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I. Preface

from Donnie Underwood, Roanoke Parks and Greenways Planner

...the perfect setting for leaving the paradigm of our life situation behind for just long enough to begin to feel and see what really concerns us.....

Trails, open spaces and our parks are, indeed, vital structural components to a community due to their provision of, at least for a moment in time, a perfect setting. A park trail is not simply a route from here to there, rather it is a place to reconnect with ourselves and nature. In the development and care of these trails, we need to think about the experience for which we provide stewardship.....what will it look, feel, smell, taste, and sound like to each user?

Gifford Pinchot, Chief Forester under President Theodore Roosevelt, coined it best when charged with the administrative task of creating a policy directive that could be used to guide resource management for a wide variety of issues including wildlife, forestry, public parks and open spaces” *the greatest good for the greatest number for the longest time*”; thus, the phrase for ever-after would be known as *conservation!*

Sound conservation and stewardship are at the heart of Roanoke’s philosophy regarding appropriate access to our natural landscapes. It was this same ethic that prompted both the Mill Mountain Advisory Committee and the Department of Parks and Recreation to work jointly towards a sound and sustainable access plan for Mill Mountain’s trails; in essence, *the Mill Mountain Trails Management Plan.*

The process that you are about to discover is best described as a “labor of love” that was crafted by eight individuals who cherish the resource known as Mill Mountain. With an excess of two-hundred service hours logged and countless additional hours of data analysis spread-out over numerous evenings and weekends, our trails task force made up of volunteers and City staff has brought this management plan to fruition for the enjoyment of trail users for decades to come.

It is the trail user, both you and I, and thousands of users yet to come that are indebted to the care and dedication this team has forged for our enjoyment.....

The Mill Mountain Trail Task Force – “The Team”

Brian Batteiger, Chair, Valley Area Shared Trails
Liz Belcher, Roanoke Valley Greenway Commission
Paul Chapman, Roanoke Parks and Recreation
Dick Clark, Mill Mountain Advisory Committee
Tom Clarke, Roanoke Parks and Recreation
Betty Field, Mill Mountain Advisory Committee
Bill Gordge, Pathfinders for Greenways
Linda Oberlender, Pathfinders for Greenways

II. Glossary of Terms and Acronyms

BMP – Best Management Practices, standards of the profession for the best ways in which to implement actions

Front country – A natural area close to population centers, as opposed to backcountry which is remote and removed from access points

GPS – Global Positioning System, equipment communicating with satellites to pinpoint locations and provide mapping

IMBA – International Mountain Bicycling Association, an organization promoting the sharing of trails with mountain bikers

MMAC – Mill Mountain Advisory Committee, a City Council appointed board of citizens.

Multi-use – Trails that are used by more than user group, such as hikers, mountain bikers, and equestrians. Also referred to as shared-use trails

NPS – National Park Service, an agency in the Department of Interior, responsible for management of the Blue Ridge Parkway

Sustainable Trail Design - What is a sustainable trail? The National Park Service has defined sustainable trails as follows:

Sustainability is the ability of the travel surface to support current and anticipated appropriate uses with a minimal impact to the adjoining natural systems and cultural resources. Sustainable trails have negligible soil loss or movement and allow the naturally occurring plant systems to inhabit the area, while allowing for the occasional pruning or removal of plants necessary to build and maintain the trail. If well built, a sustainable trail minimizes seasonal muddiness and erosion. It should not normally affect fauna adversely nor require rerouting and major maintenance over long periods of time.

- US Department of the Interior, National Park Service, Natural Resource Management Guidelines, 1997

Team – Trail Plan Team

UTAP – Universal Trail Assessment Process, a system developed by Beneficial Designs to rank the accessibility of trails for handicap users

VAST – Valley Area Shared Trails, a group representing a variety of trail users and dedicated to assisting local governments with expanding trail opportunities

Vision 2001 – City of Roanoke’s Comprehensive Plan

III. Introduction

A. Brief History of Mill Mountain's Trails

For centuries Mill Mountain has drawn people to its slopes and summit for natural resources and recreation. As early as 6,000 B.C. indigenous people were attracted to the large natural spring at the base of the mountain. In 1882, the first documented road was built up the western slope to increase the municipal water supply. Later, other roads and trails were built either to bring people to the summit for outdoor recreation, to provide access to the forested slopes for loggers or fire management, or to reach the mountainous area behind Mill Mountain. A 1943 map shows most of today's roads and trails as existing fire trails. The trail system also holds regional, state, and national significance via the Mill Mountain Greenway Trail which connects to downtown Roanoke, the Star Trail which is on the Virginia Birding and Wildlife Trail, and Ridgeline and Wood Thrush trails through Mill Mountain Park which connect to the Blue Ridge Parkway trail system.

