

The Ormond Keister and Catherine Booth

Evans Park Conceptual Master Plan



*Prepared by the Community Design Assistance Center for the City of Danville
Parks, Recreation, and Tourism Department*

August 2010



College of Architecture and Urban Studies
Virginia Polytechnic Institute and State University

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Acknowledgements

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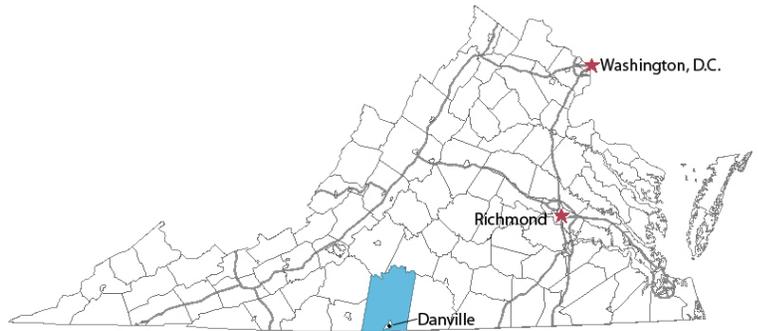
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Project Description



View of small creek flowing west across the site.



State context map showing the City of Danville and Pittsylvania County in relationship to the Commonwealth of Virginia.

The City of Danville recently received a generous, unsolicited gift of land, located within a City Enterprise Zone. A 105-acre family tobacco farm, owned by the late Ormand K. and Catherine Booth Evans, which was farmed until the 1970s, was donated to the City for passive recreation, conservation, and educational use by their sons O. Keister Evans and Bob N. Evans. The property has been placed under a conservation easement and the donation comes with a few stipulations:

- Control illegal uses such as trash disposal and four-wheeling
- Protect the property's hardwood forest and stream
- Plan amenities that will keep the park green

The old homestead, a vinyl covered log home, and adjacent outbuildings and barns still remain on site and may be reused for historical interpretation or other complimentary uses if the structures are deemed suitable for use. Several specific programmatic elements considered for the site master plan include: a "green" environmental education center; biking and walking trails; demonstration areas; restroom facilities; picnic areas; climbing tower and a ropes challenge course; and an area for group camping. The City envisions the environmental education facility serving "a dual purpose as a center for stream studies and nature programs, and a staging site for team building and initiative activities enacted on the challenge course."

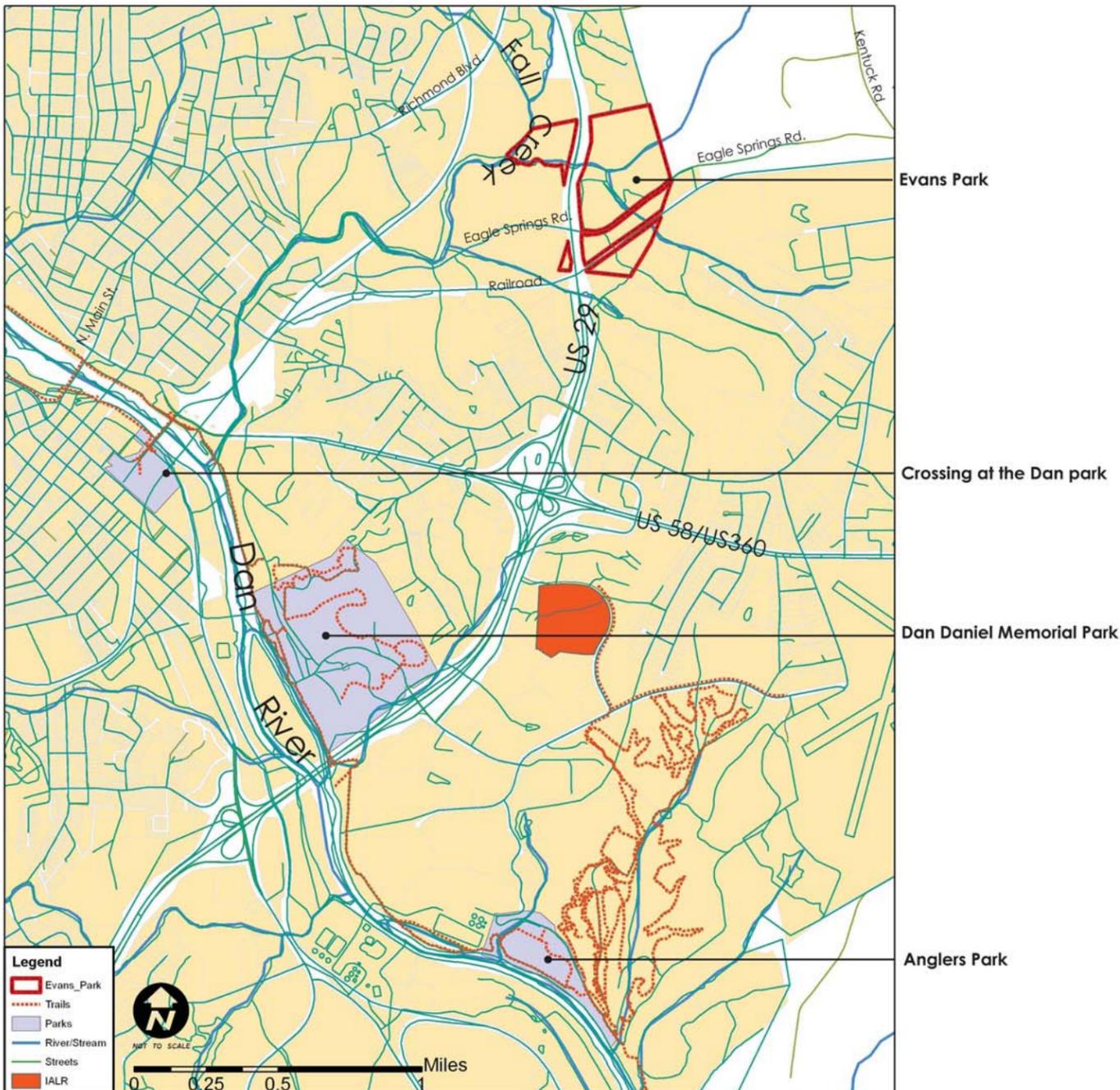
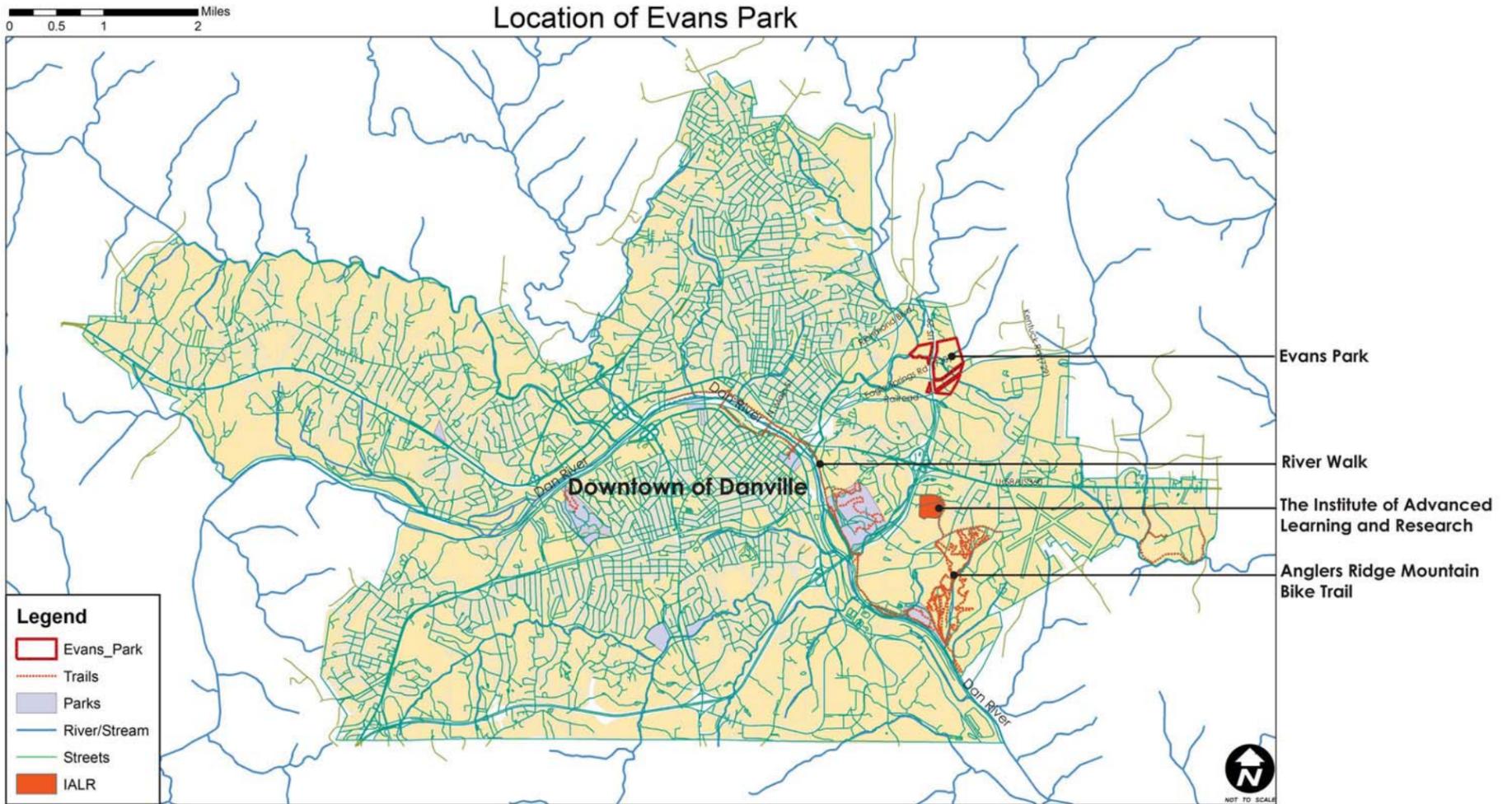
The site does pose some challenges as well. The property is bisected by US 29. Currently the only access from the primary 61-acre tract to the 16.5-acre tract is through a large box culvert that allows the stream to flow under US 29. Utility easements and railroad corridors also crisscross part of the site. The Community Design Assistance Center worked with City staff, Mr. Keister Evans, and other interested community members and stakeholder groups to develop conceptual design alternatives for the site. Based on staff and stakeholder feedback, the CDAC design team refined concepts into a final conceptual master plan for the site.



Images of Evans Park.

Evans Park Location Analysis

Evans Park is located in the northeast portion of the City of Danville, just a 7-minute drive from the downtown Danville, and 10-minute drive from the Anglers Park. The stream hydrology is very rich in Evans Park, which is rare within Danville. Two stream converge here and flow into Fall Creek, which forms the site's western boundary.



*These two maps are made by CDAC based upon the GIS shape files provided by the city government of Danville and Geography Department of Virginia Tech

The Community Design Assistance Center (CDAC) is an outreach center of the College of Architecture and Urban Studies and Virginia Tech that assists communities, neighborhood groups and non-profit organizations in improving the natural and built environments through design, planning, and research. Through the integration of the learning and working environment, the Center will execute projects that link instruction and research and share its knowledge base with the general public.

Design Process



Keister Evans (left), land donor, discusses the site history with CDAC team members Yining Xu (center) and Daniel Ling (right).



CDAC team members Daniel Ling (left) and Yining Xu (right) describe inventory and analysis boards to the project stakeholders.

The CDAC design team began the project with an initial site visit and guided tour of the site by property donor O. Keister Evans in March 2010. During that visit the CDAC team learned first-hand from Mr. Evans about the site's history and natural features.

Following the initial site meeting, the CDAC team returned to Blacksburg to prepare site inventory and analysis drawings. Mapping assistance was provided by Danville Department of Information Technology. The CDAC team also consulted with staff from the Virginia Department of Environmental Quality, the Virginia Department of Transportation, and the U.S. Army Corps of Engineers regarding site access and stream crossings.

The CDAC team, joined by Mr. O. Keister Evans, visited the Claytor Nature Study Center for an exploratory case study. Some excellent ideas were garnered from this site visit.

The CDAC team conducted an initial meeting with project stakeholders in April of 2010. During this meeting, the CDAC team presented inventory and analysis findings and discussed preliminary conceptual ideas for site with the stakeholders. Feedback from this meeting guided the CDAC team's development of two conceptual design alternatives.

The preliminary conceptual designs were presented to the stakeholders for review and comment in May 2010. The concepts were refined into one final conceptual master plan. This plan was presented to the client and stakeholders in June 2010.

This short, supporting report was prepared to document the design process and describe the proposed conceptual design alternatives for Evans Park.

Site Inventory & Analysis



CDAC design team (left) discuss site conditions with Keister Evans (center) and Karen Cross (right)



A CDAC project team member explores the existing box culvert under US 29 as a possible pedestrian connection between Zones 1 and 1 of the site.

As stated in the design process, the CDAC design team toured the Evans Park site in March 2010 to examine the existing conditions of the site and identify opportunities for recreation and conservation design suggestions. Based on field notes from the initial site visit, guidance from the agencies (Virginia Department of Environmental Quality, the Virginia Department Transportation, and the U.S. Army Corps of Engineers), and feedback from City staff and Mr. Evans, the CDAC team prepared a series of inventory and analysis drawings that addressed elements such as existing site features, topography, elevation, and site hydrology.

The site was divided into three zones for ease of inventory and analysis. These zones are delineated by transportation corridors (US 29 and Eagles Springs Road). Information from the inventory and analysis aided the CDAC design team in the formation of preliminary conceptual designs for the site.

Inventory and analysis 11x17 pullout drawings can be found on the following pages.

Evans Park Photo Inventory - Zone I



Intro

Evans Park is divided into three primary zones based on roads separating the site. Zone 1 refers to the northeast portion of the site; Zone 2 includes the northwest portion of the site; and Zone 3 includes the southern portion of the site.

Zone 1

Zone 1 of Evans Park includes the northeast portion of the park property. It is defined by US 29 to the west, Eagles Springs Road to the south, and the property boundary to the north and east. Key features located within Zone 1 include the Evan's family homestead, supporting outbuildings (tool house, smokehouse, corn house, livestock barn), hardwood forests, and an old cemetery dating back to pre-Civil War years.

A small stream runs along the eastern portion of the property and intersects with another stream, that traverses the entirety of Zone 1 from east to west. This stream flows into Zone 2, underneath US 29 via a box culvert. A City sewer line parallels the creek. The sewer line easement offers a cleared, flat, maintained area that could serve as a potential walking trail.



1. Road to the homestead



2. Old wood shed



3. Smoke house



4. Hen house



5. Homestead



6. Corn House



7. Livestock stable



8. Front yard



9. Sewer line and stream



10. Small creek



11. Sewer line above stream



12. Sewer line underground



13. Box culvert



14. Rt. 29 Bypass



15. Cemetery



Graves in the cemetery

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Evans Park Photo Inventory - Zone II



Zone 2

Zone 2 of Evans Park includes the portion of park property west of US 29. It is bounded by Fall Creek to the west, US 29 to the east, and private property to the north and south. Currently the only access to this site is via the box culvert under US 29. Key features within Zone 2 include a beautiful tobacco barn, successional and hardwood forests, two creeks, and a sewer line. In the northwestern portion of the property, the two creeks converge. Land adjacent to this area is flat with good views.



1. Tobacco barn



Entrance of the barn



roof of the barn



Inside the barn



2. Old trash dump



3. Sewer line underground



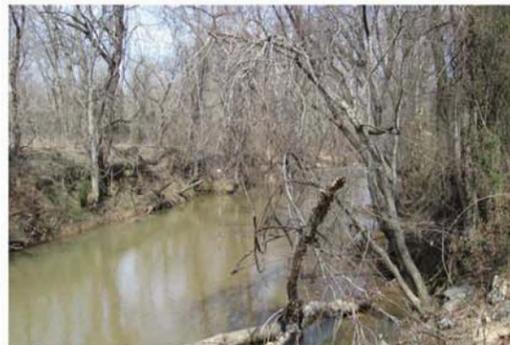
4. Sewer line above the creek



5. Fall Creek (facing to the west)



6. Sewer line across the Fall Creek



7. The Fall Creek (facing to the northeast)



8. Path along the Fall Creek



9. Fall Creek

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Evans Park Photo Inventory - Zone III



Zone 3

Zone 3 of Evans Park includes the southern portion of the property. It is bounded by US 29 to the west, Eagle Springs Road to the north, and private property to the south and east. An historical and still active railroad, the Richmond and Danville Railroad, runs through this zone parallel to Eagle Springs Road. This railroad was built in 1855, with train traffic beginning in 1856. The railroad was only 140 miles long, but it played a vital role in the Civil War, linking Richmond to the rest of the Confederacy. Addition features in Zone 3 include a creek, mature hardwoods, and an old, dirt road bed.



