,263.86	\$86,652.74
Total									66852.01	12.66			\$733,040.29	\$896,336.77

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Phase 4: 2030 - 2032

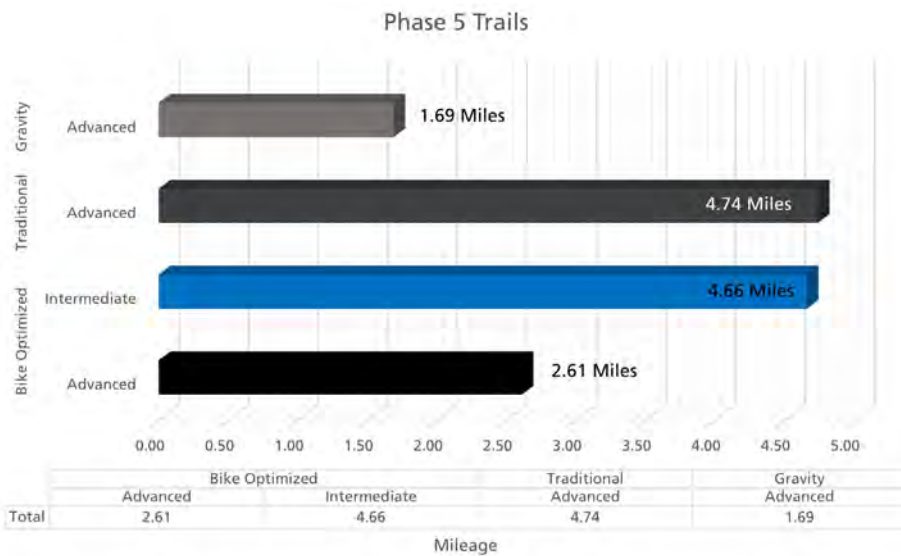
Phase 4 development is concentrated around Zone 3, building out more intermediate and advanced loops in this little visited area of the park. With the connection of segment 305 riders will be able to access trails for a more remote backcountry experience. Currently access to Zone 3 is limited. Existing maintenance roads may need improvements or easements may need to be secured for construction, maintenance, and emergency access prior to construction in this zone.



Lost River State Park - Phase 4 Concept Cost Opinion

Segment Number	Zone	Style	Skill	User	aMTB Design	Phase	Direction	Status	Length (Feet)	Length (Miles)	Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
201	2	Traditional	Advanced	Hike, Bike	x	4	Bidirectional	Concept	5846.43	1.11	\$55,000.00	\$65,000.00	\$60,900.35	\$71,973.14
301	3	Gravity	Intermediate	Bike		4	Downhill	Concept	9239.90	1.75	\$65,000.00	\$85,000.00	\$113,748.76	\$148,748.38
302	3	Traditional	Intermediate	Hike, Bike		4	Bidirectional	Concept	8175.51	1.55	\$55,000.00	\$65,000.00	\$85,161.58	\$100,645.51
304	3	Gravity	Advanced	Bike		4	Downhill	Concept	3772.94	0.71	\$65,000.00	\$85,000.00	\$46,447.21	\$60,738.66
307	3	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	5087.37	0.96	\$55,000.00	\$65,000.00	\$52,993.43	\$62,628.60
308	3	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	7595.74	1.44	\$55,000.00	\$65,000.00	\$79,122.26	\$93,508.13
401	4	Traditional	Advanced	Hike, Bike		4	Bidirectional	Concept	7875.47	1.49	\$55,000.00	\$65,000.00	\$82,036.15	\$96,951.82
Total									47593.36	9.01			\$520,409.75	\$635,194.23

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Phase 5: 2033 - 2038

Phase 5 includes many longer distance trail segments which will help disperse use as the trail system is built out and becomes more popular. The trail segments in this phase range from around 1.5 miles to over 3 miles long. Development may happen over a longer period with segments constructed as more mileage is desired. Zone 5 would see improvements to the existing trail offerings with the addition of segments 500, 501, and 502 creating new bike friendly connections to East Ridge.