Due to the mountain's unique character and prominence, City Council created 'The Mill Mountain Development Committee', later known as the Mill Mountain Advisory Committee (MMAC). This appointed body's role is to advise City Council, via the Department of Parks and Recreation, on any and all development proposals for the park. In 1998, the MMAC established a trails subcommittee. This subcommittee worked with the Department of Parks and Recreation to investigate possible trail connections using existing paths. The result was a proposed trail from the base of the mountain near Riverland Road to the summit, behind the Mill Mountain Star, later known as the "Star Trail". The MMAC recommended this action to City Council, and the trail was built by volunteers and opened in 1999.

In 2001, the Department of Parks and Recreation was approached with the notion of having the trails on the mountain open for mountain bike usage. City policy at the time prohibited bicycle usage within public parks except on paved roads. A group of trail users from the differing user-groups (hikers, bikers, and equestrians) together with staff from Parks and Recreation coordinated to form the *Valley Area Shared Trails (VAST)* group. VAST has resulted in over one-hundred thirty men, women, boys, and girls joining forces to help create and repair trails on Mill Mountain as well as other natural trails in the Roanoke Valley.

In 2003 the most recent initiative by Parks and Recreation and the MMAC began to help enthusiastic volunteers inventory existing trails on the mountain and obtain accurate GPS locations of each pathway, trail, and fire road. Over the years a labyrinth of old road beds, trails, and utility corridors had developed on Mill Mountain. Many of these receive significant use as trails, but are unmarked and inconsistently maintained. In some areas only people who know where the trails are located, where they begin and end, can find the connections. Within the last two years, both the MMAC and Department of Parks and Recreation have taken great strides in changing public policy and steering an ethic of responsible natural resource stewardship regarding the mountain and how human access is best managed. The initiative of this trail management plan was a direct result of a series of consistent and thoughtful processes led by City staff and dedicated volunteers.

B. Project Partners and Scope of Work

In the winter of 2005, Parks and Recreation created a team of volunteers and staff from the Greenway Commission, Pathfinders for Greenways, and the Valley Area Shared Trails group to address the growing need for managing Mill Mountain's trails. As part of the land-use planning process of Parks and Recreation and the MMAC, the team's initial assignment was to inventory existing trails and utilize Best Management Practices (BMP's) for trail assessment to identify which trails were best suited for the different types of usage (hiking, biking, and horseback riding). The process of developing that plan highlighted the importance of the trail

system for outdoor recreation and environmental education opportunities. Consequently, the trail team developed a trail management plan which could be incorporated into the Mill Mountain Land-Use Plan.

The Trail Plan Team's objectives were:

- 1) To inventory and map existing trails, road beds, and paths within the Park.
- 2) To evaluate the suitability of each trail for use by hikers, equestrians, and mountain bikers.
- 3) To identify an official trail network for Mill Mountain Park.
- 4) To explore connecting the trail system for Mill Mountain Park with the Blue Ridge Parkway and Roanoke Valley Greenway trails.
- 5) To identify the issues, challenges, and opportunities for managing the trail system.
- 6) To identify needs, such as improvements to trails and ancillary facilities.
- 7) To identify operation and maintenance issues to be addressed by Parks and Recreation.
- 8) To provide input from representative trail users for the planning process.

C. Existing Direction Relevant to Trails

The Trail Plan Team reviewed existing deeds, goals, plans, study findings and vision statements to crystallize direction pertinent to trails. These include:

Fishburn Deed (1941):

[Mill Mountain ...]“Developed and forever preserved, improved, and maintained for the use and pleasure of the people of the City of Roanoke, Virginia, and vicinity”.

Rhodeside and Harwell (1991):

“B. Presentation of Goals and Objectives

1. Preserve visual integrity both to and from Mill Mountain.
2. Preserve Mill Mountain as a natural resource.
3. Preserve Mill Mountain as a symbol of Roanoke.
4. Enhance Mill Mountain as a place for recreation.
 - Maintain Mill Mountain as a predominantly passive park environment.
 - Enhance the close relationship between the Blue Ridge Parkway and Mill Mountain by developing scenic and nature-oriented recreational opportunities on the Mountain.”