1. Path to the railroad



2. Railroad (facing northeast)



3. Railroad (facing southwest)



4. Eagle Springs Road



5. Path along the creek



6. Path along the creek



7. Current trash dump

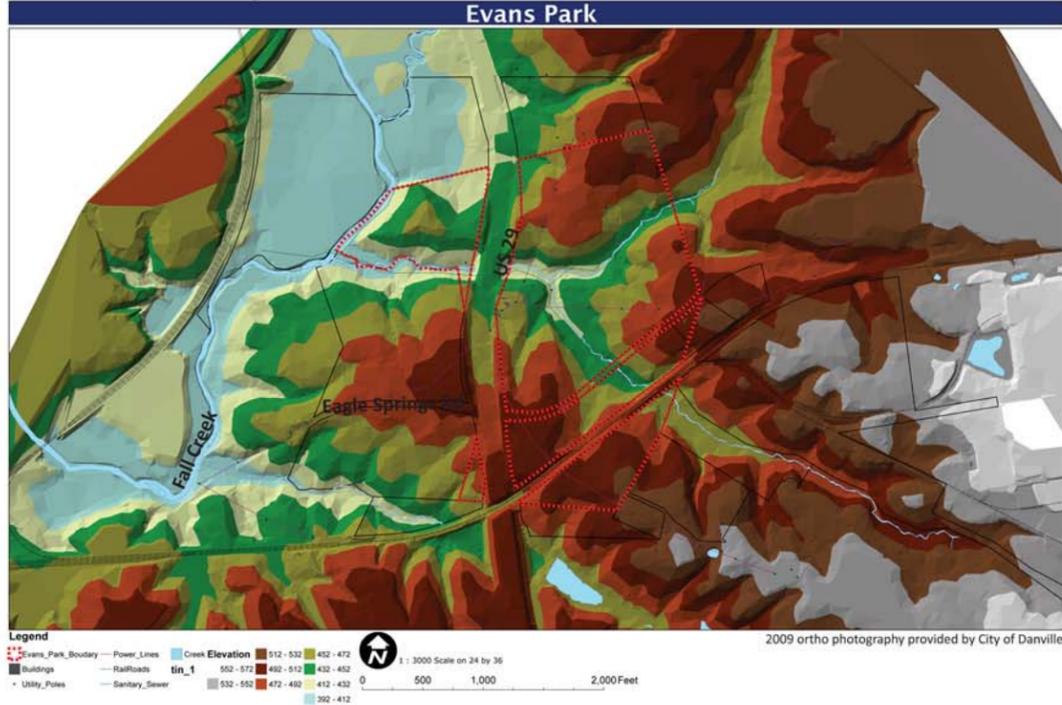
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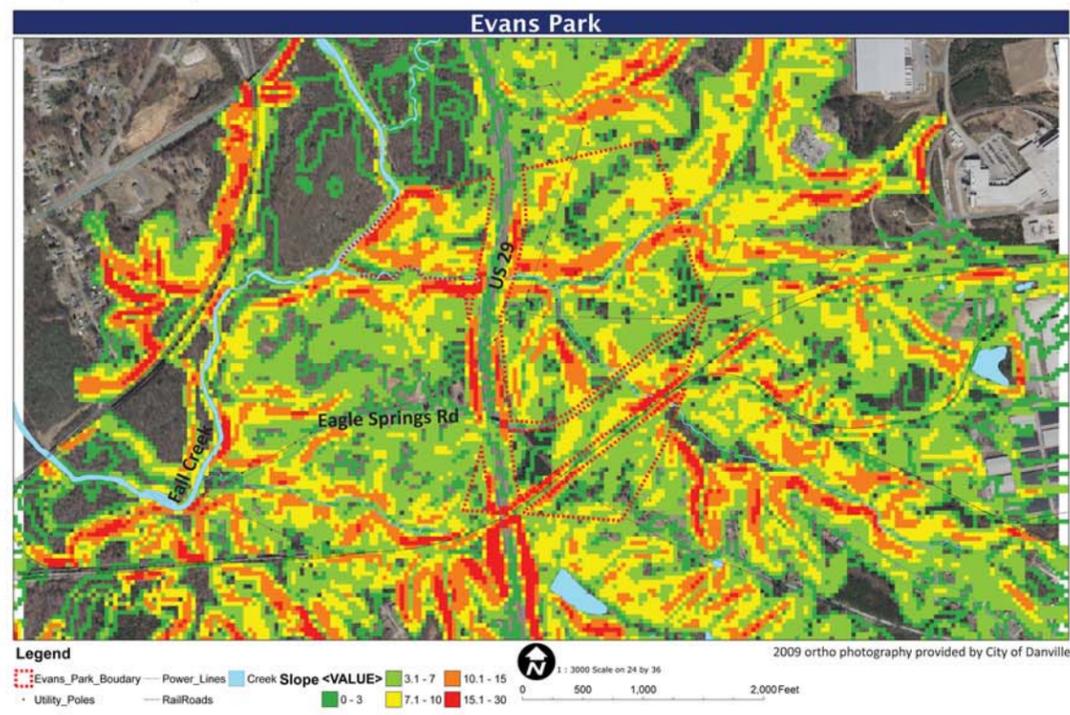
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Evans Park Site Analysis

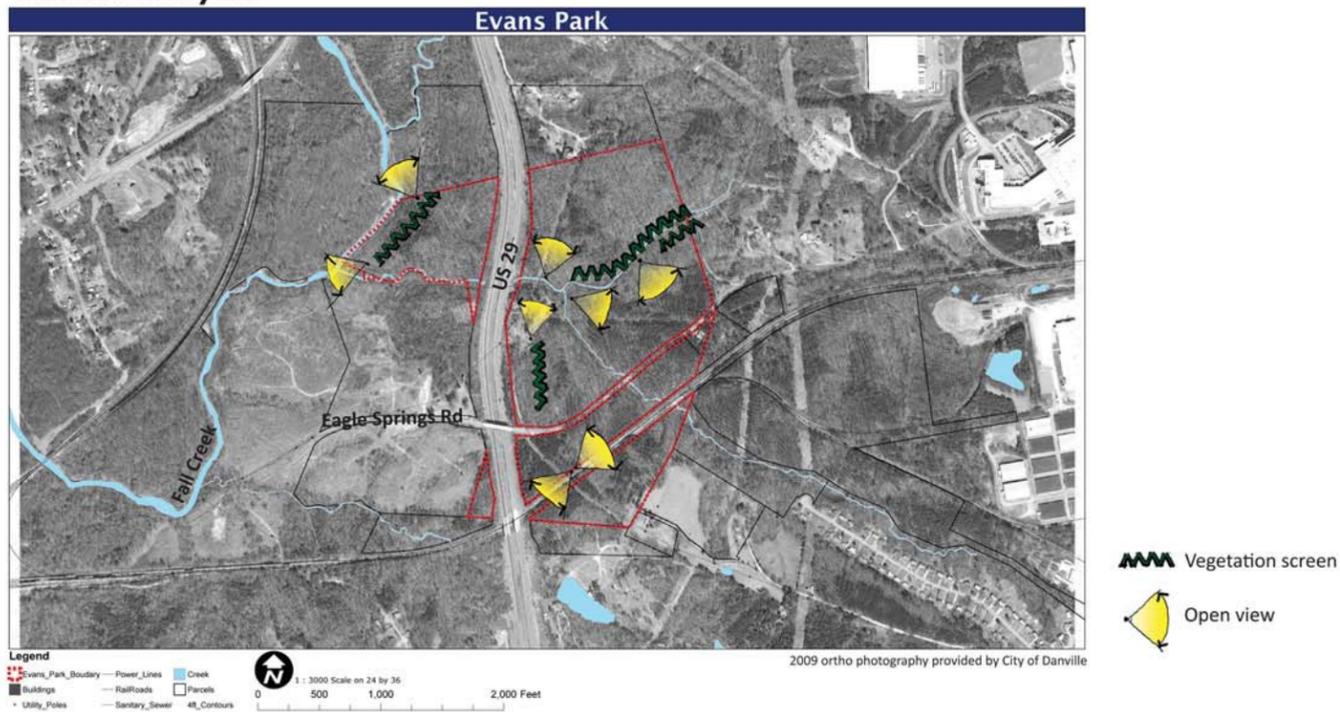
Elevation Analysis



Slope Analysis



Visual Analysis



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Case Study: Claytor Nature Study Center



Covered porches around the education center afford excellent indoor-outdoor opportunities for classes and workshops.



Keister Evans (l), Yining Xu (left center), and Daniel Ling (right center) meet with Claytor Nature Study Center Director Greg Eaton (right)

Lynchburg College's Claytor Nature Study Center was made possible by a generous gift of property and an endowment from prominent Central Virginia resident and businessman A. Boyd Claytor III. The establishment of the Claytor Nature Study Center, in 1998, fulfills the dream of Mr. Claytor, and his late wife Virginia, that their Cloverlea Farm be protected for future generations to explore, study, and enjoy.

The mission of the Center is

- to enrich the learning experience about nature through education and research
- to promote and demonstrate sustainable human-environment interactions
- to preserve and enhance the diversity and function of ecosystems

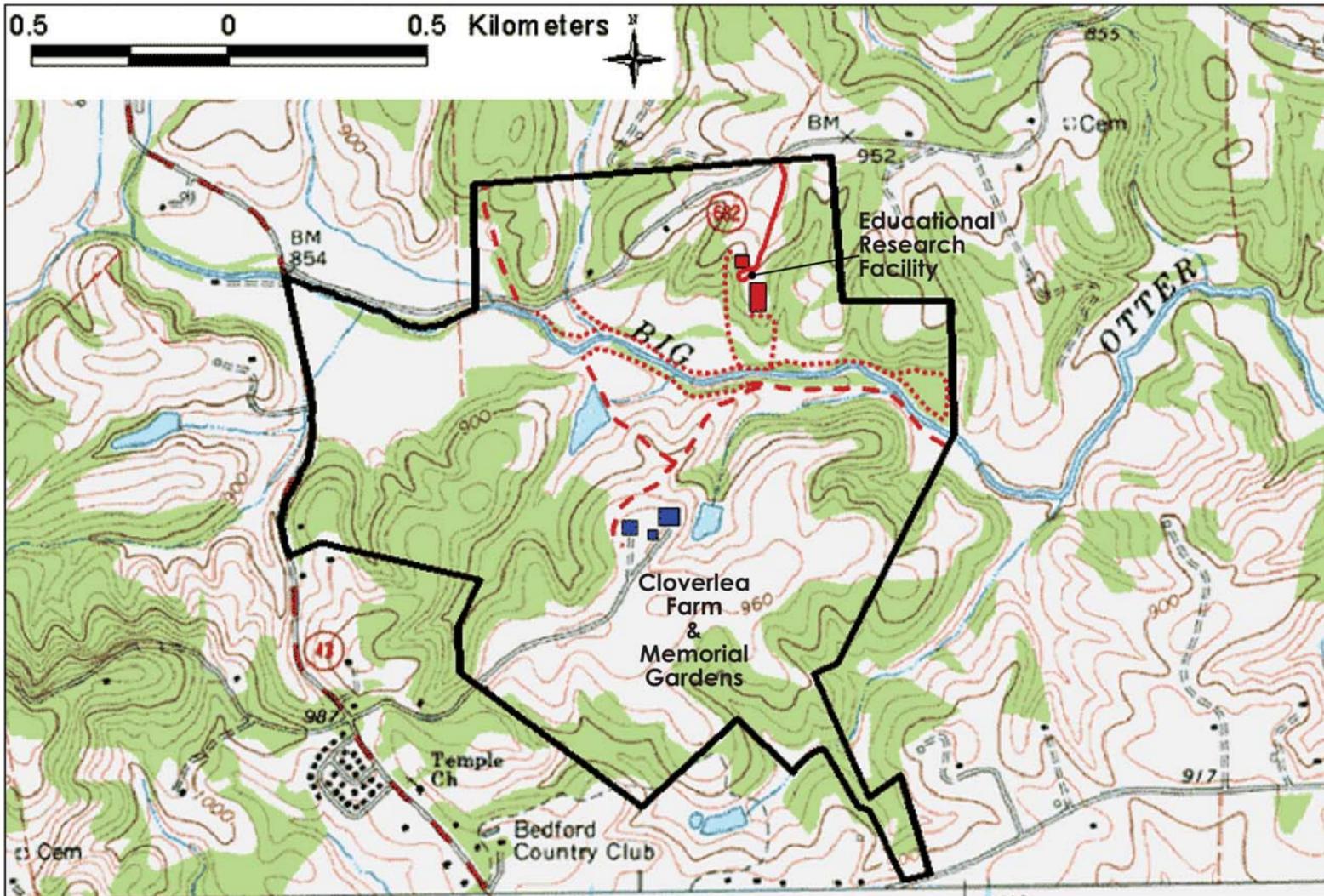
The Center promotes natural ecosystems, research and education for the students and faculty of Lynchburg College, for teachers and students in elementary and secondary schools, and for the community. Sound environmental stewardship governs all uses of the Center.

The CDAC design team and Mr. Evans toured the Claytor Nature Study Center with Greg Eaton, the Center's Director. The beautiful facility had a number of exemplary implemented features relevant to the future Evans Park. Elements of particular interest included the education center, the group camping area and adjacent amphitheater, rustic trails, created and enhanced wetlands, and the low-impact parking area. The education center serves the K-12 Bedford County School System as well as Lynchburg College. It offers classroom space, office space, restrooms & showers, kitchen, conference room, and covered porch space. As it is located within five-hundred feet of the group camping area, the lower level restrooms and showers serve as the bath house for group camping as well.

Director Greg Eaton shared information about several USDA federal programs administered by the Natural Resource Conservation service that provided them with valuable expertise and resources in restoration of habitat from former agricultural fields. Links to some of the programs mentioned are:

- Conservation Reserve Program - <http://www.nrcs.usda.gov/programs/CRP/>
- Wetland Reserve Program - <http://www.nrcs.usda.gov/Programs/WRP/>
- Wildlife Habitat Incentive Program - <http://www.nrcs.usda.gov/programs/whip/>
- Easement Programs - found off of the main NRCS website <http://www.nrcs.usda.gov/programs/>

Case Study - Claytor Nature Study Center



Map provided by Lynchburg College - Claytor Nature Study Center



Education & Research Center



Educational facilities



Classroom



The John E. and Kathryn S. Husted Pavilion



Amphitheater



Walking trail and footbridge



Conservation easement signage



Individual campsite with picnic table



Group camping area with picnic table

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Preliminary Design Concepts



Yining Xu describes Preliminary Concept A.

Two conceptual design alternatives were prepared and presented to project stakeholders on May 12th, 2010. Feedback from this presentation was used to guide the CDAC design team as they refined the concepts into one final conceptual master plan. Descriptions of the preliminary design concepts can be found below.

Concept Plan A

Preliminary Concept Plan A used key existing site features connected by a proposed walking trail system as the primary means of spatially organizing the site. A proposed educational center and main entrance are sited in zone one. The education center would include restrooms, office and classroom spaces, and information about the history of the site. An area for historic interpretation of the agricultural history of the site is also proposed near the education center. An improved one-way entrance road follows the existing gravel road bed, giving park users vehicular access to the education center. A camping area, amphitheater, and picnic shelter are sited in close proximity to the education center. A small deck area is proposed adjacent to the creek, providing a gathering area for classes for stream observation and fishing. An additional parking area is proposed adjacent to Eagle Springs Road, providing trail users a safe parking spot when the main park access may be closed. A walking trail system allows park users to enjoy the diversity of the site. Additionally, two areas are identified in zone one as potential mountain bike areas.