Lost River State Park - Phase 5 Concept Cost Opinion

Segment Number	Zone	Style	Skill	User	aMTB Design	Phase	Direction	Status	Length (Feet)	Length (Miles)	Unit Cost Low	Unit Cost High	Estimated Cost Low	Estimated Cost High
104	1	Bike Optimized	Intermediate	Bike		5	Bidirectional	Concept	2418.67	0.46	\$65,000.00	\$85,000.00	\$29,775.28	\$38,936.90
202_2	2	Traditional	Advanced	Hike, Bike		5	Bidirectional	Concept	16867.40	3.19	\$55,000.00	\$65,000.00	\$175,670.00	\$207,610.00
203	2	Traditional	Advanced	Hike, Bike		5	Bidirectional	Concept	8155.80	1.54	\$55,000.00	\$65,000.00	\$84,956.29	\$100,402.88
306	3	Bike Optimized	Advanced	Bike		5	Bidirectional	Concept	13780.69	2.61	\$65,000.00	\$85,000.00	\$169,648.63	\$221,848.21
500	5	Bike Optimized	Intermediate	Bike	x	5	Bidirectional	Concept	14098.79	2.67	\$65,000.00	\$85,000.00	\$173,564.65	\$226,969.16
501	5	Gravity	Advanced	Bike		5	Downhill	Concept	8914.21	1.69	\$65,000.00	\$85,000.00	\$109,739.38	\$143,505.35
502	5	Bike Optimized	Intermediate	Bike	x	5	Bidirectional	Concept	8083.14	1.53	\$65,000.00	\$85,000.00	\$99,508.29	\$130,126.23
Total									72318.70	13.70			\$842,862.52	\$1,069,398.72

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IMPLEMENTATION

Permitting and Compliance

All construction projects are subject to regulatory requirements. This section provides a brief breakdown of anticipated permitting needs to implement this plan. The list is general in nature and is intended only to provide high-level planning for future trail development phases.

Obtaining proper permits ensures that work follows local, state, and federal laws as this trails concept plan is implemented. Working under permits can also help trailbuilders – and visitors – to be good stewards of the land. Permitting needs can be affected equally by landscape features and funding sources. Both should be identified during the design phases to ensure relevant permitting is completed.

People use trails for all kinds of reasons – but a chief motivator among visitors is to enjoy the outdoors. Ground disturbance and uncontrolled erosion and sedimentation can negatively impact our environment, water quality, and flora and fauna. These impacts are also unsightly and, if not quickly mitigated, can rapidly increase maintenance costs and ultimately create trails that visitors no longer want to visit.

National Pollutant Discharge Elimination System (NPDES)

Construction General Permit (CGP)

Clean Water Act 404

Clean Water Act 401

Environmental and Cultural Review

Depending on funding sources, various levels of review may be required. For instance, Recreational Trails Program (RTP) grants will require environmental and historical reviews compliant with the National Environmental Policy Act due to use of Federal Highway Administration funds. Reviews may be for federal- or state-listed threatened and endangered species, in conjunction with state historical preservation offices or for other unidentified reasons. Other grants or funding sources may require similar, less, or more review during the design phases prior to construction. It is also possible that consultation with United States Fish and Wildlife Service will be required depending on final funding source and scope of construction.



Utility Locate

It is against state law to excavate or grade without a utility location. It is extremely important that contractors notify the applicable organizations in a timely fashion for utility location services prior to construction.

General Construction Guidelines

Most of the recommended trails require extensive mechanized construction which in turn requires experience and knowledge. Trail Solutions recommends the trail alignments be constructed by professional trail builders.

Maintenance and Stewardship

Trails should be managed according to recommended difficulty guidelines, trail type guidelines, and respective trail narratives. Master planning and design will provide these detailed guidance documents. Maintenance is an ongoing cost and should be planned for from the beginning. Typical annual maintenance budgets for traditional and mountain bike-optimized trails are 5%-15% of the installation cost, and gravity trails can be closer to 20%-25% of the construction cost. Some of the annual maintenance for all trails can be performed by adequately managed and trained volunteers. These tasks will include corridor trimming, downed tree removal, general clean up (branches, leaf litter, etc.), and minor drainage work. Professional assistance will occasionally be required. The frequency will depend upon ongoing maintenance as well as weather patterns and use. Typically for cross-country trails, professional maintenance will be required every 10-20 years and will involve small reroutes, major drainage work, or other large tasks. Gravity trails can be expected to need professional help every 5 years or so as trails wear through weather and use. This will typically come in the form of rebuilding large dirt features and upgrading trails to provide slightly new experiences which help continue to draw regional riders, give locals something new, and help all riders progress in their skills. Bike facilities such as pumptracks and skills features can