Comprehensive Parks and Recreation Master Plan (2000):

Action Strategies:

9. “Develop trails, greenways, and on-road bicycle facilities, doing so in a way to interconnect shopping areas, schools, work sites, parks, other important places in the valley, and future open spaces. Where appropriate, trails should be multi-use trails, accommodating activities such as hiking, bicycling, and horseback riding.

The development of greenways has very strong grassroots support throughout the City and Roanoke Valley.”

Vision 2001/2020 (2001)

EC A7 “Promote trails on City-owned land, where feasible and suitable.”

EC A8 “Promote and increase access to trails and natural areas by providing parking, guide maps, and appropriate marking.”

Mill Mountain Vision Statement (2005):

“Mill Mountain will continue to enrich the quality of life for those who visit, work and live in the Roanoke Valley. It is an integral component of the green infrastructure of the region, or our urban fabric, and of the evolution of the City, which shall be honored and preserved.

Through sound stewardship, Mill Mountain will offer environmentally sensitive educational, recreational, and civic opportunities while preserving its natural character and resources.”

A review of the literature about Mill Mountain, and a series of meetings with representative citizen’s groups indicated that the mountain has been viewed in many ways by the people of Roanoke. These views generally fit within four descriptive categories:

1. Mill Mountain as a beautiful, natural environment that should be retained
2. Mill Mountain as an important symbol for the City of Roanoke
3. Mill Mountain as a significant visual landmark
4. Mill Mountain as a recreational resource

D. Goals, Objectives, and Strategies for the Trail System on Mill Mountain

The Trail Plan Team developed the following goals and objectives for the trail system on Mill Mountain.

Goal:

To provide a sustainable network of trails which provides residents and visitors with opportunities to enjoy the natural environment in ways which fulfill their physical, emotional, and spiritual needs while protecting the mountain resources.

Objectives:

To provide opportunities for multiple uses, including hiking, mountain biking, bicycling, and horseback riding.

To provide opportunities for disabled users and young people.

To provide sustainable trails.

To provide trails with a range of difficulties, but generally rated as easy to more difficult.

To provide linkages to other trail networks, including Roanoke Valley greenways and Blue Ridge Parkway trails.

To provide a spectrum of opportunities for educators, including scientists, artists, naturalists, and teachers.

Strategies:

Provide loops.

Provide sustainable trails built to standards of U.S. Forest Service and International Mountain Bicycling Association (IMBA).

Provide connectivity among trails and destinations.

Provide for multi-use trails, including hikers, mountain bikers, bicyclists, and equestrians.

Provide signage and wayfinding.

Develop a cadre of volunteers to assist with maintenance.

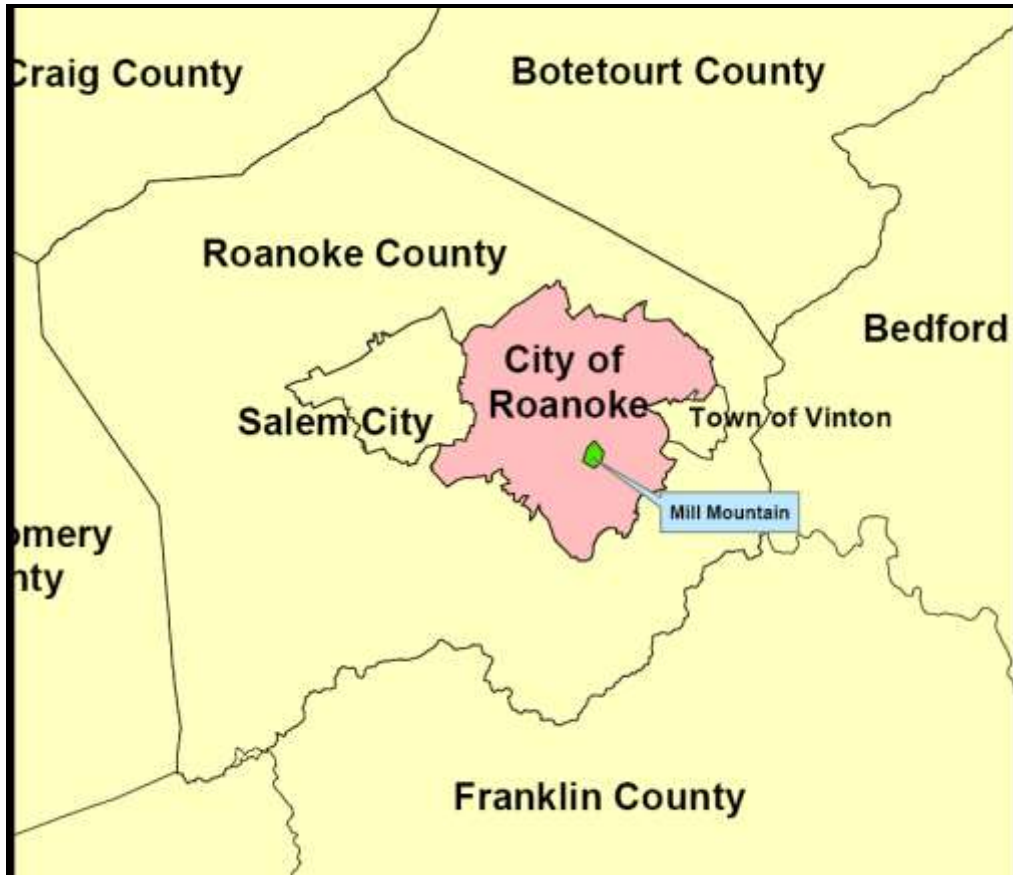
Provide parking for a variety of users and vehicles.