A potential access road is proposed off of Eagle Springs Road, giving vehicular access to zone two of the site. A high and low ropes course and climbing wall are proposed for this area. Two picnic areas are sited adjacent to Fall Creek. A walking trail connects these elements and provides access to the historic tobacco barn in zone two.

Zone three has minimal design interventions. The existing vegetation serves as a good boundary edge for the park and buffer between adjacent land owners. Proposed hiking and biking trails offer recreational opportunities in this portion of the site.

8.5x11 drawings of Preliminary Design Concept A can found in Appendix B.

Concept B

Preliminary Conceptual Plan B organized the site into several different areas of use: Educational Zone, Heritage Zone, Mountain Bike Trail Zone, Educational Emphasis Zones, and Buffer Zones. These broad categories directed the programming and supporting design elements within each area of use. As in Preliminary Conceptual Plan A, an educational center and parking area is proposed in the center of the site, near the location of the existing homestead. This area is relatively flat and has minimal vegetation that would need to be removed. A farm heritage interpretation area is proposed adjacent to the educational center complex.

A moderately sized amphitheater is proposed in close proximity to the main parking area, though separated visually from it by vegetation. The amphitheater is sited to afford views of the creek as a background. A group camping area is proposed in the northeast corner of the site, on a high point. This area will offer opportunities for star gazing and for a more secluded group camping experience. Opportunities for creating vernal wetlands were identified along the creek floodplain. A small parking area is sited adjacent to Eagle Springs Road for hiking and mountain bike trail users, similar to Preliminary Conceptual Plan A.

A proposed challenge course is sited in the center of the site, near Eagle Springs Road. Several visibility studies were conducted to ensure the challenge course elements would not be able to be seen by motorists on Eagle Springs Road.

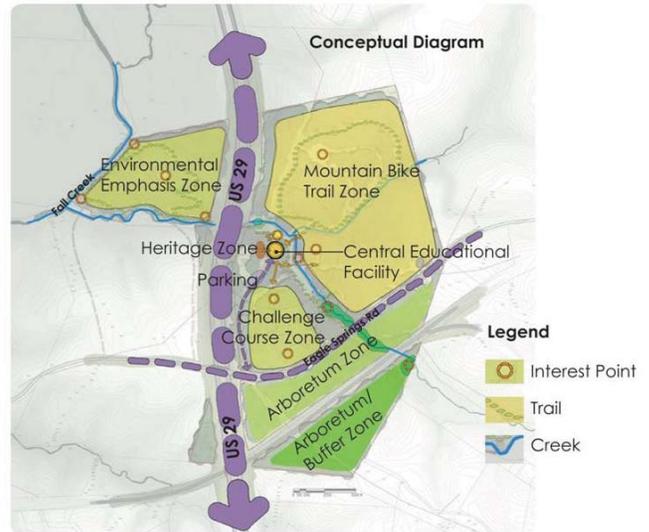
The extreme western portion of the site is currently inaccessible, except through the existing box culvert running under US 29. Because of the limited access to this portion of the site, minimal programmatic elements were included in this portion of the site. A trail loop, overlook, and picnic area are proposed.

8.5x11 drawings of Preliminary Design Concept B can be found in Appendix B.

Final Conceptual Master Plan



O. Keister Evans displays the final conceptual master plan for Evans Park.



The final conceptual master plan for Evans Park blends ideas from each of the preliminary design concepts and offers an exciting long term vision for the park. The majority of proposed activities are concentrated on the east side of the park (Zone One) so that proposed activities are all within approximately five hundred feet of the future LEED-certified educational complex. A network of trails connects points of interest and invites park users to explore the natural beauty of the site. Key components of the master plan include:

Zone One:

1. **Central hiking and branch mountain biking trails.** Two central trails connect the group camping area, the challenge course, the outdoor amphitheater, covered pavilions, and farm history interpretation area. Areas without other planned uses will be designated as mountain bike trail opportunities. Specific trail locations will be determined by the Southern Virginia Mountain Bike Association and approved by Parks, Recreation & Tourism. Best management practices should be followed for trail construction to minimize erosion and to minimize liability. Care should be taken at stream crossings to ensure the trails do not promote environmental degradation. (See Appendix C for more information). A small parking lot is proposed along Eagle Springs Road to provide access to mountain biking trails when the main park entrance is closed.

2. **Entrance drive, parking area, and US 29 vegetative buffer.** A single, two-way road was preferred as primary access to the site. This road will utilize the existing entrance road to the homestead and will be widened and paved. This access will lead to parking near the proposed educational center, with 20-30 spaces and approximately 4 spaces for bus parking. A formal park entrance sign is proposed at the intersection of this entrance drive and Eagle Springs Road. It is anticipated that this will be a gated entrance drive and will initially be opened by Parks and Recreation Staff for group activities only. Once an education center is added, with office space for full time staff, the entrance gate will be open during regular park hours. A vegetative buffer is proposed between US 29 and the eastern portion of the park.

3. **Environmental Education Center.** The Evans Park Environmental Education Center would be a tremendous asset for the Danville community, offering opportunities for stream and conservation education. The education complex at Claytor Nature Study Center is an excellent model for Evans Park - offering indoor and outdoor learning spaces, classrooms, restrooms and shower facilities, offices, and a kitchen. As there is no City water on or near the site, for the purposes of the conceptual master plan, water for the educational center will come from a well. Clustering the majority of activities around the education center allows the restrooms in the center to serve other park users as well.

4. **Challenge course and pavilion.** A high and low ropes challenge course and climbing wall are also proposed in Zone One. As mentioned earlier, the challenge course is sited within approximately 500 feet of the proposed education center. This allows the central parking and restrooms in the education center to serve the challenge course area as well. The central hiking trails connect the education center to the challenge course. A proposed pavilion is sited in close proximity to the challenge course and can serve as a starting and ending point for team building workshops.

5. **Group camping area.** A group camping area is proposed on the eastern side of the small creek that runs northwesterly through Zone One. A gravel maintenance access is proposed to provide limited vehicular access for maintenance and City-staff assisted access to the camping area for any user with limited mobility. A small, rustic amphitheater, similar to the example from Claytor Nature Study Center, is proposed adjacent to the camping area. A small covered shelter is also proposed in this area, making the camping area a delightful spot for group uses and activities. The camping area is sited in close proximity to the proposed education center so that the parking and restrooms/showers in the education facility can serve the group camping area.

6. **Farm history interpretation area.** Current farm outbuildings on site are not in good enough condition to be preserved, with the exception of the stables building and the original logs of the log house. The stables building is proposed to remain and could possibly serve as a maintenance building for the park. The option is available for the log house (home-stead) to be relocated and new outbuildings from the area can be added, if desired, to create a farm interpretation area. This would make up the farm history interpretation area.

Zone Two:

1. **Constraints.** Currently there is no way to access Zone Two without trespassing or wading a shallow stream. A box culvert runs under US 29, connecting Zones One and Two, but utilizing the box culvert for daily pedestrian access to Zone Two does not appear to be the best solution for site access. Pursuing an access easement from the adjacent property should be a priority.

2. **Recommended Uses.** The conceptual master plan indicates two possible options for access easements, with the thought that only one will be pursued. The access easements will lead to a small parking lot on the Evans Property. A hiking trail loop is proposed in Zone Two, connecting the historic tobacco barn to three proposed overlooks. The proposed overlooks include picnic benches for small group gatherings. Two of the overlooks are sited in close proximity to Fall Creek and could be further developed to provide safe access to the creek for bank fishing should that be desired in the future. Should the access easement be obtained, Zone Two may still not be publicly accessible to individuals coming to the park, but rather may be accessible only through Danville Parks, Recreation & Tourism group programs.

Zone Three:

1. **Arboretum.** An arboretum is proposed for the southern portion of the site. Practically and financially, the proposed arboretum may be one of the first implemented elements in the conceptual master plan. A small parking lot is proposed on the south side of Eagle Springs Road (6 spaces with one bus pull-through) to provide access to the arboretum. A small shelter (24'x24') with a restroom (waterless pump-out) and two educational kiosks are also proposed for the arboretum area. It is anticipated that the arboretum will be developed in two phases, as funding is obtained. A specific master plan for the arboretum will need to be created following more detailed soil and site cultural analysis.

2. **Wetlands.** Exploration for opportunities for the creation of wetlands on site is also underway. Low-lying, wet, areas have been designated as environmental conservation areas. Specific areas for wetland development will be identified by area experts in partnership with Danville Parks, Recreation, and Tourism staff.

Evans Park Final Conceptual Master Plan



Zone One: Education Complex



Character sketch of proposed Evans Park entrance signage.

Zone One: LEED Certified Education Building



The visitor's center at New River State Park in North Carolina serves as a character example of possible architecture and materials of the education center.



Example of multi-level education center with exterior access to restrooms and showers on the lower level.



Example of historic farming interpretation exhibit at the New River State Park in West Jefferson, North Carolina.

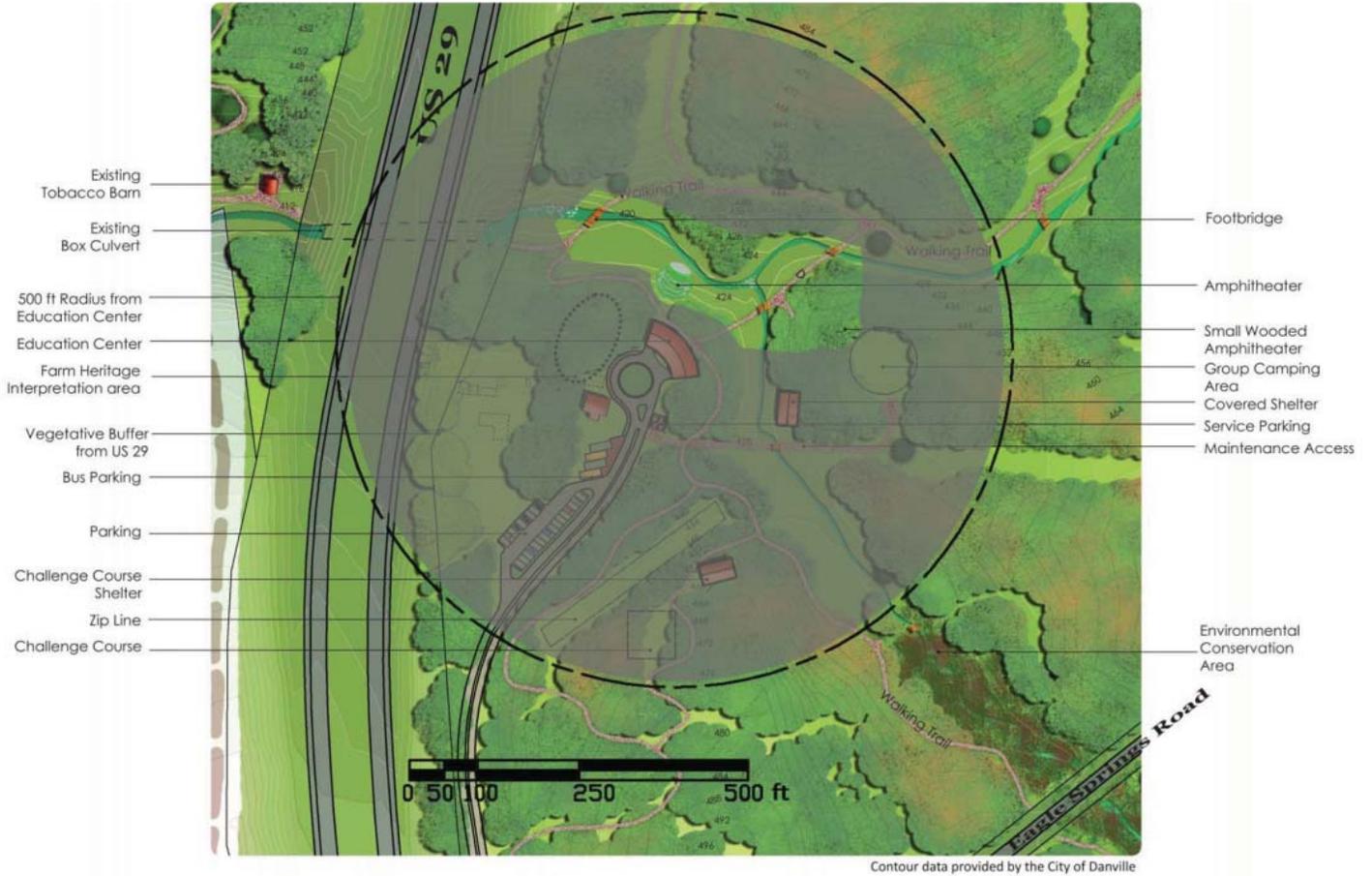


Example of covered exterior space at the Claytor Nature Study Center Education Complex.



Example of indoor conference room at Claytor Nature Study Center.

Zone One: Outdoor Classrooms

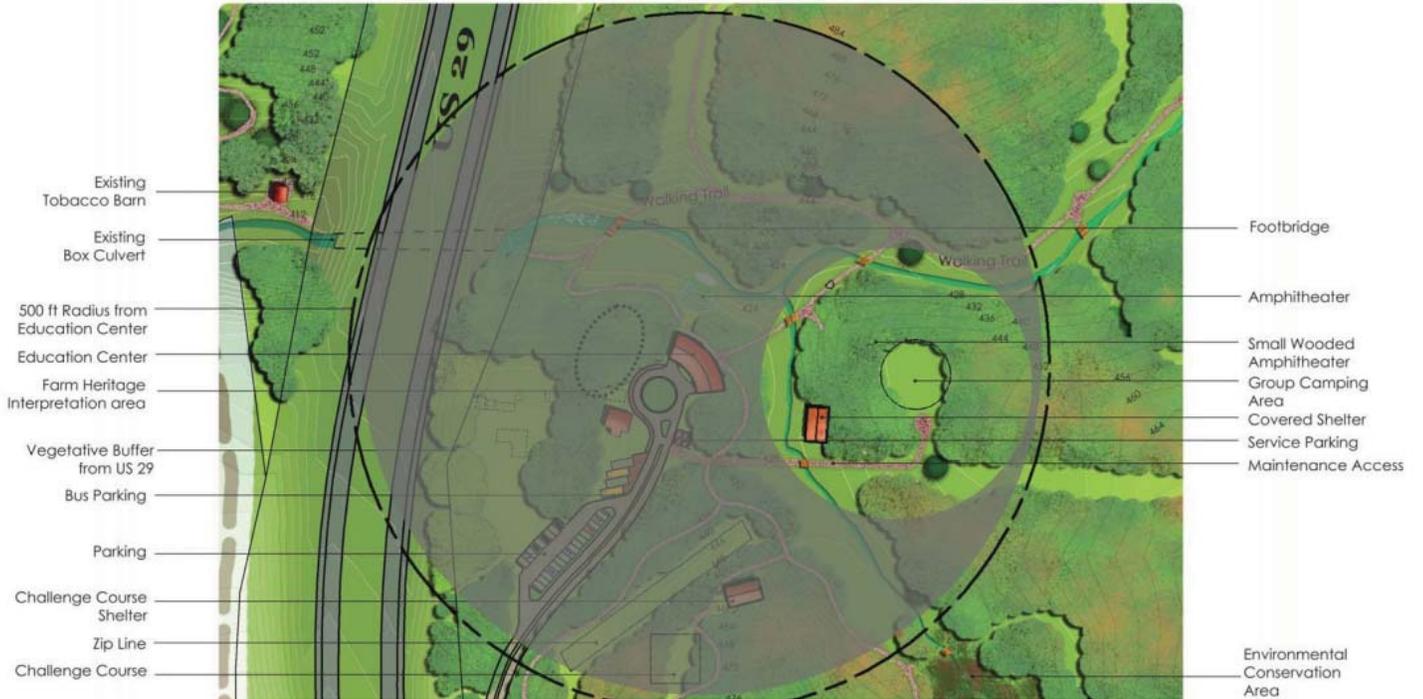


Example image of larger outdoor amphitheater.



Example image of small, rustic outdoor amphitheater.

Zone One: Group Camping



Example of open area for group camping.



Example image of covered shelter with storage.