typically be maintained by traditional parks staff. Maintenance can include seal coating, grass cutting, checking fasteners, and wear/tear on wood. Increasingly, destination mountain bike trail systems are funding and hiring part- or full-time staff to provide maintenance to trail systems. Ensuring a quality, consistent riding experience is key to attracting visitors and keeping a local riding community satisfied and growing.

Programming

To fully activate and create a community around outdoor recreation and mountain biking, certain programming is recommended. LRTC along with the Hardy County Composite NICA Team are at the forefront of the mountain bike community in Hardy County and are helping provide young riders with an introduction to the sport and access to mountain bikes. Kids should also be encouraged to organize events or races to get their peers excited about the sport, additionally this supports their own educational and leadership skills. Mountain bike skills clinics and/or guided rides can be provided by area groups such as LRTC and other regional organizations to help introduce the sport to new riders, helping them to improve their skills, and providing instruction for aMTB riders adjusting to unfamiliar equipment. The trail system provides the potential to train for competitions. Having scheduled volunteer days keeps the community engaged, invested in their local trails, and helps improve the conditions of the trails while reducing the maintenance workload of land managers. Events and programming keep visitation numbers high throughout the year.



CONCLUSION

This document presents the feasibility, key opportunities, constraints, and recommendations for the development of trails and related facilities for LRSP. The area of interest offers incredible terrain, ample open space, and amazing views. When coupled with existing and proposed facilities, the property offers highly suitable conditions for trail development that will create a destination worthy system. The planned trails and amenities provide an engaging experience for visitors of all ability levels and preferred trail styles. The incorporation of these trails and related infrastructure introduces new features to the area, adding to the appeal of the region and attracting new visitors. Overall, the development of trail infrastructure encourages residents to enjoy the outdoors and improves the quality of life for local residents.



APPENDIX A: GENERAL TRAIL PLANNING AND DESIGN GUIDELINES

The following are guidelines for the construction and maintenance of trails. The natural environment is dynamic and unpredictable. The nature of recreational trails and roads, the desired user experience, and the constant forces acting on natural surface trails and roads make strict standards untenable and undesirable. As such, the guidelines below are simply that: best management practices that should be followed within environmental constraints.

Trail System Design

Mountain Bike-Optimized Trails and Preferred Direction Trails

Mountain bike-optimized singletrack trails are designed and constructed to enhance trail experiences specifically for mountain bikers. Mountain bike-optimized trails might differ from traditional trails in several ways: enhanced tread shaping, directional or one-way travel, and the addition of man-made technical trail features (TTFs). Bicycles move differently along a trail than other modes of transportation. The movement of the wheel, the use of gravity and friction, the transfer of energy from the rider to the wheel – these offer both opportunities and constraints for trails and trail features that may differ from those of other users.

Mountain bike-optimized and one-way trails that harness gravity are a growing area of interest for mountain bikers. These trails can be designed and built at any level, from beginner friendly flow trails to extremely difficult race-oriented downhill trails. Riders cherish the feeling of flight that a bicycle provides while coasting through a succession of bike-optimized features from top to bottom. A consistent trail is not necessarily a boring or easy trail (though it can be), it's one that is designed such that a preceding section of trail prepares users for

the subsequent sections. This is a hallmark of flow trails and can be particularly important for beginner trails, as well as for higher speed trails with gravity features, such as jumps and drops.

As trail systems grow and become congested, one-way trails help to take the pressure off popular shared-use trails. Riders looking for speed, thrill, and challenge will have their own designated areas, and users traveling at slower speeds will have their own trails. Well-designed mountain bike-optimized singletrack and gravity singletrack are exciting for mountain bikers but are also designed to help manage risk and minimize user conflict

Rolling Contour Design

Providing consistent climbs and extended descents is a design priority. Trails may contour gently up or down for consistent lengths to maximize climbs and



descents. This is known as rolling contour design. All shared-use trails should be of rolling contour design to minimize impact and sedimentation in the watershed.