IV. Trail Inventory

A. Description of Project Study Area

The project study area included 574-acres of Mill Mountain Park. In addition, the Team assessed the Fern Park Trail as a potential connection to the Blue Ridge Parkway trails. Mill Mountain Park is approximately a mile from Interstate I-581 and abuts the Blue Ridge Parkway. The Park is predominately a natural area, except for approximately 10 acres at the summit that are maintained for the Mill Mountain Star, picnic area, Discovery Center, wildflower garden, scenic paths, Mill Mountain Zoo and parking areas.

Vicinity Map for Mill Mountain Park



B. Data Collection Process and Methods

Process

The team used the following process:

1. Inventory
 - a. Development of inventory forms and system.
 - b. Training and procedure review with team.
 - c. Inventory of existing trails and road beds.
 - d. Review of potential trails and connections.
2. Mapping of existing and potentials trails.
3. Review and definition of standards by user group.
4. Review of trail data to determine user suitability and difficulty.
5. Coordination with Mill Mountain Management Plan team.
6. Recommendations for each trail of user groups and actions needed.
7. Composition of trail plan for presentation to Mill Mountain Advisory Committee.

Methods

The team reviewed several existing trail inventory systems, including the U.S. Forest Service, National Park Service, and Appalachian Trail Conference. Four of the Team members had been involved with the Blue Ridge Parkway trail inventory and plan, which used the Universal Trail Assessment Process (UTAP). The team decided to use a simplified version of that process. The UTAP system is a method developed by Beneficial Designs for assessing the accessibility of the trail for wheelchairs. The system records trail characteristics such as corridor width, tread width, slope, cross slope, obstacles and condition. Because UTAP is most useful when a trail system is complete, the Team made modifications to the forms to make them more suitable for collection of pertinent data. A sample cover sheet, data sheet, guidelines to the team, and a UTAP instruction sheet are included in Appendix A.

The inventory data was collected in leaf-off season in the winter of 2005. Trails were mapped using Trimble GeoExplorer and TDC1 GPS equipment with assistance from the Roanoke Valley Governor's School. There are significant gaps in satellite coverage for certain parts of the mountain due to topographical and forest canopy challenges; these sections were mapped multiple times. The raw data and draft mapping were then presented to Virginia Tech for GPS correction and final trail mapping.

With regard to trail names, some of the trails had existing colloquial names. These were used during inventory. Others were given names by the team as illustrated via the tables on the next page that show the trails which were inventoried and those which were only mapped. Those which were only mapped were either "not yet in existence but potential connections" or created by "illegal motorized activity".