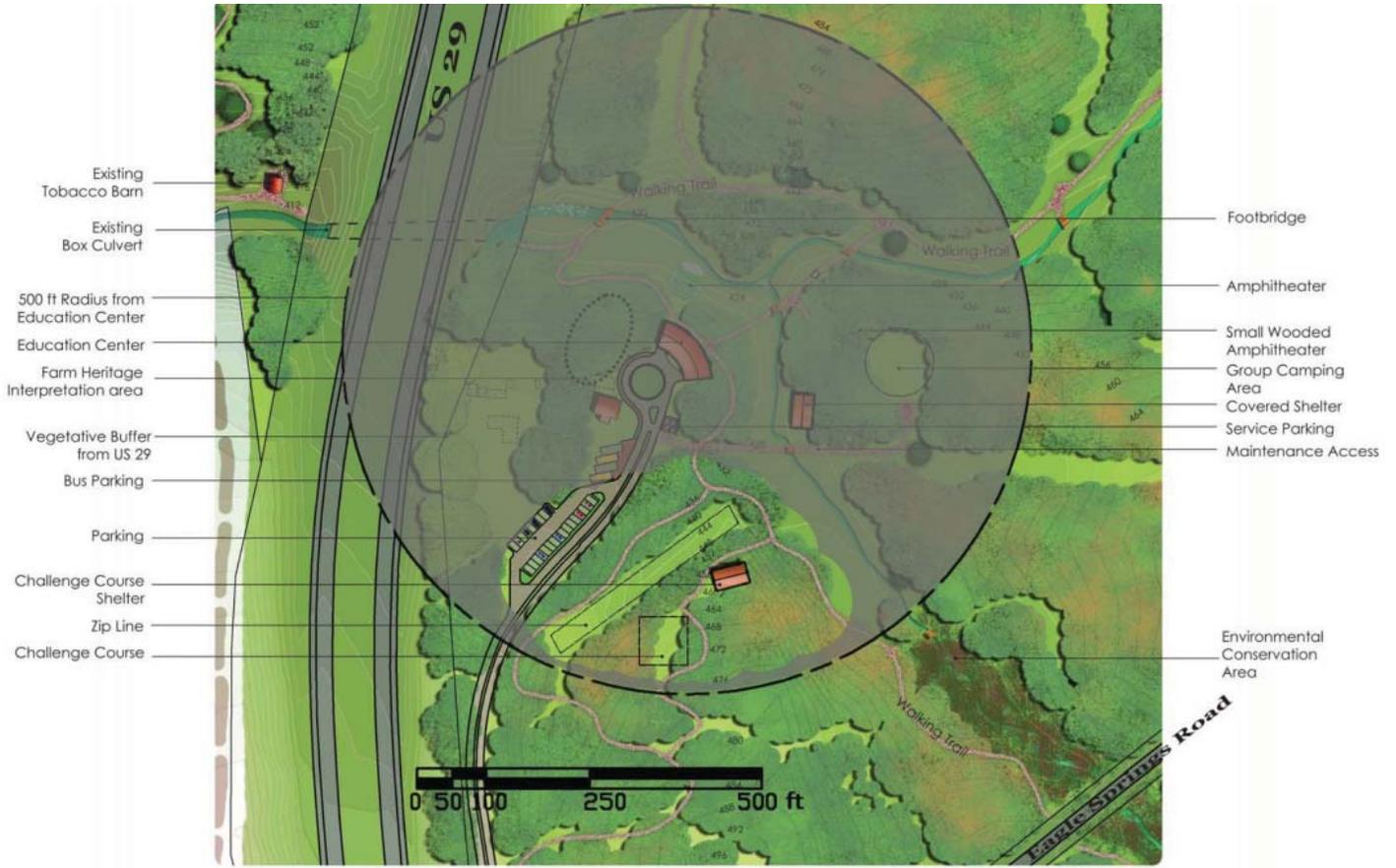


Example image of wooden footbridge at stream crossings.



Example image of small, rustic outdoor amphitheater.

Zone One: Challenge Course



Example image of covered shelter with storage.



Example image of natural surface trails.



Example of climbing wall.

Zone Two: Guided Group Activities



Example image of wooden footbridge at stream crossings.



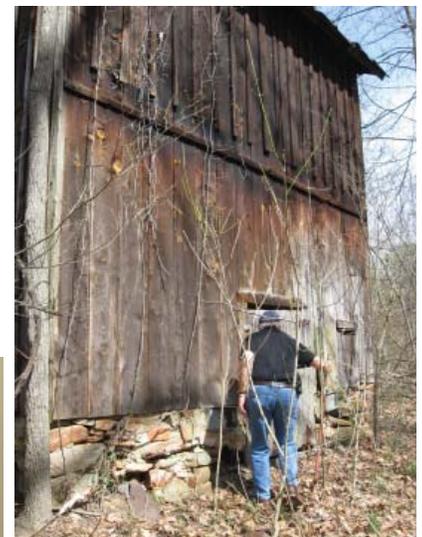
Example image of covered shelter with storage.



Example image of potential picnic area along Fall Creek.



Waders could be stored at the education center for accessing Zone Two through the box culvert



Interpretive signage is proposed by the tobacco barn in Zone Two.

Zone Three: Arboretum



Example image of covered shelter with storage.

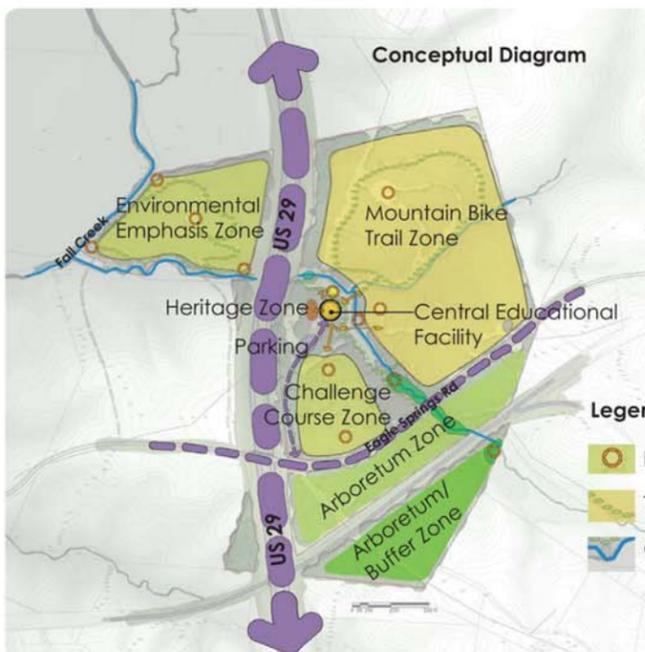


Example image of natural surface trails.



Example images taken from Greensboro Arboretum - <http://www.greensborobeautiful.org/Arboretum.htm>

Evans Park Final Conceptual Master Plan

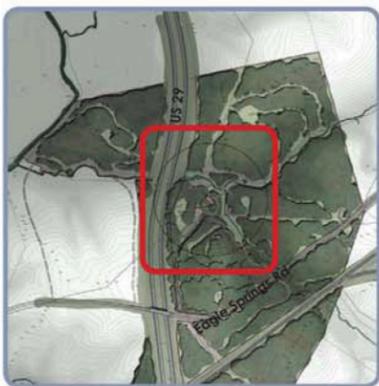


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This drawing is conceptual and was prepared to show approximate location and arrangement of site features. It is subject to change and is not intended to replace the use of construction documents. The client should consult appropriate professionals before any construction or site work is undertaken. The Community Design Assistance Center is not responsible for the inappropriate use of this drawing.

Evans Park Final Conceptual Master Plan - Education Center Complex Detail



Context Map



Trail and Bridge



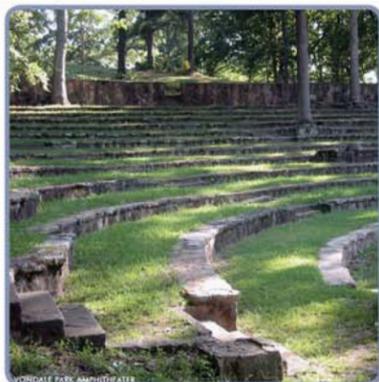
Covered Shelter



Picnic Area along Fall Creek



Group Camping Area



Amphitheater



Educational Signage



Challenge Course

This drawing is conceptual and was prepared to show approximate location and arrangement of site features. It is subject to change and is not intended to replace the use of construction documents. The client should consult appropriate professionals before any construction or site work is undertaken. The Community Design

Conclusion

The Ormond Keister and Katherine Booth Evans Park is a tremendous gift to the community. The site offers an array of natural features for park users to learn from and enjoy. The conceptual master plan for the park offers a long term vision of what it can become. This park will offer a different experience than many of the other parks in Danville, with a focus on education, conservation, and group activities (team building, camping, etc). Visitors can step back in time and appreciate the agricultural heritage of the region at the farm history interpretation area of the park. Simultaneously, they can look ahead to the future as they visit the LEED-certified education center, highlighting energy efficient building and living. Walking and biking trails guide visitors along the stream corridors and through established hardwood forests. The arboretum will highlight an array of demonstration gardens. Most importantly, this park ensures that the land is preserved for conservation and recreation enjoyment for future generations in perpetuity!

Appendices

Appendix A: Site History-----page 31

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Appendix A: Site History

The Evans family farm, totaling 160 acres and located in Pittsylvania County, was purchased Oct. 7, 1905 by David T. Allen from A.E. Fox and his wife N.S. Fox. David Allen's wife, Sarah Evans Allen, was sister to Nancy Elizabeth Evans, Ormond Evans' mother. Sarah Allen died in 1936. Following her death, Allen realized that he needed care and attention and invited Ormond and his wife, Catherine Evans, to come live with him on his farm and manage the farming operations. They moved there in 1939 and lived there and farmed the property most of their productive lives. Mrs. Evans also worked at Roman Eagle Nursing Home as dietician for several years in the 1960's.

The farm was deeded to Ormond Evans by David Allen upon his death in August, 1954. In his will dated Dec. 3, 1940 David Allen deeded the farm and all his personal property to "O. K. Evans, my wife's nephew in testimony of my affection for his taking care of me in my declining years like a son."

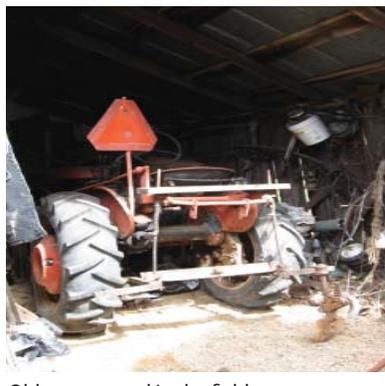
Following the death of Ormond Evans in June 1982, Catherine moved into the city of Danville. She lived at Holiday Village for about 10 years and then at Roman Eagle Nursing Home until her death in March 2000. Ormond and Catherine's families (Evans and Booth) both trace back generations in the Kentuck Community with close ties to Kentuck Baptist Church. Ormond taught the Intermediate Boys Sunday school class for many years and also served as a Deacon. He was a member of the Kent Masonic Lodge.

The basic farm house has a frame of very large logs. It was moved to the present location (probably in the late 1800's) from the North side of the property. Three frame rooms were added through the years. Of historical interest is the railroad on the south side of the property which runs parallel to route # S730, (Eagle Springs Road). The Richmond and Danville Railroad was built in 1855 and train traffic began in 1856. The railroad was only 140 miles long during the Civil War but it played a vital role in linking Richmond to the rest of the Confederacy. Confederate soldiers traveled on this railway to battles further north. In 1865 Confederate President Jefferson Davis rode this rail line as he traveled from Richmond to Danville where the Sutherlin Mansion was used as the last capitol of the confederacy.

The Evans farm was located in Pittsylvania County until 1988 when it was incorporated into the Danville City limits. The two sons, Ormond Keister Jr. and Bob N. Evans spent their entire childhood years on the farm until graduating Dan River High School; Keister in 1957 and Bob in 1961. It was a typical working tobacco family farm with livestock, poultry and vegetable gardens. The Evans family also sold farm products in North Danville on Saturdays.



Old storage shed.



Old tractor used in the fields.



Outbuildings around the homestead.



Richmond and Danville Railroad, running east-west across the southern portion of the site.



Remnants of old farm equipment found on site.

In December 2008 the Evans sons and their spouses donated a Conservation Easement to the City of Danville, specifying that the property then totaling 106 acres be designated a City Park to be named the Ormond K. and Catherine B. Evans Park. The natural forests and streams are to be protected and the park is to be used for walking and biking trails.

Site history provided by O. Keister Evans

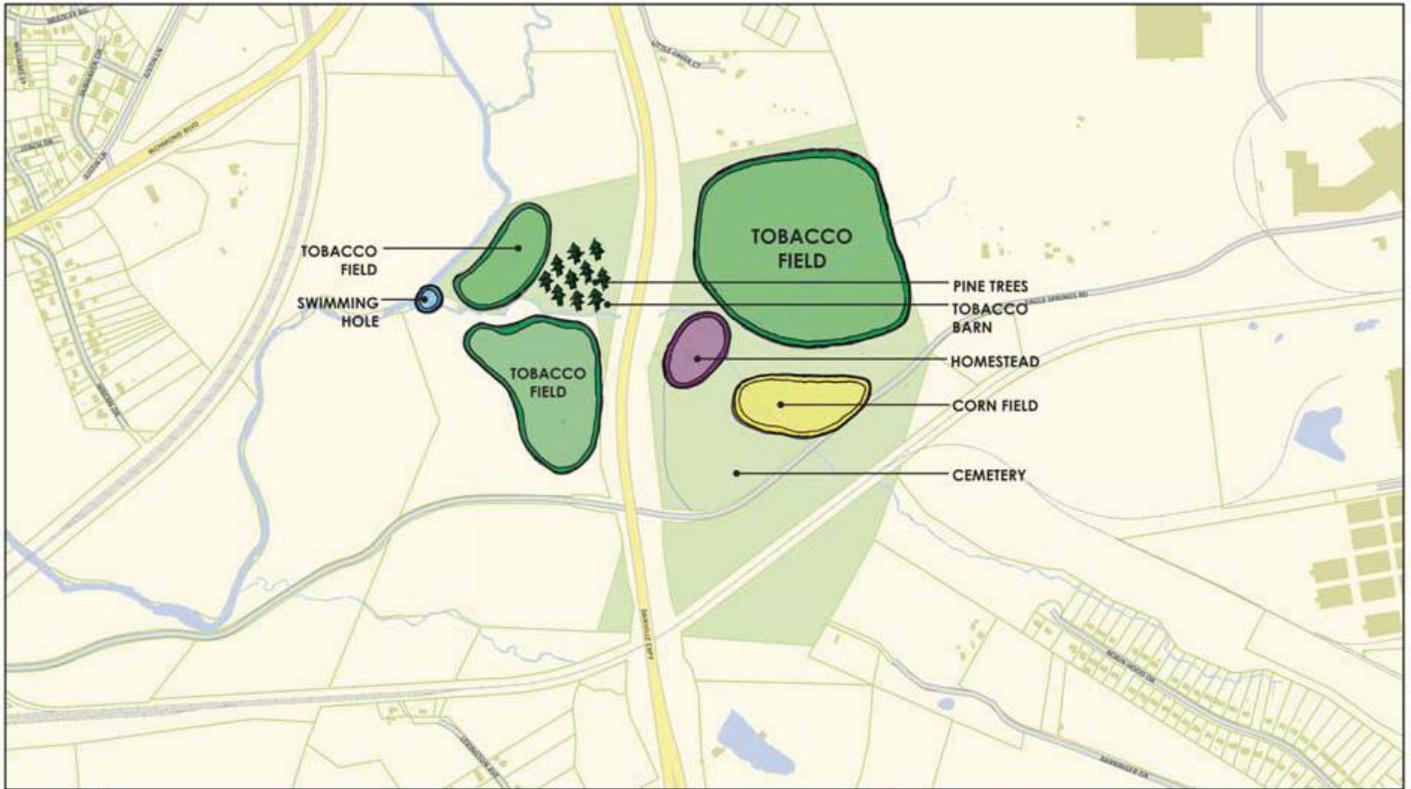


Keister Evans (right) describes the historic tobacco barn on site

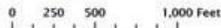


Pre-civil war cemetery located on site near Eagle Springs Road.