Stacked Loops

A stacked-loop system is a series of loops somewhat like links in a chain. The loops can vary in length and difficulty. In a stacked-loop system, the loops that are closest to the trailheads are more inviting to novice riders, and the loops further out cater to more advanced riders. This creates a progression of experiences and challenges as users explore the trails in more depth.

Progressive Hubs and Clusters

A trail system of hubs and clusters looks more like spokes radiating out from a central junction and intersecting at various points. A trailhead or major intersection is a hub. A cluster is a concentration of trails radiating out from the hub. Like a stacked loop system, hubs and clusters are designed with skill level progression in mind. Hubs and clusters give users more trail options for varying skill levels at each hub, allowing for skill level diversity. At many intersections,



riders have the option to change trail difficulty or continue on the same difficulty level.

With progressive trail features, a mountain biker may become a better rider by gradually moving up in trail difficulty. This practice also spreads out visitors and helps reduce trail user conflict. This is also a proven risk management tool. Signage shows difficulty levels at every hub and wherever necessary in the trail system to help users choose trails based on their skill levels and desired experience. Giving riders the option to warm up before hitting more technical segments provides a level of safety in the system.

Loops and clusters are often favored over out-and-back routes because they offer variety. People love the adventure of starting down one path and returning to the same point by way of a different trail. With loops or clusters in a trail system, visitors can choose a short route, a combination of routes, or a long outer route.

Progressive design and construction also allow users of different levels to ride the trails in the same system, so families and groups can enjoy being together in one place and riders can find a trail that matches their skills and progress.



Trail Difficulty Rating System

In order for a trail system to provide the varied riding experiences and skill progression which trail users seek, the trails must be built to provide relatively specific challenges and riding characteristics. For the purposes of this conceptual trail plan, the difficulty rating system has been simplified into three levels:

- Easiest Trails, Green Lines (green circle) – For beginners, these trails have a smoother and wider tread, lower trail grades, and less exposure.
- More Difficult, Blue Lines (blue square) – For intermediate riders, these trails can be steeper, more technically difficult, or longer.
- Very to Extremely Difficult Trails, Red Lines (black diamond or double black diamond) – For advanced riders, these trails offer a combination of difficult trail tread, technical features, and long distances for those looking for challenge and endurance-oriented experiences. Generally, they have significant exposure and have less predictable surfaces.

This system was adapted from the International Trail Marking System used at ski areas throughout the world. Many trail networks use this type of system, most notably resort-based mountain biking trail networks. The system applies well to mountain bikers and is also applicable to other visitors such as hikers and equestrians. These ratings should be posted on trail signage and in all maps and descriptions. Following is a summary of criteria to be considered when implementing a trail rating system.

Tread Width

The average width of the active tread or beaten path of the trail.

Tread Surface

The material and stability of the tread surface is a determining factor in the difficulty of travel on the trail. Some descriptive terms include hardened (paved or surfaced), firm, stable, variable, widely variable, loose, and unpredictable.

Trail Grade (maximum and average)

Maximum grade is defined as the steepest section of trail that is more than approximately 10 feet in length and is measured in percent with a clinometer. Average grade is the steepness of the trail over its entire length. Average grade can be calculated by taking the total elevation gain of the trail, divided by the total distance, multiplied by 100 to equal a percent grade.






Natural Obstacles and Technical Trail Features

Objects that add challenge by impeding travel. Examples of natural obstacles include rocks, roots, logs, holes, ledges, drop-offs. The height of each obstacle is measured from the tread surface to the top of the obstacle. If the obstacle is uneven in height, measure to the point over which it is most easily ridden. Technical trail features are objects that have been introduced to the trail to add technical challenge. Examples include rocks, logs, elevated bridges, teeter-totters, jumps, drop-offs. Both the height and the width of the technical trail feature are measured.