Trails Assessed with Inventory Names

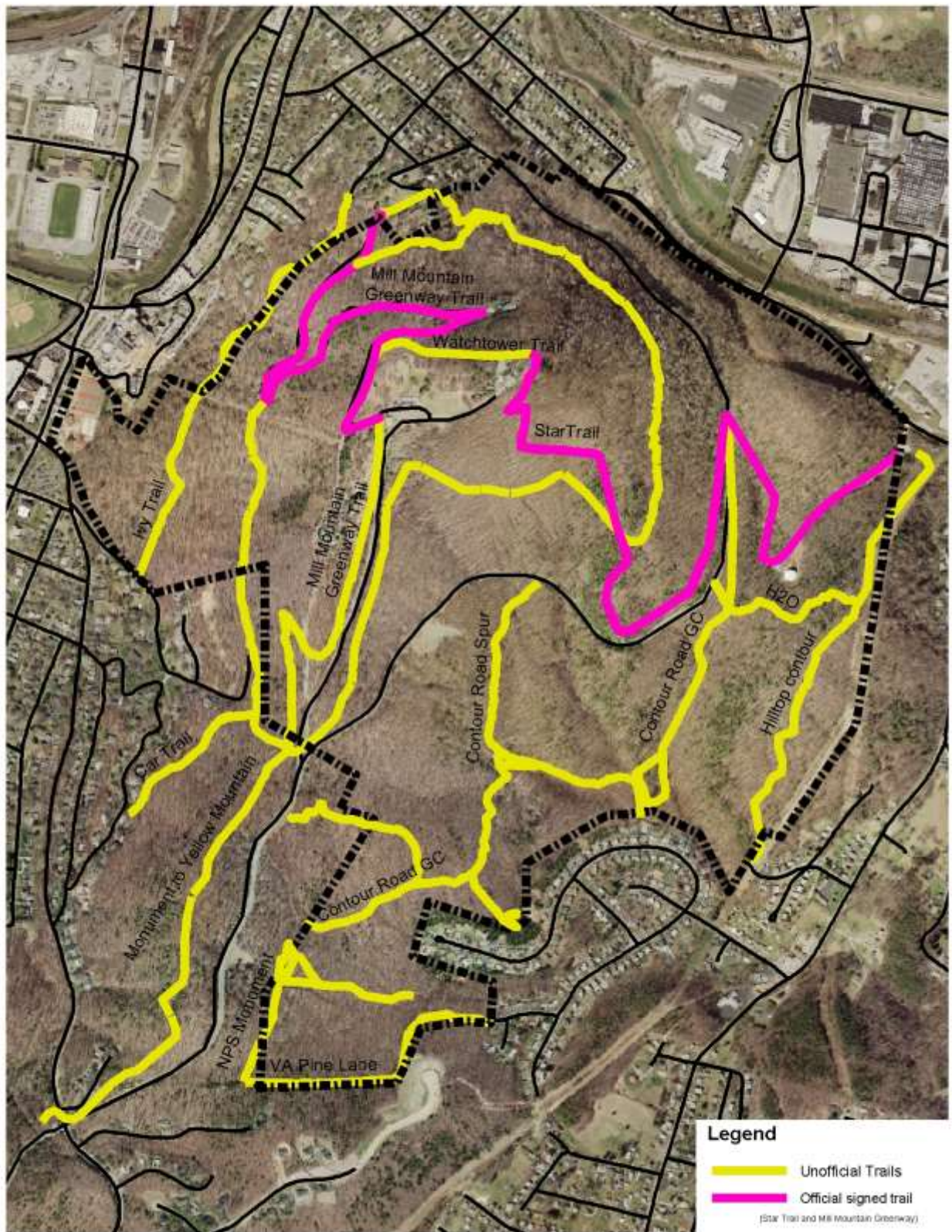
Name Used During Inventory	Segment Start	Segment End
West Side		
Car Trail	Prospect Road at Big Sunny	Robin Hood Rd.
Connecting Trail	Car Trail	Saddle
Fern Park Trail - Upper	Developed area	House site
Fern Park Trail - Lower	Developed area	Upper trail
Ian's Spot	Fishburn Parkway	Dead end below Monument Trail
Ivy Trail	Ivy Street	Woodcliff Road
Kepley Trail	Saddle	Morrison Street
Mill Mountain Greenway	Prospect Road at Sylvan	Discovery Center
Mill Mountain Greenway Extension	Saddle	Discovery Center
Mill Mountain Star Trail - Lower	Parking lot at Riverland	Edge of woods near water tower
Mill Mountain Star Trail - Upper	Edge of woods near water tower	Mill Mountain Star Trail Connection
Mill Mountain Star Trail Connection	Parking lot at Star (going to right)	Star overlook
Monument Trail	Monument near Fishburn Parkway	Star Trail
Terra Alta Trail	Star Trail	Sylvan Road
Watchtower Trail	Mill Mountain Star Trail Connection	Mill Mountain Greenway
Garden City Side		
ATV Trail - Unauthorized	Tree line at Parkway	Contour Road
Bear Here Trail	Triangle Corner on NPS Monument	Better Yet Trail
Better Yet Trail	NPS Monument Trail	3 ravine convergence
Contour Road - Garden City	NPS boundary by ravine	"The Flat"
Contour Road Spur #1	Contour Rd Segment 3	Fishburn Parkway
Contour Road Spur #2	The Flat	Fishburn Parkway
H2O Trail	The Flat	Hilltop Contour Rd.
Hilltop Contour Road	Powerline	Crown Point St.
Hilltop Loop Trail	The Flat	Hilltop Contour Rd.
NPS Monument Trail	Virginia Pine Lane	Triangle Corner
Neighborhood Loop	Contour Rd #4	Contour Rd #5
Virginia Pine Lane	Hartsook Blvd.	NPS boundary/NPS Monument Tr.