Historic Programming



Prepared March 2010
by the Department of
Information Technology



DISCLAIMER: Information contained on this map is to be used for reference purposes only and the City of Danville is not responsible for any inaccuracies herein contained. The City of Danville makes no representation of warranty as to this map's accuracy, and in particular, its accuracy in labeling, dimensions, contours, property boundaries, or placement or location of any map features thereon. No responsibility is assumed for damages or other liabilities due to the accuracy, availability, use or misuse of the information.



1. Road to the homestead



2. Homestead



3. Corn house and livestock barn



4. Tool house and smoke house



5. Authentic old tobacco barn (now gone)



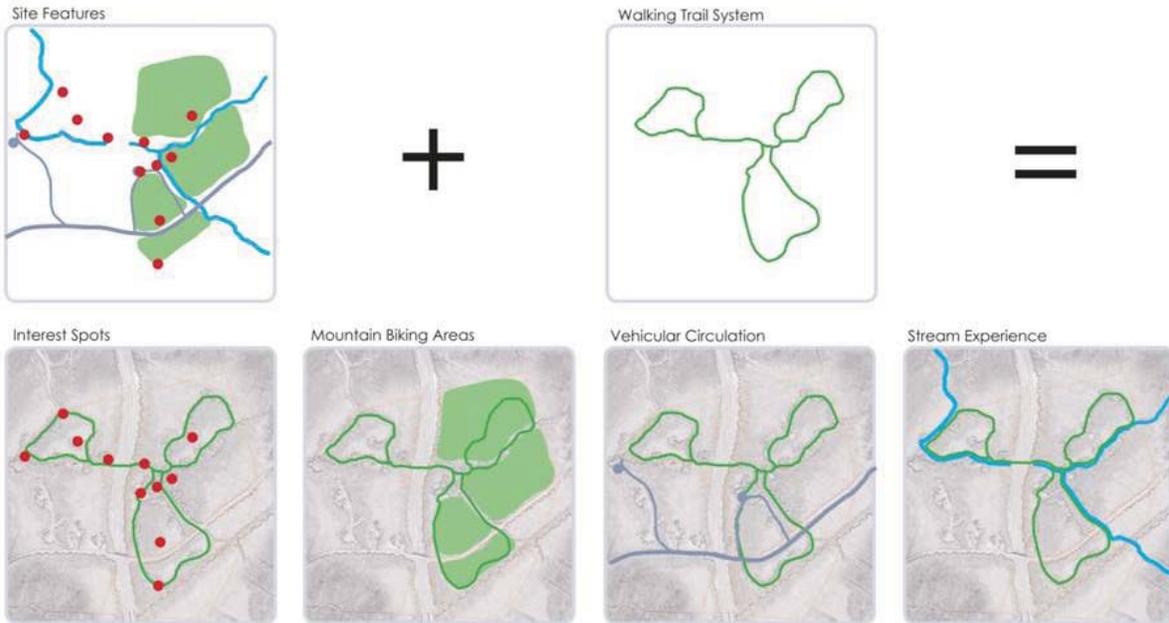
6. Spring house

Appendix B: Preliminary Design Concepts

Conceptual diagrams and design drawings for Preliminary Concepts A and B can be found on the following pages.

Evans Park Preliminary Concept A

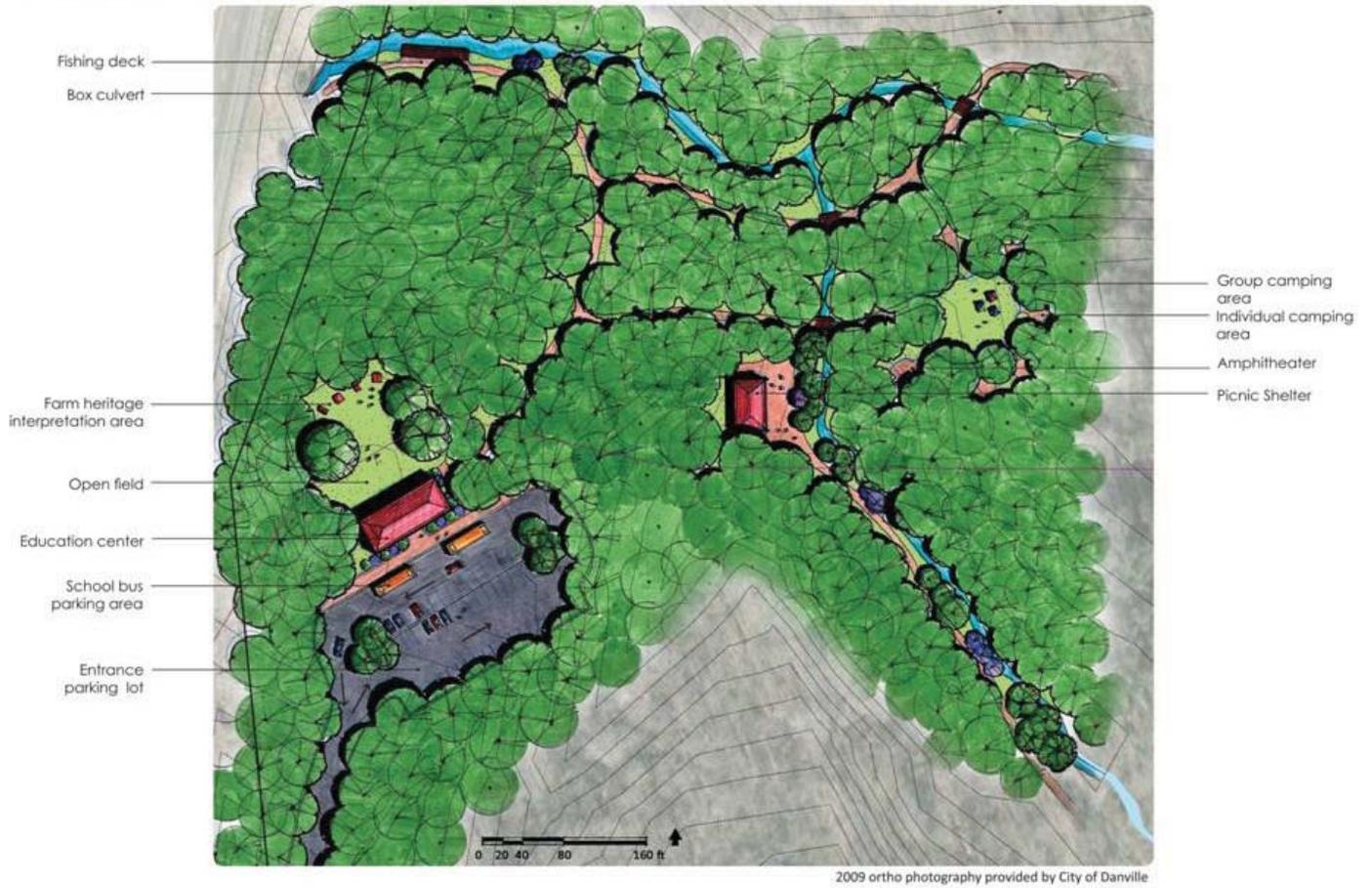
Conceptual Diagrams



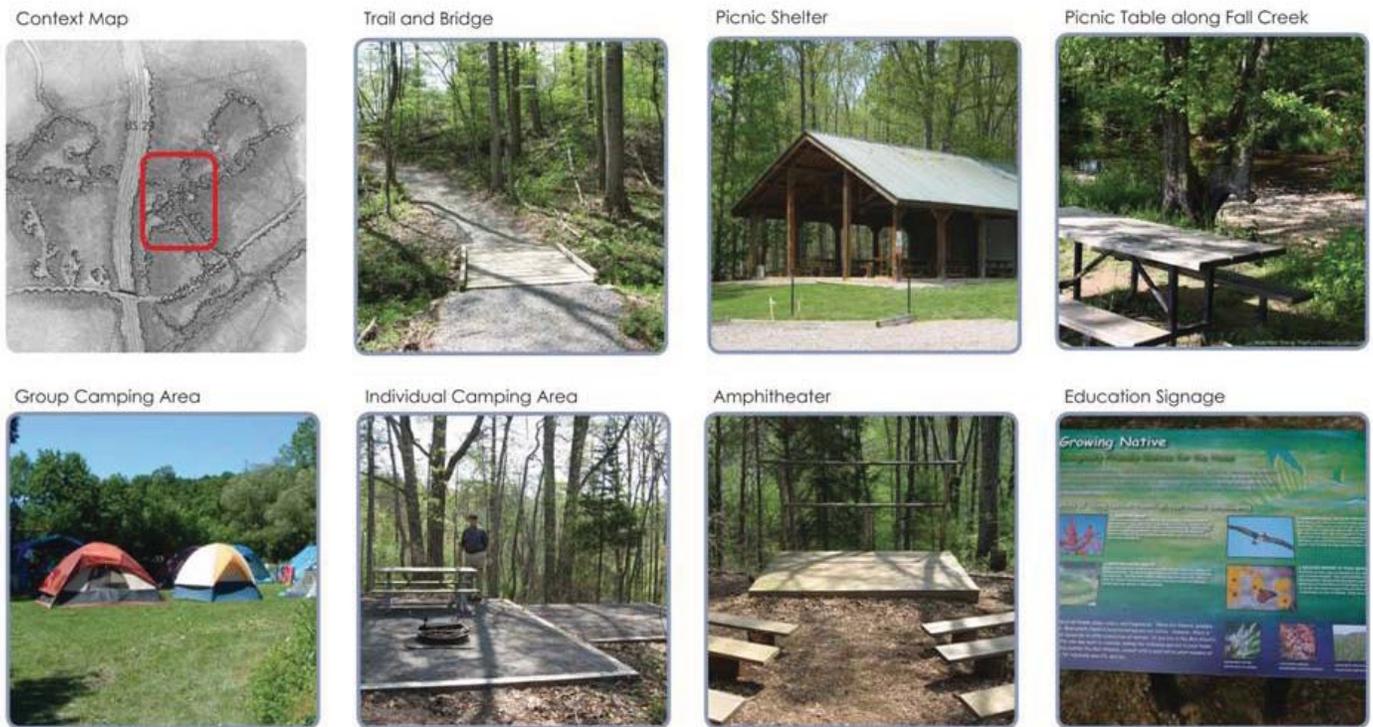
Master Plan A



Concept A Educational Area Plan

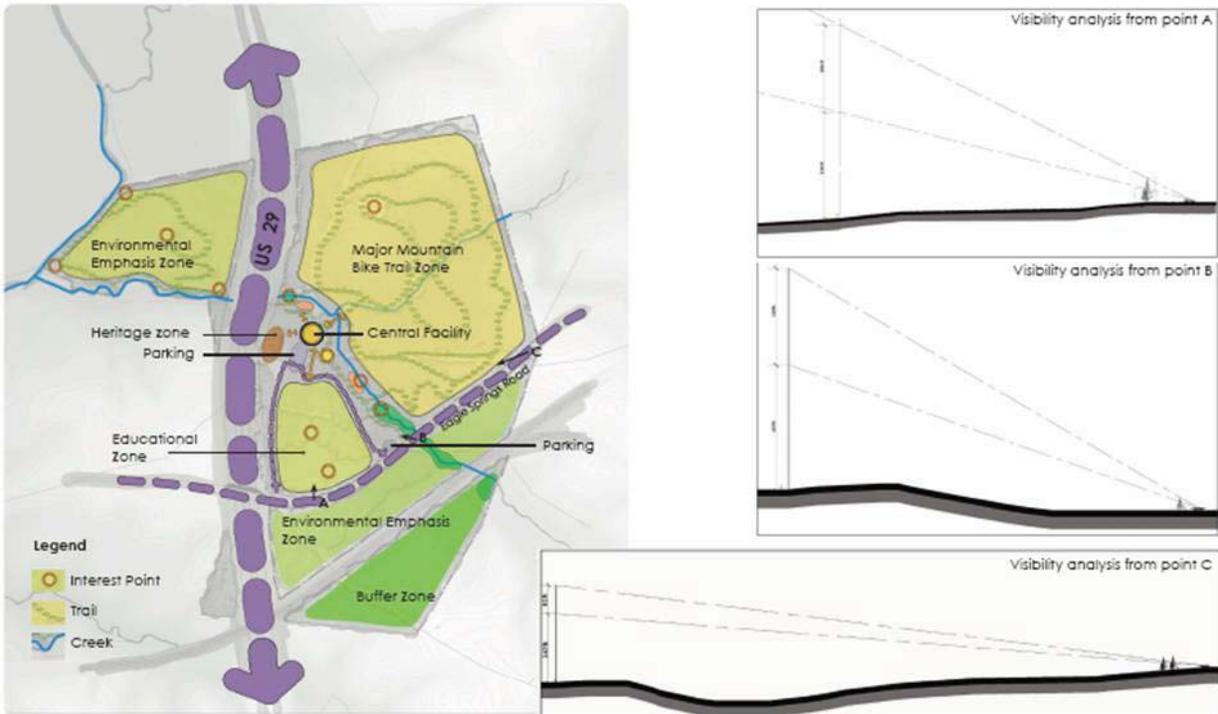


Concept A Example Images

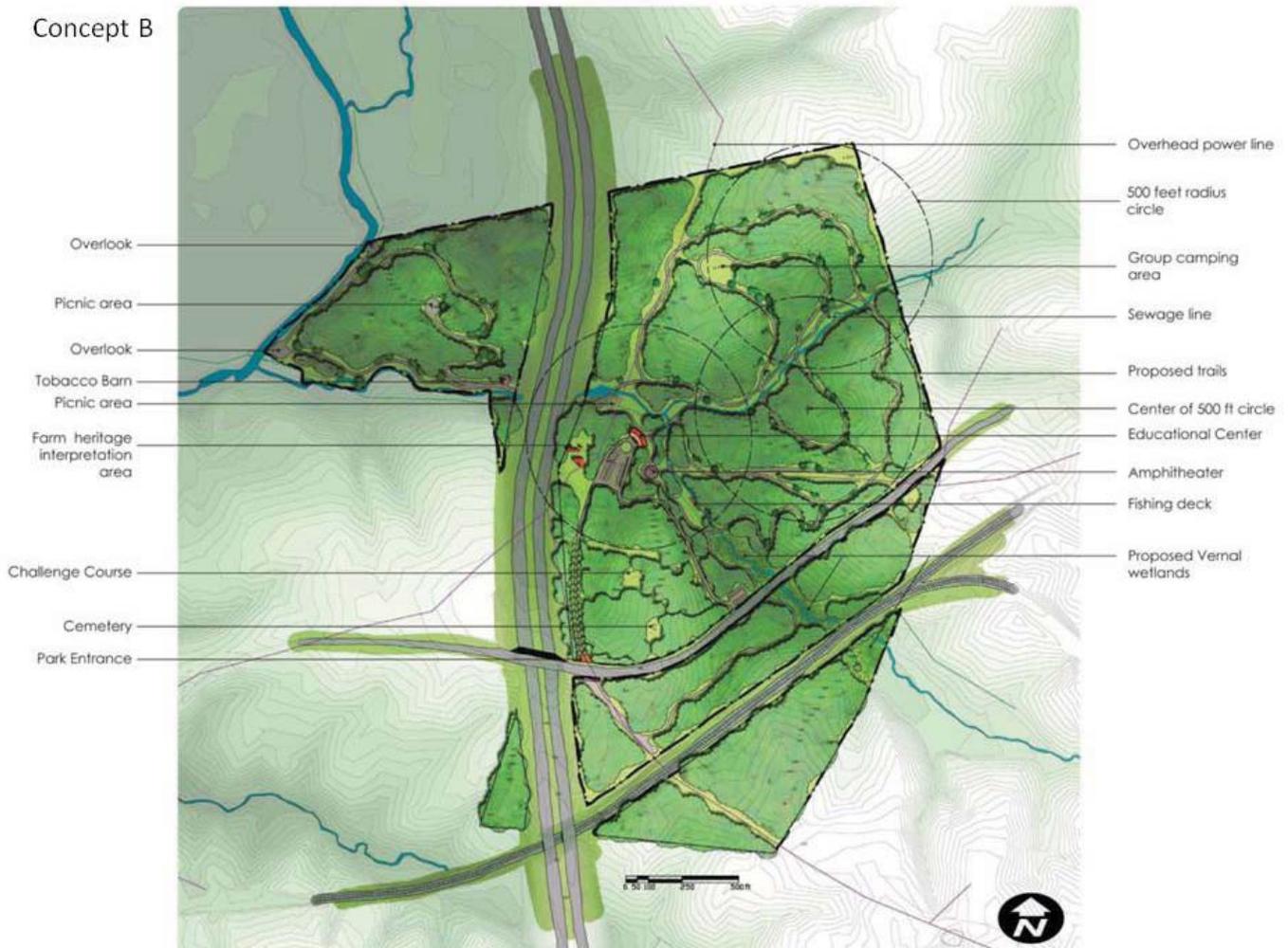


Evans Park Preliminary Concept B

Conceptual Diagram



Concept B



Concept B Educational Plan Detail



Concept B Example/Status Quo Images

Amphitheater



Climbing Wall



Fishing Deck



Shelter



Group Camping



Status Quo of Picnic Area



Overhead Power Line



Trail



Appendix C: Mountain Bike Trail Design and Layout

Introduction

This report addresses the process of designing, constructing, and maintaining sustainable mountain biking trail. These conventions are symbiotic and a sustainably built trail will naturally lend itself to minimal maintenance and management issues in the future. According to the National Park Service, a sustainable trail:

- Supports current and future use with minimal impact to the area's natural systems.
- Produces negligible soil loss or movement while promoting adjacent vegetation cover.
- Minimizes adverse impacts to the area's animal life.
- Accommodates existing use while allowing for appropriate future use.
- Requires little rerouting and minimal long-term maintenance.