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" or more	36" or more	24" or more	12" or more	6" 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" tall or less Avoidable obstacles may be present Unavoidable bridges 36" or wider	Unavoidable obstacles 8" tall or less Avoidable obstacles may be present Unavoidable bridges 24" or wider TTF's 2' high or less, width of deck is greater than 1/2 the height	Unavoidable obstacles 15" tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" or wider TTF's 4' high or less, width of deck is less than 1/2 the height Short sections may exceed criteria	Unavoidable obstacles 15" tall or greater Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" or narrower TTF's 4' high or greater, width of deck is unpredictable Many sections may exceed criteria

Trailheads

Well-placed trailheads and parking lots contribute to a successful trail system. Trailheads should be located in areas of lower elevation, as most trail users prefer outbound climbs with inbound descents back to the parking area. This also helps mitigate risk by allowing fatigued riders an easier route back to their starting point. This is especially true for mountain bikers, and necessary for families and beginners. Trailheads should offer information useful for the trail users, including trail maps, location information, emergency contact details, and volunteer information.

Sustainable Trails

A sustainable trail balances many elements and is designed to have little impact on the environment. Sustainable trails resist erosion through proper design, construction, and maintenance and blend with the surrounding area. A sustainable trail also appeals to and serves a variety of users over many years. It is designed to provide enjoyable and challenging experiences for visitors by managing their expectations effectively. Following sustainable trail design and construction guidelines allows for high-quality trail and education experiences for users while protecting the land's sensitive resources. For additional trail design, construction, and maintenance techniques, refer to *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*. These guidelines are appropriate for any hike, bike, or equestrian trail.



Signage

The development of a mountain bike trail network requires the development of a comprehensive system of signs. Signs are the most important communication tool between land managers and trail users. A well-implemented and maintained signage system enhances the user experience by helping visitors navigate the trail network and providing information about the area. Signage also plays a critical role in managing risk and deploying emergency services.

Recommended signage for the trails should be simple, uncluttered, and obvious with a sign at every major intersection to help users stay on track. Signs should meet the needs of all users, from the daily trail user to someone who is experiencing the trails for the first time. In order to serve the variety of visitors, sign placement should be strategic and frequent. Because signs can intrude on the natural outdoor experience, too much signage can be unsightly. Balancing competing interests is key to developing a successful signage program.

Sign Types

A variety of signs can be created to help users identify trails and their location, select routes, remain confident in their trail choices, find destinations and key points of interest, and understand regulations and allowed uses. Signage can also be interpretive, helping visitors learn about responsible recreation, trail etiquette, and resource protection, as well as how to reduce risk and hazards.



Informational signs

Usually positioned at the trailhead and major intersections, informational signs provide details such as trail length and difficulty. These include signs that identify a trailhead from a road, signs at a trailhead kiosk, trail intersection signs, waymarks, difficulty rating signs, and trail length or elevation gain and loss signs.

Regulatory signs

These types of signs delineate rules, such as prohibited activities, direction of travel, or other restrictions.

Directional signs

Directional signs provide navigational information.

Warning signs

Often incorporating highly visible designs, these signs warn trail users of upcoming hazards or risks. These include visitor rules and regulations, allowed activities, road and trail intersections, and emergency signs.

Educational signs

Educational signs can provide a variety of information for trail users, such as guidelines for responsible recreation, descriptions of natural or cultural resources, trail etiquette, and bike skills



APPENDIX B: BENEFITS OF MOUNTAIN BICYCLING TRAILS

Promoting Active and Healthy Lifestyles

The benefits of mountain biking may start on the trails, but they don't end there. Learning to ride a bike is a rite of passage. Bikes and the sport of mountain biking provide a multitude of opportunities to teach children valuable lessons that will carry into adulthood.

Obesity is at a high, while activity levels among Americans are plummeting. With its progressive nature and way of stimulating the senses, mountain biking is appealing, especially to youth, and provides an excellent form of recreation for reversing the trend toward poor health. Since riding a bike provides excellent cardio conditioning, improves strength and coordination, and burns several hundred calories an hour, it is an activity as appealing to parents as it is to kids.

The unstructured play that mountain biking provides inspires people to explore and appreciate the natural world, leading to positive associations with outdoor activities and exercise.

Mountain biking allows individuals to advance at their own pace, so kids looking for a challenge can have just as much fun as children who are more interested in exploring the scenery. Riding in nature provides an environment where children can work on their skills, have fun, and pedal their bikes without parents having to worry. Mountain biking is a cross-generational endeavor, accessible to all ages and levels of physical fitness. Going for a trail ride is an excellent way for parents to do more than support their children's activities, it's a way to share the experience. Every ride is an opportunity to create a healthy lifestyle and pass on lessons that are best learned through experience.