The table below shows the routes which were mapped, but not inventoried because they either were not built yet or were illegal ATV paths.

Trails Mapped but Not Assessed – Potential Connections or Closures

Mapped Trails Not Inventoried- Potential Connections or Closures		
Name Used During Inventory	Segment Start	Segment End
ATV Trail 2 - Unauthorized	Contour Road/Neighborhood Tr.	Contour Road Segment 5
ATV Trail 3 - Unauthorized	Contour Road Segment 3	Contour Road Segment 4
ATV Trail 4 - Unauthorized	Contour Road Segment 2	Back yard on Estates Drive
Crown Point Connector - new	Crown Point St.	Contour Road Segment 5
Fern Park Trail - new	Upper trail	Chestnut Ridge Trail
Kepley Trail (New to replace road)	Near Morrison St.	Yellow Mtn Road.
Powerline Trail	Riverland Rd. Trailhead	Hilltop Contour Road
Tower-Flat Connector	The Flat	Water tower
Yellow Mtn. Connector	Virginia Pine Lane	Yellow Mtn Road

Inventory of Existing Trails on Mill Mountain – Winter 2005



C. Summary of Current Trail Conditions

Most of the trails on the mountain are in good condition with little erosion. This stability is largely attributable to the age of the roadbeds and the rockiness of the soil. Some of the road beds with excessive grade (>20%) are eroded and rutted, particularly the Hilltop Contour Road. Other erosion is evident on the multiple trails made by all terrain vehicles (ATVs) and motor bikes on the Garden City side of the mountain. There is one creek crossing on the Contour Road Trail which has been significantly rutted out by ATVs.

The table below summarizes the trail conditions found during inventory. Data sheets are in Appendix B.

Name Used During Inventory	Length	Typical Width	Typical Grade	Max Sustained Grade	Surface
West Side					
Car Trail	3839'	24" for 1328' 60" for 2511'	5%	23% for 50' 21% for 30'	Natural
Connecting Trail	702'	36"	22%	27% for 140' 24% for 140'	Natural
Fern Park Trail - Upper	1674'	24"	9%	25% for 81' 21% for 84'	Natural
Ian's Spot	375'	48"	17%	45% for 15' 20% for 60'	Natural
Ivy Trail	3540'	110"	3%	25% for 230' (paved section)	Gravel
Kepley Trail	3383'	48"	12%	21% for 150' 19% for 205'	Natural
Mill Mountain Greenway	6481'	210"	10%	12% for 435' 11% for 410'	Paved
Mill Mountain Greenway Extension	4000'	24"	8%	15% for 50'	Natural
Mill Mountain Star Trail - Lower	1296'	168"	11%	14% for 225'	Gravel
Mill Mountain Star Trail - Upper	7204'	48"	12%	35% for 70' 21% for 90'	Natural
Mill Mountain Star Trail Connection	468'	144"	3%	7% for 150'	Gravel
Monument Trail	4214'	24"	8%	18% for 85'	Natural
Terra Alta Trail	3952'	24"	8%	24% for 60' 17% for 110'	Natural
Watchtower Trail	1228'	60"	7%	12% for 205'	Natural
Garden City Side					
ATV Trail - Unauthorized	1495'	46"	15%	>20 for 200' >15 for 500'	Natural
Bear Here Trail	300'	84"	20%	28% for 75'	Natural
Better Yet Trail	1100'	84"	15-20%	>20 for 225'	Natural
Contour Road - Garden City -#1	968'	48"	6%	18% for 75'	Natural
Contour Road - Segment #2	1293'	60"	10%	23% for 110'	Natural
Contour Road - Segment #3	99'	72"	5%	5%	Natural
Contour Road - Segment #4	1058'	60"	5%	12% for 60' 21% for 55'	Natural
Contour Road - Segment #5	2417'	72"	10%	19% for 65'	Natural
Contour Road Spur #1	1668'	72"	10%	16% for 220'	Natural
Contour Road Spur #2	236'	72"	>15%	19% for 170'	Natural
H ₂ O Trail	1194'	72"	6%	11% for 110'	Natural
Hilltop Contour Road	2342'	60-72"	1/2 = 5% 1/2=16%	>15% for 400' in two places >17% for 410'	Natural
Hilltop Loop Trail	830'	54"	15%	22% for 160'	Natural
NPS Monument Trail	1059'	96"	8%	10% for 210'	Natural
Neighborhood Loop	298'	48"	8%	10% for 75'	Natural
Virginia Pine Lane	2233'	96"	8%	20% for 60'	Natural