(National Park Service, Rocky Mountain Region, 1991)

Building a sustainable trail is generally more difficult than a conventional trail but it has a number of conservation and management advantages. The most visible benefits are that once the sustainable trail is built it accommodates greater use with less impact and requires less maintenance. Efforts to permanently minimize erosion and wear when the trail is built ensure that less time and money will be spent later on.

Sustainability Concerns

When building an unsurfaced trail several factors must be considered that add to the degradation of the natural environment and impair the trail itself. Sustainable building practices strive to minimize these impacts but can never entirely avoid them. This section identifies and describes a variety of environmental impacts created by trails.

Vegetation

The most obvious impact to vegetation is its initial removal during trail construction and trimming during subsequent maintenance. Vegetation on and adjacent to trail treads can also be damaged from trail users, leading to cover loss or a change in composition. Different vegetation types react to impacts very differently. Generally grasses that receive a lot of sunlight are the most resistant and resilient, able to receive moderate to high use with little impact. In contrast, broad-leaved herbs and plants growing in shade are more sensitive to damage and recover more slowly. Consistent trail traffic can also lead to plant compositional changes, as less resistant plants are replaced by more resistant species over time. Another management concern is the introduction and spread of non-native or invasive plants, which are often the most resistant species present in any given ecosystem.

Soil

Soil loss due to erosion is one of the most common and complex problems facing trail managers today. Erosion occurs when soil is exposed due to loss of vegetation and transported by displacement, water, or wind. The easiest way to combat erosion is to minimize soil exposure by maintaining vegetation cover. In vegetated areas there are three differ-

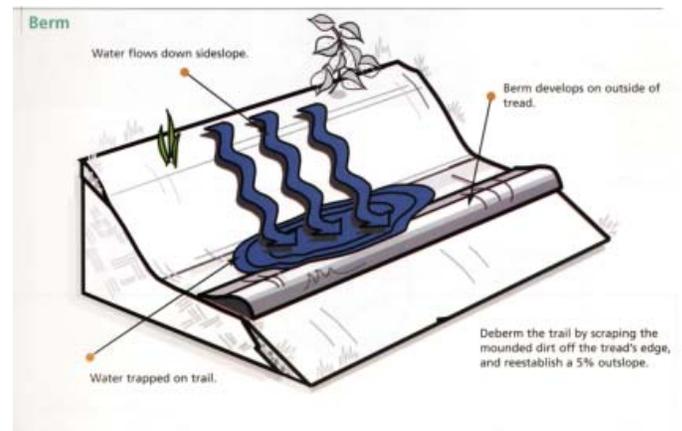
ent basic soil types, including Litter, Duff, and Mineral soil. Litter consists of large organic material such as leaves, twigs, dead grass and needles. Duff is darker soil that lies below the litter and contains the organic material found in the litter but in a much finer decomposed state. These two layers range from negligible to several feet deep, depending on the surrounding environment and the biomass that it produces. Underneath them lies the mineral soil, which varies greatly in texture from fine clays and loams to coarse sands and rocks. Litter and duff layers break up the forces of rainfall and the overland flow of water, allowing the water to infiltrate into the soils.

Exposing mineral soil along trails to wind and water is generally unavoidable so trail managers must work to minimize and control erosion. To do that some of the basic factors that affect erosion must be looked at, the most important of which is slope. Rainwater naturally travels downhill along the path of least resistance. Vegetation and organic soil layers add resistance and slow water down so water can penetrate into the soil. However, some water finds its way onto the compacted soil of the trail tread, and may be intercepted to flow along the tread. Because there is no vegetation or litter/duff layer to slow the water down and the compacted soil will not allow it to soak in, water trapped on the tread will pick up speed. The faster water travels the more sediment it can pick up and transport and steep trail alignments will allow it to erode tread substrates.

The mineral soil type comprising the tread substrate also affects its erosivity. Evans Park is fortunate in that it contains a sandy loam type of soil that is ideal for trail building. Loam soil types contain enough clay to hold together well with heavy use and enough sand to drain well after a rain. That will help ensure that water does not pool and create mud puddles in flat areas.

Erosion has many negative effects on the trail and the environment. Erosion makes trails unpleasant to hike by exposing tree roots and rocks and making the tread rutted and uneven. As the tread becomes rutted it sinks below the level of the surrounding ground, intercepting and transporting large amounts of water, accelerating the erosion process and making it difficult for managers to divert the water from the trail. Erosion also impacts the environment when it washes soil-laden water into adjacent waterways.

Muddiness can also be a big significant problem with trails built in flat terrain, such as a majority of the Danville site. As a newly built trail is used, loose soil can be displaced to the sides of the tread and the remaining soils are compacted. This can create a cup shape to the trail bed that is lower than the surrounding ground and flat areas have the potential to fill with water and create puddles and muddy areas. Because bikers don't always like riding through mud they will often try to ride around it. This causes the trail to widen around the edges of the mud and eventually creates large puddles and excessively wide trail.



Water

Water is another major concern when building a mountain biking trail. Poorly cited or constructed trails can divert large amounts of sediment into otherwise clean water supplies due to erosion and destructive stream crossings. This extra sediment can clog waterways, divert flow and harm marine life.

Wildlife

Trails provide pathways in the homes and habitats of wildlife. Simply the presence of visitors will disturb wildlife as they pass by. For the most part many of these impacts are unavoidable; however Sensitive habitats and endangered species should be avoided when laying out a trail. Visitors should also be informed of the negative impacts of harassing or feeding animals through signage or informational programs.

Trail Design and Construction

This section describes the steps necessary for designing and constructing mountain biking trails with an emphasis on practices that lead to greater sustainability.

Initial Planning

First one must identify who will be using the trail. Will the trail be specifically for mountain bikers or mixed use, to include hikers? How much use is the trail likely to receive and what is the skill level of the people who will be riding on it? These factors will help you design a trail that meets their needs. Since the Evans Park site is constrained by its size and limited elevation gradient, an easy to intermediate mountain bike trail may be all that can be provided.

Site Trail Alignments

Where a trail is sited and how it is laid out is the first thing that must be considered during the design process. Siting is the single most important component in building a sustainable trail. The following steps should be taken as part of the trail alignment process:

1. Identify the boundary for the project. It appears as though Zone 1 would be the best area to use because it is large and self contained. Bikers would not need to cross the busy highway to get to Zone 2.
2. Identify control points for where you want the trail to go. The basic control points must include the beginning and end point for the trail, preferably the same point for a loop configuration. After that, points of interest can be included that you want the trail to pass by, such as:
 - o Water bodies
 - o Scenic vistas
 - o Unique forests or vegetation
 - o Historic or cultural sites
 - o Rail, road, or water crossings
 - o Interesting rock ledges, formations or boulders, or topographic constraints
 - o Meadows
 - o Hill slopes for gaining/losing elevation
3. The boundary for the project and control points should be mapped. This way the points can be strung together and the overall shape of your trail should naturally emerge.
4. The areas between your control points should be scouted and evaluated for potential trail locations.
 - o Positives –
 - A variety of landscapes – forest, meadow, riparian
 - Transition zones between landscapes – for example running the trail along the edge of a meadow instead of through it keeps the scenery fresh and variable.
 - Slightly sloped terrain
 - o Negatives –
 - Steeply sloped terrain
 - Completely flat terrain
 - Sensitive/rare plant or animal communities, historic/archaeological sites that you want to protect
 - Marshy/wet areas
 - Unnecessary road or stream crossings
5. The trail should be roughly plotted on the map. This can be done on paper maps but consider computer Geographic Information System (GIS) software and the use of GPS devices to collect control points or proposed trail alignments.
6. Someone with trail building experience should walk the proposed route and flag the trail corridor with sustainable trail building practices in mind.

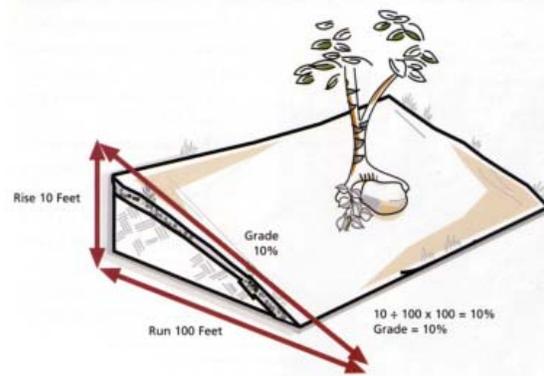
7. Before the corridor is finalized someone should walk or jog the pathway to make sure it flows smoothly without turns that are unexpectedly sharp or hills that are too steep.

8. Construct the trail.

Sustainable Trail Design Practices

The standard style with which all sustainable mountain biking trails are built today is called Singletrack. Singletrack is trail in which bikers are forced to travel in single file along a relatively narrow trail. A singletrack trail typically has a tread that is only 18-24 inches wide. This provides just enough space for one biker to travel abroad which limits the amount of soil exposed by the trail and discourages bikers from attempting to ride side by side which ultimately widens the tread. It also makes the trail more enjoyable by immersing the rider in nature and creating the illusion of greater speed when traveling in a narrow trail corridor.

What is Grade?



Grade is determined by dividing the elevation gain between two points by the linear distance between them. Percent grade equals rise over run multiplied by 100.

Trail Grade

Trail grade is a critical factor when building a sustainable trail that is resistant to erosion. Grade is simply the difference in elevation between two points displayed as a percentage. The easiest way to measure grade is with a device called a clinometer. A clinometer measures grade with a weighted disc. Hold the glass opening up to one's dominant eye to read the measurement and sight the target with the other eye. The clinometer scale will show the grade in both degrees and percent, but percent grade is more commonly used. When pointing the clinometer at something of equal elevation, for example the eyes of a partner that is the same height of the measurer, while standing on a flat surface, the device should read 0. If the partner is not the same height as the measurer, simply pick a point on their body that is at the measurer's eye level and aim for that. If the partner walks uphill the measurer should get a positive % reading that indicates the grade of that hill. This allows one to measure the grade of a perspective trail by standing apart from their partner on the prospective tread alignment and taking a reading.

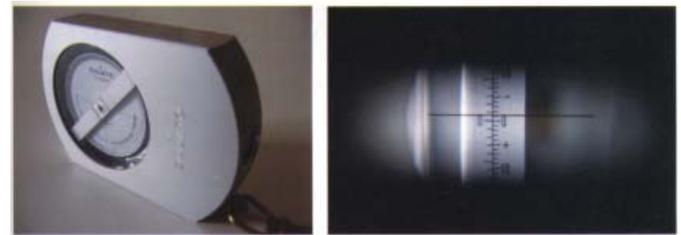
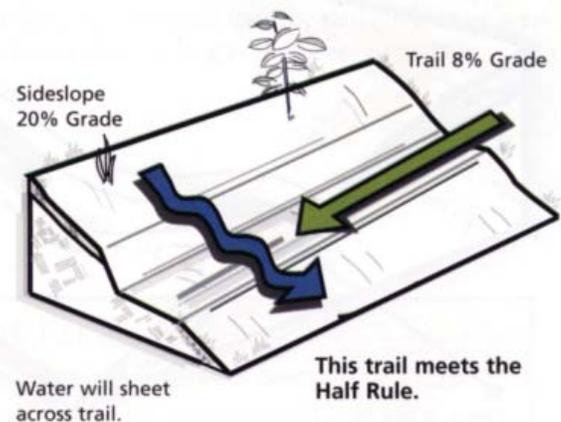
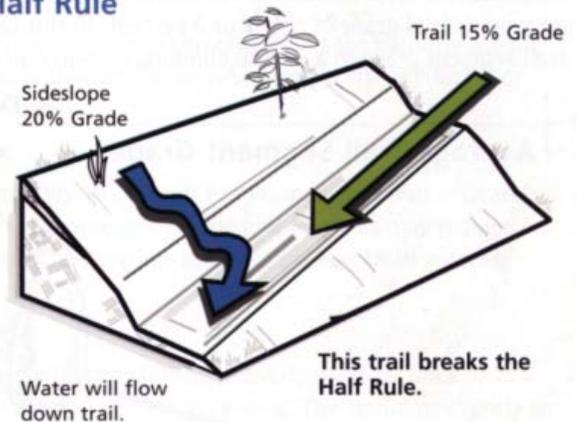


Image of a Clinometer

The easiest way to avoid problems with erosion on any given trail system is to follow the "Half Rule" by never letting the tread exceed half the grade of the hillside on which it is located. For example a hillside with 16% grade should not contain a trail with over 8% grade. This rule prevents trails from being on or close to the "fall line" on a slope, the path taken by water straight downslope. Fall-aligned trails are nearly impossible to drain water from and erode quickly.

The Half Rule is amended by another rule that trail grades should not exceed an average of 10%. This means that on a 20% grade hillside a trail with 10% grade is fine but a 30% hillside would not allow a steady 15% grade trail. This does not mean the trail cannot ever exceed 10% grade, just that it should do so sparingly. Maximum grades of 15-20% are ac-

Half Rule



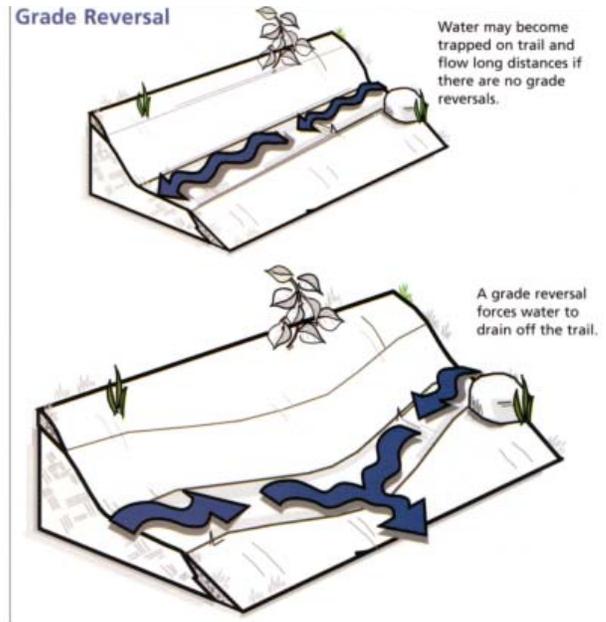
ceptable for short distances of 10-20 feet where necessary, particularly where there is substantial rock in the soil (or added rock and gravel). This additional rule is to keep water that does make it onto the trail bed from picking up enough momentum to cause serious erosion.

Sustainable trails should avoid flat ground when possible as sloping terrain can be more easily drained. Sloping terrain allows trails be built so that the tread slopes gently outwards. Building such "side-hill" trails is more time-consuming because a bench must be excavated from the side of the hill to provide an even tread. A principle advantage is that the outslope of the bench can be controlled and ideally built at a 5% grade. This allows water that is moving downhill to run across the trail instead of being funneled down the tread or collecting as mud puddles in low points and depressions. Side-hill trails also discourage trail widening by constraining visitors to the center of the path and making off-trail travel more difficult.