Several studies on physical activity have indicated that proximity to recreational facilities, such as trails, is a predictor for physical activity. Simply put, if there are walking and biking trails nearby, then residents are more likely to use them and therefore be healthier. Physical health and exposure to nature also benefit mental health, reducing stress and increasing happiness. In addition, individual and community health translate to economic benefits by decreasing health care costs.



Contributing to Economic Growth

A well-designed trail system can stimulate economic growth by increasing activity within the local population as well as attracting visitors from outside. Trails can generate business in retail sales and services, support jobs, provide sustainable growth in rural communities, and produce tax revenue. Access to trails also correlates to a higher quality of life, thus making the community more desirable and capable of attracting new businesses and workers to an area.

IMBA assists local communities in increasing mountain bicycling tourism as a sustainable, renewable source of economic development. A mountain biking destination is one that attracts tourists to an area for the benefits of the mountain biking experience; provides visitors with all of the amenities needed to compliment, ease, and enhance their visit; and in turn creates word of mouth about the community that will draw new and repeat visits.

According to the Outdoor Industry Alliance, mountain bicyclists represent approximately 3.4% of the U.S. population, or nearly 10.6 million participants.



IMBA's own research indicates that enthusiasts, who represent a portion of this overall number, travel extensively within a four-hour range and will typically devote one week per year specifically to travel to reach mountain bicycling destinations. Same-day visitors spend approximately \$35 per day in local communities while destination visitors spend closer to \$193 per day (due in part to lodging and increased meal purchases).

While mountain bicyclists are certainly willing to travel to ride, they will only do so if their destination contains a key ingredient: high-quality trails. These trails must be of a sufficient length and contain a variety of experiences, such as traditional singletrack, bike-optimized singletrack, bike parks, and shuttle options. The competition for these destination-quality locations is slowly increasing over time.

A case study in Cable, Wisconsin, clearly illustrates how a community can benefit from offering a world-class bicycling experience. Construction of new bicycle trails in Cable resulted in:

- Increased property values.
- Increased spending on bicycle related goods.
- 35 jobs created annually, adding \$523,000 to total employee compensation.
- Nearly \$1.3 million impact related to spending from mountain bicyclists.

Fostering Community Pride and Identity

Involving community members in the planning, building, and maintaining of trails fosters community pride. In order to maintain sustainable trails, care of the trail system should be managed by local enthusiasts and rely on an organized membership base. Volunteering to help with trails provides an opportunity for area residents to connect with each other and with the terrain and land that surround them. IMBA members donate nearly one million volunteer hours to trails throughout North America every year, making volunteerism a large part of mountain bike culture.

Trails and parks also provide informal opportunities for people to meet and interact with others in a natural setting. Connection to nature is paramount to maintaining the health of the environment and making the outdoors relevant and accessible to all. Trails serve a diverse population and cultivate unity and stewardship in the community. Trails can even revitalize blighted areas, for example, turning landfills into bike parks or gravel pits into trailheads.

Preserving Open Space

Trails make communities better places to live by preserving and creating open spaces for recreation. Greenways function as hands-on environmental classrooms for people of all ages, providing opportunities to enjoy nature close up. With its abundant plant life, open spaces can decrease pollution, protect water quality, and reduce soil erosion. Economic growth and property values are also tied to open space as buyers are generally willing to pay more for property located close to parks and open space. The recreation, health, economic, and environmental benefits of trails can contribute to an overall enhanced quality of life in nearby communities.

Encouraging Positive Recreation Use to Displace Negative Use

Without a plan, undeveloped areas are often haphazardly transformed by users creating unauthorized sites to suit their personal wants. Purposefully designing trail systems can help create diverse recreational opportunities, encourage safe use, and meet the needs of the entire community. Unauthorized trail building and dumping or other unacceptable activities can damage ecology, cause safety hazards, and leave behind debris that is both unsightly and illegal. The best way to encourage positive use is to displace negative use. A well-planned trail system can discourage and displace destructive activities with healthy recreational use that attracts visitors of all ages.



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