D. Access and Parking

Mill Mountain's strategic location between South Roanoke, Garden City, and the Blue Ridge Parkway contributes to its functioning both as a neighborhood park and an important destination site. Many people walk, bike, or ride to the trails from their homes. Others drive to one of the parking lots and use the trails from there. Some of the trails with termini on neighborhood streets are principally accessed without a vehicle; others have minimal on-street parking. The table below lists the various access points and facilities.

Inventory of Access to Mill Mountain Trails

Location	Type	Number of Vehicles	Other facilities
Mill Mountain Discovery Center	Parking Lot	54 cars; 3 buses,RVs	Visitor center; bathrooms; picnicking; overlook
Mill Mountain Star Parking Area	Parking Lot	15	Overlook; bathroom; kiosk
Riverland Road Trailhead	Parking Lot	10	Brochure dispenser
Crown Point St.	On street parking	4	None
Fern Park/Jefferson St.	On street parking	2	Park, playground
Fishburn Parkway at Monument	On street parking	3	Designated by curbing
Fishburn Parkway at Star Tr.	On street parking	2	Designated by guardrail
Hartsook Blvd.	On street parking	6	None
Morrison Street	On street parking	2	None
Robin Hood Road	On street parking	2	None
Woodcliff Road	On street parking	4	Gate, utility building
Yellow Mtn. Rd. - east side	On street parking	6	Gravel pull-off
Ivy Street	Walk/ride-in	0	Gate
Prospect Road at Big Sunny	Walk/ride-in	0	None
Prospect Road at Sylvan	Walk/ride-in	0	None
Yellow Mtn. Rd. - west side	Walk/ride-in	0	None

V. Trail Management Issues

The team members recognize that accommodating the trail needs of both residents and visitors to the Roanoke Valley, while protecting the resource base, is a challenging task. Mill Mountain provides an urban, “front country” trail system that could see hundreds of users a week. Long term management will require sustainable trail design and the continued development of a partnership approach to planning and managing trail resources.

The team identified the following issues which Parks and Recreation managers will need to address in managing the trails. Additional information is provided in Appendix C.

A. Sustainable Trail Design

Sustainable trails are needed to protect the soils of Mill Mountain and provide facilities that require minimal maintenance. Trails should be located in such a way that they can be used without significant trail degradation or erosion. Such trails are aligned with a rolling contour design, using grade dips as a standard drainage structure to remove rain water. The IMBA book Trail Solutions is an excellent resource for designing trails.

B. Trail User Designation

In developing this plan, the team discussed strategies available to manage types of use on trails. These strategies include single use trails for different user groups, multi-use trails for all or portions of trail networks, and time-sharing programs in which various user groups are allowed on the trail at different times of the week. This plan recommends that most trails on the mountain allow multi-use with hikers, mountain bikers, and equestrians, but that some trails be reserved for single use.

Two key considerations in designing sustainable trails are proper siting and construction to reduce erosion. Trail erosion is caused by a combination of grade, water, soil type, and trail users. Water damages the trail surface by removing soil when it flows across its surface. The steeper the grade, the more velocity and power the water has to move material downhill. Trail users increase this erosion potential by loosening the surface of the tread, making it easier for water to scour it away. In order to prevent erosion, it is critical to site the trail in a manner that encourages sheet flow (a dispersed flow of water across the trail) rather than channeling the water down the trail, leading to a down-cutting of the trail tread.