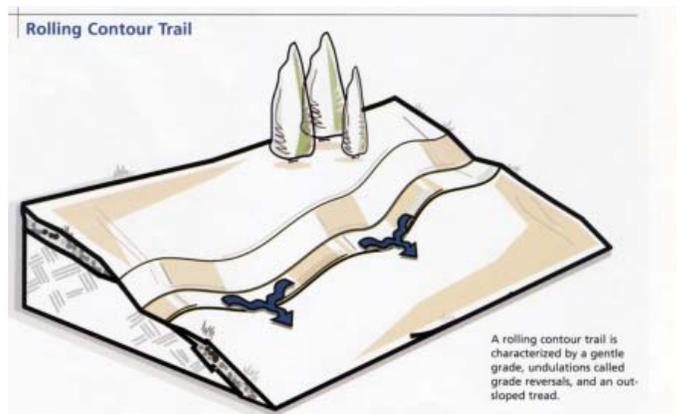
Sustainable trail alignments should also contain frequent grade reversals. A grade reversal is a spot where a climbing trail levels out and briefly turns downward, reversing the grade so that all water is forced off the tread, and then resuming its climb. Otherwise flowing water that has become trapped on the trail can pick up volume and momentum as it travels downhill. If the water encounters a grade reversal, the brief change in elevation stops it and the change in direction directs it off the trail bed and down slope. In essence a grade reversal plays the same role as a water bar does on conventional trails, except grade reversals require no routine maintenance, do not interrupt the flow of the trail with log or rock obstructions, and are permanently effective at removing all flowing water from the trail.

When designing a trail it is good to include frequent grade reversals on longer sections of climbing trail. Besides helping to control erosion, grade reversals also make the trail more enjoyable by making a monotonous climb more interesting and allowing bikers to lay off their brakes or take a short breather on long sections of sloped trail. The length and depth of the grade reversals should vary depending on the grade of the trail and how far apart they are placed. Generally the trail should dip for about 10-20 feet before resuming its climb and reversals should be as common as is practical. Remember that it is much easier to design a trail right the first time with frequent grade reversals than to attempt to control erosion with water bars later on. Installing grade reversals on an existing trail can be difficult, particularly for steeper grades.

The easiest way to accomplish all of these sustainable trail features is with a trail design called a "Rolling Contour Trail." A contour trail is characterized by a path that gently traverses a slope by roughly following the contour of the hillside. The bed of the trail is excavated from the side of the slope and outslopped with a 5% grade to flush sheet water from the hillside across the tread. Since a trail bed is already being excavated from the sideslope, take advantage of that opportu-



Example of a grade reversal



nity and precisely control the grade of the trail as it travels across the hillside to keep it well under the 10% average. The directional changes for grade reversals are already supplied by the natural rolling contour of the hillside and only the brief dip in trail grade has to be placed. Lastly, interesting trail is never straight. Contour trails continuously change direction and grade, which keeps them interesting and fresh.

Problems to Avoid

Fall Line Trails – Fall line trails are trails that follow the shortest route downhill. Trails that travel straight downhill, no matter how low the grade, will collect moving water and focus it into the tread because it is the path of least resistance. Any path following the fall line will quickly turn into an eroded gully.

Flat Terrain – When designing a trail attempt to avoid flat ground. Trails built on flat ground have no place to divert water. Eventually the tread of the trail can become a depression due to soil compacting and the movement of loose soil to the edges of the path. When it rains water will collect and have no way of soaking into the already compacted soil, resulting in muddiness, puddles, trail widening problems, and the creation of braided trails.

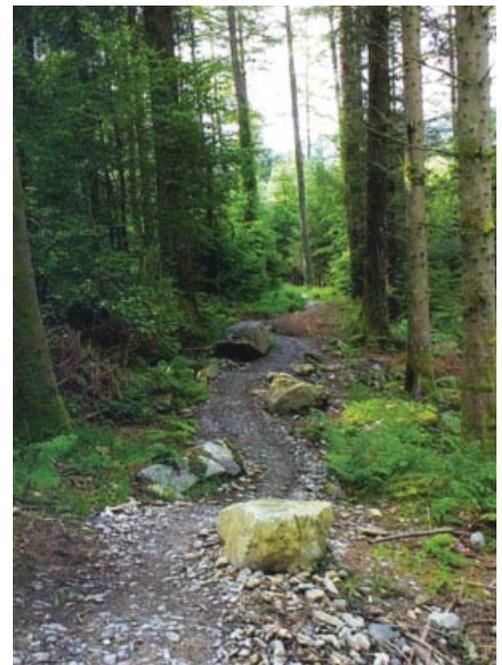


Example of erosion caused by a trail sited straight downhill

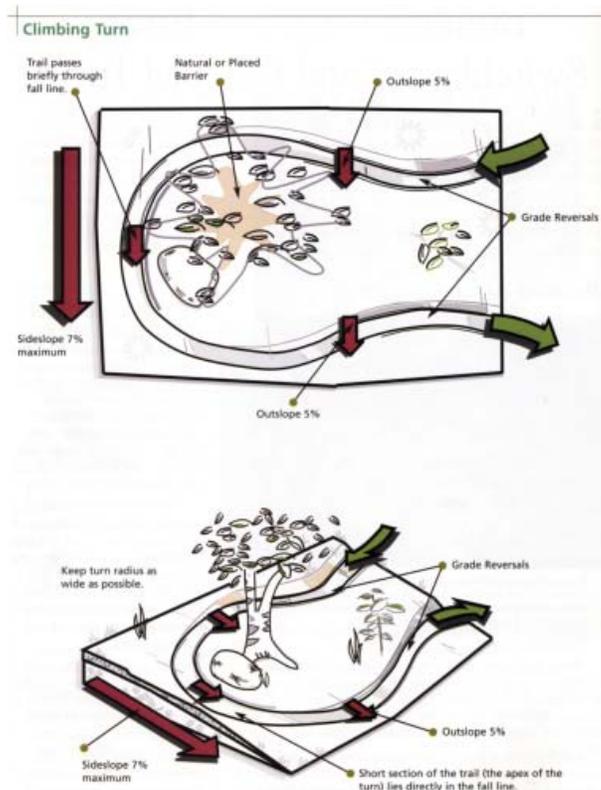
Trail Building Tips

Anchors

Well designed trails will often include natural objects called ‘Anchors’ to help define and control the trail alignment. Anchors can be large rocks, trees, plants or natural logs positioned to line the trail. These objects help give the rider a sense of speed, emphasize the path of the trail ahead, discourage the formation of undesigantated shortcuts and help contain the trail in technical areas and sharp turns.



Example of natural anchors



Climbing Turns

Try to avoid creating sharp turns on climbing trails; locate turns on level or less steep sections of trail when possible. However, when trying to gain elevation in a restricted space a

turn is necessary to keep the grade low. Climbing turns can become quickly eroded because they usually increase the grade of the trail and must briefly travel directly up the fall line of the hillside. To combat this, build climbing turns on hillsides that are 7% grade or lower. The turn should be long and gradual and only the apex of the turn should be located on the fall line to minimize the amount of trail located there. Grade reversals can be placed both above and below the turn to remove water from the tread as it turns. Ideally the turn should be designed so that natural barriers such as boulders, trees or bushes are located on the inside of the turn so that visitors are discouraged from cutting.

The Trail Construction Process

First the trail corridor should be cleared of brush. The tread of the trail will only be 18-24 inches wide but the trail corridor should encompass an area about 3-4 feet wide and 8 feet high.

- Try to bend the trail around trees and trim branches instead of removing, provided there is sufficient space for handle bars. Trees help restrict trail width and act as anchors.
- Small trees and shrubs located within the tread should be cut at waist level and then dug out of the ground, roots and all. If they are cut flush with the ground their stumps inevitably re-sprout or become a dangerous sharp point when the soil compacts around them. After digging them out, make sure any resulting holes are filled with rocks and gravel and covered with soil.
- A wider trail corridor with ample sight lines should be cleared around bends if you expect the trail to get use in both directions; bikers need to see each other coming and have room to pass. This particularly important if the trail will be used by non-bikers that could potentially have children or dogs with them.

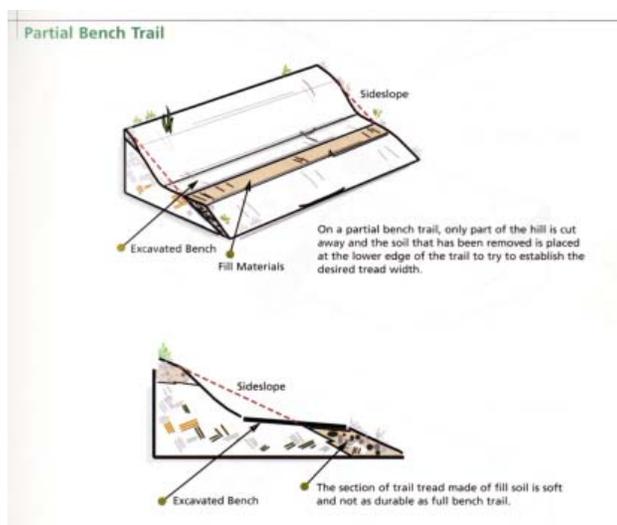
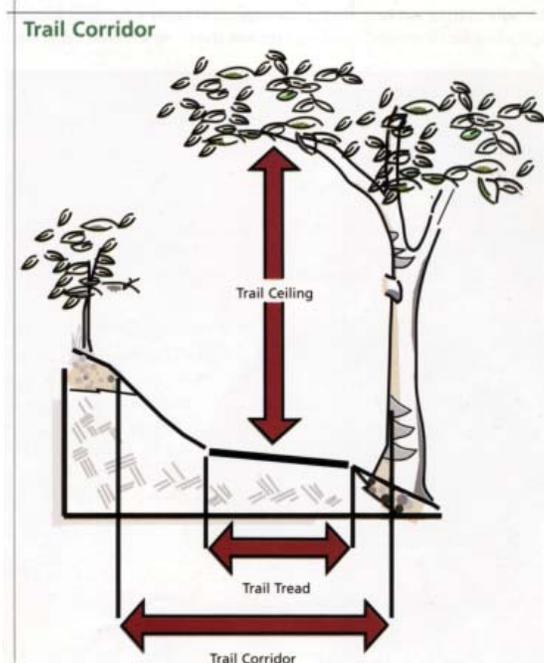
• The corridor should also be cleared a little wider if maintenance will be infrequent, (e.g., less than once a year).

• For an ideal sustainable trail, a single-track biking trail requiring visitors to travel in one direction is recommended because it allows a narrow trail tread and corridor, which limits its impact and makes it more enjoyable to use.

• Care should be taken to preserve plants and trees that grow along the corridor during the building process. These will make the trail more interesting and help to control its width. Ferns, wildflowers and other native herbs can be removed and set aside for transplanting next to the trail after it is excavated.

If the trail is in a relatively flat area this is really need. Deep grass or leaf litter should be removed but not down to the mineral soil if it can be avoided. If the pathway of the trail is not obvious, it should be clearly marked with signs or blazes. If the trail runs through a large meadow, cairns or posts can be placed to guide the way. The grass or duff that is present will most likely disappear on its own in the first year as the trail gets its initial use and the pathway should become more apparent. Otherwise use mowing or weedwacking to reduce vegetation height and create a visually obvious tread.

If the trail is being placed on the side of a slope you will want to build what is called Full Bench trail. This includes cutting the entirety of the trail tread into the side of the hill to provide a level surface on which to walk. The benefit being that you can precisely control the outslope of the trail tread as well as the grade if it is climbing. There is a shortcut to building bench trail called partial bench where the tread is only partially excavated from the side-slope and soil that is removed is used to extend its width on the



downslope. Partial bench is easier to build but less desirable because the soil used to extend the bench can compact unevenly and slump downhill over time. Overall I would not recommend it because it requires more routine maintenance and doesn't work as well as full bench, particularly for the concentrated weight of mountain bike tires.

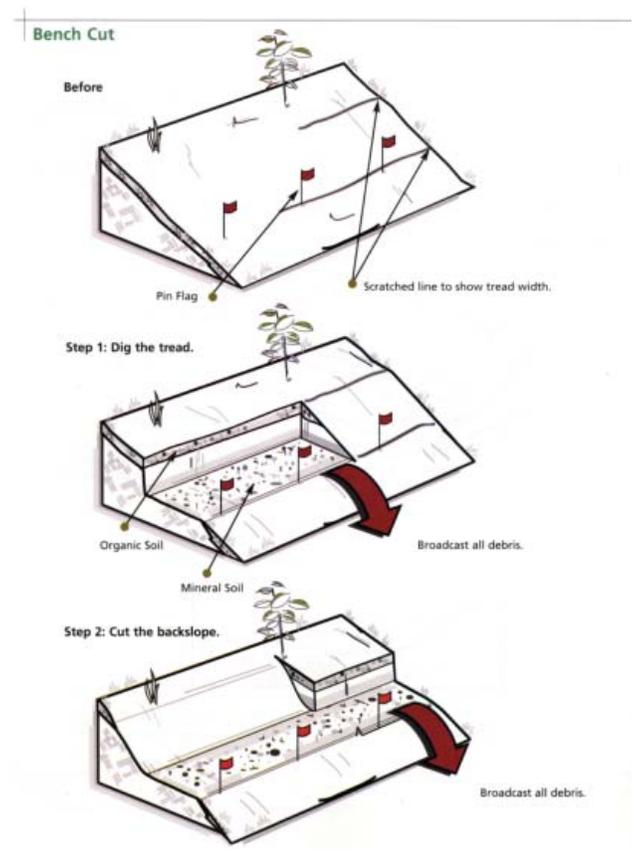
Steps for building Full Bench Trail

1. *Dig the tread*
 - a. Start by placing a line of pin flags a few feet apart exactly where you want the downhill edge of the tread to be.
 - b. Take all of the loose litter materials covering the slope, including leaves and twigs, and rake them uphill just beyond the trail corridor. Keep them together and close by because they will be used later.
 - c. Stand downhill of the line of pin flags and measure upslope the 18-24 inches that you want the width of the tread to be and make a mark with a digging tool.
 - d. Scratch a line into the soil along the lines created by the pin flags and the marks you made upslope. This should clearly show the path of the tread you intend to excavate.
 - e. Stand downhill from the pin flags and use a grubbing tool such as a Pulaski, hoe or mattock to begin loosening up the organic soil in your tread. As it is loosened use a digging tool such as a shovel or rake to broadcast the organic soil well downhill from the tread. Rocks and roots can sometimes be left to armor the tread and increase trail difficulty, if desired. If they are left make sure they do not disrupt the center of the tread or they will force bikers to the outer edges, which will widen the trail.
 - f. Keep loosening soil and moving it downhill until the tread is roughly level. If the cut has not reached mineral soil at this point continue digging downward. This is essential because organic soil will not compact enough to sculpt the precise tread angles you will need to construct later.

2. *Cut the Backslope*
 - a. The backslope is the steep slope that has been left directly uphill of the tread. If it is left this way it will erode or collapse onto the tread.
 - b. Take a grubbing tool and use it to round off the backslope by blending it into the slope of the hillside above. Continue digging until the back slope transitions smoothly from hillside to tread. The smoother the transition the better because water must travel down this slope and sheet over



Example of digging the tread



the trail without gaining speed or turning into a focused channel.

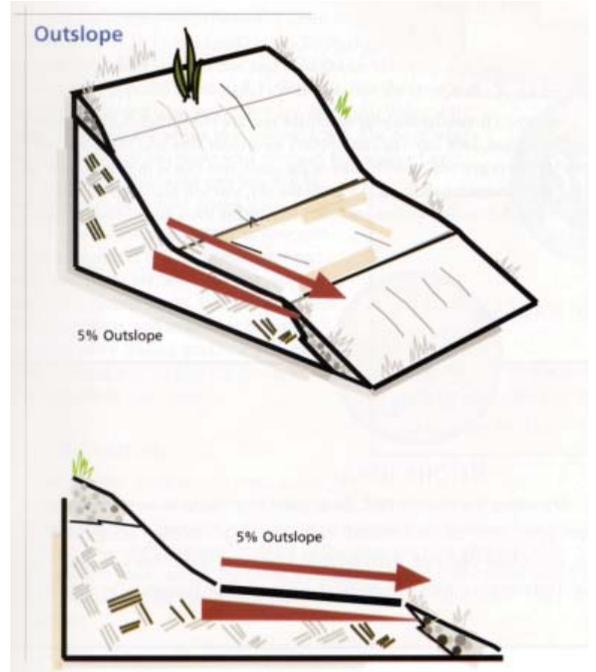
- c. Use the bottom of a McLeod or a boot to compact the backslope and round the edge where it meets the original hillside. This area must be well compacted and smooth or the water will cut into the newly exposed soil.



Example of cutting the back slope

3. *Outslope the Trail Tread*

- a. Outsloping the tread is the most important part of building bench style trail. Outsloping ensures that water will sheet across the trail and continue downhill.
- b. Stand downhill of the trail and use a McLeod or another digging tool to scrape and carve a 5% out-slope into the tread. Take the excess soil and broadcast it downhill so that no berm is created.
- c. Measuring a 5% out-slope can either be done with an inexpensive electronic level or measured using a leveled 24 inch stick, and tape to measure off 1.2 vertical inches on the lower end.
- d. Make sure the out-slope smoothly meets the back-slope and continues evenly to the downhill side of the tread. Any loose soil along the downhill side of the trail should be removed to make sure it doesn't form a berm when the tread is compacted.



4. Compact the Tread

- a. Use the head of a McLeod or your feet to compact the trail tread. This is important because trail users will not compact the tread evenly and a depression could form in the center. Pay special attention to the outside edge of the tread where it meets the downhill slope so that a berm doesn't form.

5. Finish the Tread

- a. Remove your pin flags and clean up the trail corridor.
- b. Take the organic leaf litter that was placed uphill from the trail corridor in the beginning and use it to cover exposed soil in the upper portion of your backslope and the broadcasted soil below the tread. This will help prevent erosion and make the trail look more natural and well-established.
- c. If you saved any native herbs from earlier you can plant them in the backslope to make the trail more natural looking. Water them as much as possible for a few days.
- d. Large rocks and logs can be moved from the nearby woods to be placed as anchors as needed to contain traffic in open areas or around sharp turns.



Example of finished backslope

Advanced Construction Techniques

Here are a few more advanced construction techniques, though they may not be necessary since the project area does not have many substantial elevation differences. Have someone who is experienced in trail building apply these methods if they are needed. A brief description of each is included along with a link to more in-depth instructions.

Retaining Walls

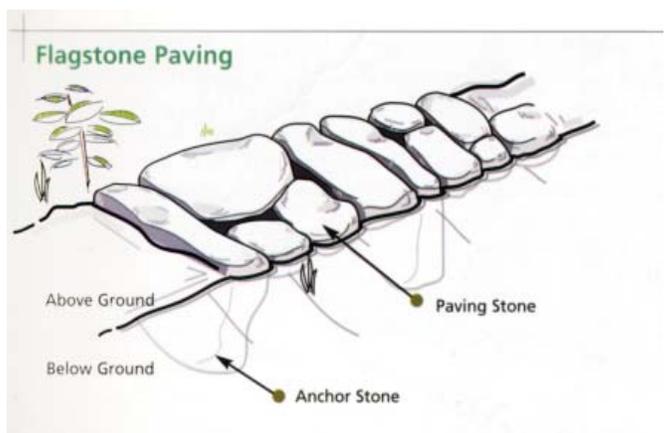
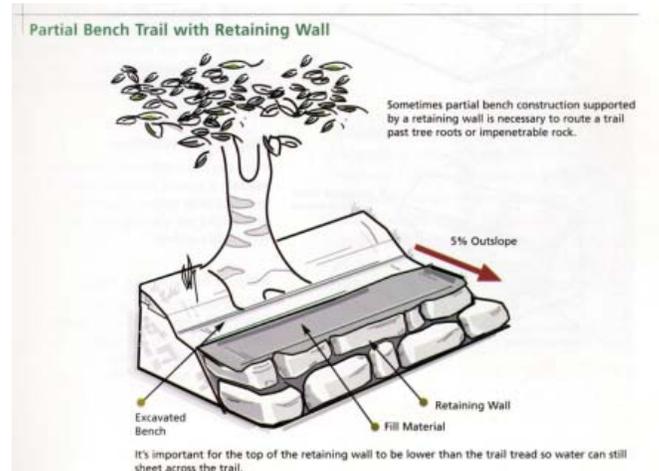
In terrain that is too steep or rocky for building a bench trail, a retaining wall may need to be built underneath the downhill slope of the trail. Retaining walls are also used in constructing complex uphill turns, such as switchbacks, to ensure the turn has a controlled grade and outslope at all times. Building retaining walls is both time-consuming and difficult so it is best to simply avoid switchbacks and steep/rocky areas that would require their construction in the first place; however, small simple walls are often handy in difficult terrain. Some steps to follow when constructing a retaining wall area:

- First roughly excavate the area where the wall will be placed.
- Next select large anchoring stones of at least 50 pounds and place them at the base of the retaining wall. Rot-resistant logs can also be used but are less desired because they will eventually rot and need to be replaced.
- Next place more stones on top of the anchor stones. These stones should be placed so that they straddle the gaps left by neighboring stones like in a brick wall and lock together like a jigsaw puzzle.
- Use smaller stones as wedges to keep the large ones from shifting and add a layer of small rocks and mineral soil between each layer to cement the wall together.
- If the wall is large, occasionally place a very large stone called a deadman that extends into the adjacent bank to weigh everything down and lock it in place.
- When placing each layer of the wall, make sure it tilts inward towards the upslope.
- At the top of the wall try to place very large flat rocks to create a smooth trail surface and help hold the wall together.

IMBA Guide to Switchbacks with Retaining Walls –
http://www.imba.com/resources/trail_building/switchbacks_2.html

Armoring

Areas susceptible to increased erosion or muddiness can be armored with stone to increase their resilience. Armoring is most often used on stream crossings or wet/muddy areas. Building them is very similar to building a retaining wall except that only one layer of stones is required. The trail tread will need to be excavated and lined with very large stones. These stones should be sunken into the ground similar to icebergs with the majority of their surface area underground so that they will not be displaced in the future. If you are armoring a stream crossing make sure that the anchor stones are large enough to stay put in a flash flood. Smaller paving stones can be placed second to fill in any gaps left by the anchors. In a stream crossing these most likely will not stay in place so all stones must



be anchors. In a muddy or marshy area the armored section of trail can then be covered with gravel or mineral soil to smooth out the tread. This process should raise the trail above the water/muddy soil and allow water to filter through the rocks and gravel so that it does not disturb your tread.

IMBA Armoring Guide –

http://www.imba.com/resources/trail_building/rock_armoring.html

Switchbacks

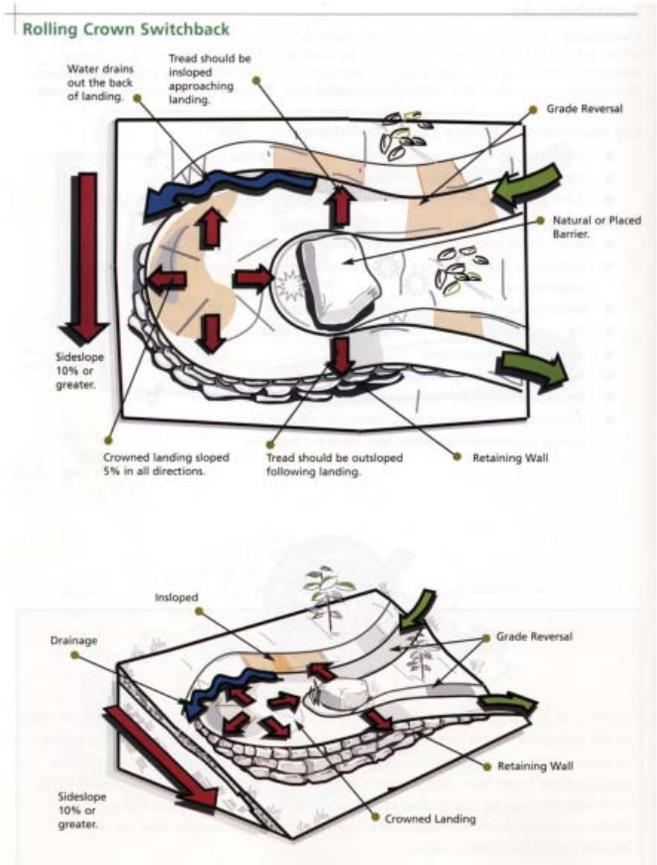
Switchback turns are very difficult and time-consuming to build correctly. Avoid constructing switchbacks unless someone has experience building them. They are similar in design to a climbing turn but require more slope excavation and sometimes retaining walls. For sharp climbing turns, a substantial amount of soil must be excavated from the backslope of the turn and used in combination with large rocks to build a level platform for the apex, possibly supported by a retaining wall. This platform should be slightly crowned so that it is outsloped by 5% on all sides. This way any water draining down the upper section of trail will drain out of the back of the landing and not complete the turn with the trail. All changes in elevation should occur on the straight parts of the climbing trail on either side where the trail is not in the fall line and erosion can be controlled. A large natural barrier such as a boulder or tree should be placed on the inside of the turn so that bikers are not tempted to shortcut it.

IMBA Guide to Basic Switchbacks –

http://www.imba.com/resources/trail_building/switchbacks.html

IMBA Guide to Technical Switchbacks –

http://www.imba.com/resources/trail_building/switchbacks_2.html



Water Crossings

All water crossings should be identified ahead of time in your control points for the trail system. This makes it easier to carefully design how you approach and cross them.

Considerations

- Trails should always descend into and climb out of stream crossings. This ensures that stream water never flows down the trail. This rule applies to any water source regardless of size. Intermittent streams and small springs located along hillsides are often overlooked and over time they can turn a trail bed into a stream bed or mud puddle.
- Trails should descend at a gentle grade of no more than 8% and avoid the fall line when crossing streams. This will prevent the trail from choking it with eroded soil and other debris.
- When choosing a crossing site pick one with a gradually sloping bank to avoid extensive bench excavation that would erode when the stream floods.
- Design grade reversals just up trail on both sides of the crossing to remove excess water from the trail before it intersects the stream.
- Maintain the natural stream bed as much as possible for the crossing so as to not disrupt the ecological habitat.
- Its best to armor the trail tread for the stream crossing with large stones with a flat face. Make sure

they are large enough that they won't wash away in a flood and sink them into the soil to secure them in place and level the tread surface. This will make the crossing more stable and less muddy.

Other Options

Bridges – Bridges are by far the most sustainable way to cross a stream because they do not affect the water quality or disturb aquatic habitat. However, they are also the most difficult and expensive to install. If you decide to build a bridge make sure that it is large enough and properly built, and high enough to allow for river flooding. Engineers must be consulted for longer or more complex bridge designs. The ends of the bridge should extend well beyond the banks of the stream to account for flooding and to protect water quality. The bridge should be well anchored and high enough that it does not break or wash away in a flood.

Culverts – Culverts are drier than fords and cheaper than bridges but are still labor intensive to create and are the most disruptive to streams. Culverts severely restrict the movement of water, segment aquatic habitat, and often fail or become clogged, requiring periodic maintenance.



Example of trail sited sensitively through wetlands

Wetland Considerations

Wetlands are delicate and sensitive ecosystems and generally should be avoided when building trail. However if a trail must traverse a wetland there are some recommended methods. The most common involve raised wooden boardwalks or raised tread. Building them is complex and more information about properly designing and installing such measures can be found in the U.S. Forest Service publication titled "Wetland Trail Design and Construction," available at www.fhwa.dot.gov/environment/fspubs.

Trail Management

Once construction is finished, the trail will need to be managed. The first step for a trail manager should be to place adequate signage for the trail system, provide facilities such as parking, and to advertise its existence to the local community. Another important task for a trail manager is to organize maintenance for the trail system. Routine maintenance should ideally occur several times a year in the spring/summer to control vegetation growth. A minimum of annual trail maintenance at the beginning of summer is the most practical for working with volunteers.

Basic Maintenance

- Trim vegetation – If you can only do it once a year, make sure you severely cut back quick growing bushes and trees further than is needed to clear the trail so that they have room to grow again. Use a weed whacker or weed whip to clear grass and weeds from the tread.
- Clear fallen trees and logs
- Remove loose rocks and exposed roots

Dealing with Problems

- **Muddy areas/puddles** – If the terrain is sloped, reconfigure the tread outslope to 5% and completely remove any berms on the downhill side of the tread. Alternately, excavate a broad shallow ditch through the berm to drain the tread. If muddiness occurs in flat areas, consider



Example of muddy area

- rerouting the trail so that it is on a nearby slope. Otherwise you will need to elevate the tread above the surrounding terrain. This can be accomplished by filling it with gravel or armoring it with rocks. Never use organic soils and even mineral soil can become muddy if not mixed with rock or gravel.
- *Trail widening* – Trail widening usually occurs when visitors are trying to avoid some obstacle on the trail such as rocks, downed trees, mud puddles, rutting, or overgrown vegetation. Remove or correct whatever is causing the trail widening behaviors.
 - *Informal Trail Development* – Informal (user-created) trails commonly develop when users seek to access areas or sites not connected to the formal trail system. These trails are usually used to reach a landmark, such as a vista or to shortcut a turn. The problem with these trails is that they are not designed sustainably. They can be dealt with either by discouraging their use or embracing them by building a sustainable trail in their place that takes users to where they want to go. In the case of a shortcut downhill, informal trails should be eliminated by placing logs and brush in the path and covering the trail with leaf litter to disguise it. If visitors want to use an informal trail badly enough you won't be able to stop them, but adding an informational sign may help to educate them if you have serious problems with visitors re-opening closed trails.
 - *Erosion* – Erosion is much more difficult to deal with after a trail has already been designed and built, however, even a well-built trail can have problem areas or require occasional maintenance. First, make sure that there are a sufficient number of grade reversals and that the tread is still outsloped by 5%. Every few years you may need to remove berm buildup on the lower edge of the tread to keep it functionally outsloped. If you are dealing with a problem area you can install water bars as a last resort. Dig a deep dip in the tread that angles downhill on the fall line. Their depth and frequency should depend on the steepness of the trail and how badly it is eroding. Once a water bar is constructed it will most likely need yearly maintenance to clear soil deposited in the dip.
 - *Repair Trail Structure* – Watch for features such as slumping backslopes and treads, crumbling retaining walls, and washed out stream crossings that may need to be repaired.

Additional Resources

- *International Mountain Bicycling Association (IMBA) homepage* – <http://www.imba.com/>
- *IMBA Trail Building Resources* – http://www.imba.com/resources/trail_building/index.html
- *Practical Resources for Building Trails (Includes where to get hand tools, equipment, how to books, signs and bridges)* – http://www.imba.com/resources/trail_building/tool_guide.html
- *Engineering Resources for Standard Mountain Biking Bridges* – http://www.imba.com/resources/trail_building/trailbridgedetails.pdf
- *Guide to Rating Trail Difficulty* – http://www.imba.com/resources/trail_building/itn_17_4_trail_difficulty.html
- *How to Use a Clinometer* – http://files.dnr.state.mn.us/education_safety/education/plt/activity_sheets/howToUseAClinometer.pdf
- *Information on Invasive plant species and identification* – <http://www.usna.usda.gov/Gardens/invasives.html>
http://www.cityofchicago.org/content/dam/city/depts/doe/general/NaturalResourcesAndWaterConservation_PDFs/InvasiveSpecies/LandbasedInvasivePlantBrochure2009.pdf

- *Working with Trail Volunteers* –
<http://www.imba.com/resources/organizing/volunteers.html>
- *Closing Old Trails* –
http://www.imba.com/resources/trail_building/reclaiming_trail.html
- *Building Switchbacks* –
http://www.imba.com/resources/trail_building/switchbacks.html
http://www.imba.com/resources/trail_building/switchbacks_2.html
- *Building Armored Trails* –
http://www.imba.com/resources/trail_building/rock_armoring.html
- *Building Rolling Grade Dips* –
http://www.imba.com/resources/trail_building/gradedips.html
http://www.imba.com/resources/trail_building/gradedips_2.html
- *Building Full Bench Contour Trails* –
http://www.imba.com/resources/trail_building/contour.html

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