Blue Ridge Parkway Trail Plan, Final Draft

C. Trail Standards

The team reviewed trail design standards from a wide range of agencies and published sources, as listed at the end of this document. After review and comparison of recommendations, Park staff selected the U.S. Forest Service guidelines for use in developing this plan.

U. S. Forest Service Trails Management Handbook Guidelines, Region 8
11/8/91

	Hiker	Mountain Bike	Horseback
Grade			
Max for Easiest	20% for 100'	10% for 100'	15% for 200'
Max for More Difficult	30% for 300'	30% for 300'	25% for 300'
Max for Most Difficult	+30% for 500'	+30% for 500'	=30% for 500'
Max. sustained		5%, 10%, 15%	
Turning radius		6', 3', 2'	
Clearing (width x ht)			
Easiest	48" x 8'	48" x 8'	8' x 10', 6' between trees
More Difficult	36-48" x 8'	36-48" x 8'	6' x 8'
Most Difficult	36" x 8'	36" x max. 8"	3-4' x max 8'
Tread (width & surface)			
Easiest	18-24", spot gravel	24", relatively smooth	24", surface for stability
More Difficult	12-18", some obstacles	12-24", rough sections	24", leave roots&rocks
Most Difficult	12", no graded tread	12", some portage	18", not graded exc. >30% side slope

D. User Conflicts and Responsible Behavior

Trail conflicts develop for a variety of reasons, usually related to users expectations and desired experience. Many conflicts occur because of inconsiderate user behavior. Such conflicts can be avoided by education on trail etiquette, posting of guidelines and regulations, and enforcement of rules. Frequency of contact is an important factor, as hikers normally travel at 2 miles per hour, horses at 5-6 mph, and mountain bikers at 3-15 mph. Interaction among users can be reduced through careful design and construction or management actions by Parks and Recreation, such as restricting the direction of use, days of use, or types of users. The team recommends an educational program to instill a trail ethic of etiquette in all users.

All trail users should know who has the right of way. Bikers yield to hikers and horses, with hikers also yielding to horses.

Trail Right of Way Symbol



Etiquette guidelines for various users are included in Appendix D. All users should be courteous, speak to others and horses when approaching to pass, restrict noise, and “leave no trace”.

VI. Trail Recommendations

A. Trail Prescriptions for Usage and Closure

The team reviewed each trail in light of the standards presented above in Section V-C and the goals and objectives from Section III-D. The recommendations are shown in the tables below and on the following page:

Trail Uses and Closures

Name Used During Inventory	Recommended Name	Recommended Use	Rationale
West Side			
Car Trail	Big Sunny Trail	Open to hikers, mtn. bikers, equestrians	Historically open; grades moderate, condition good.
Connecting Trail	Riser Trail	Open; one way for horses and mtn. bikes	Historically open; grades steep; one way uphill needed for safety and sustainability.
Fern Park Trail	Fern Park Trail	Extend to Chestnut Ridge Trail; hikers only	Not part of Mill Mtn Park or Plan; provides connectivity to Parkway trails and access for Mill Mtn. Parkway trails are hiker, equestrian only.
Ian's Spot	No name	Close	Too steep; does not connect to trails.
Ivy Trail	Crystal Spring Trail	Open to hikers, mtn. bikes	Easy grade, good condition; too close to neighborhoods for horses.
Kepley Trail	Ridgeline Trail	Open to hikers, mtn. bikers, equestrians	Historically open; fair-good condition; major connector to Parkway's Chestnut Ridge Trail.
Mill Mountain Greenway	Mill Mountain Greenway	Open to all	Historically open; paved; connection to downtown.
Mill Mountain Greenway Extension	Ridgeline Trail	Open to hikers, mtn. bikers, equestrians	In Greenway Plan; connectivity to Discovery Center
Mill Mountain Star Trail - Lower	Wood Thrush-Star Access Trail	Open to hikers, mtn. bikers, equestrians	Gravel road suitable for any use; sign as access to Star and Wood Thrush Trails. Consider improvement or off-road route. Need connection to Roanoke River
Mill Mountain Star Trail - Upper	Star Trail	Open to hiking only	Built for hikers; steep grades; modify termini so that gravel road is not part of Star Trail
Mill Mountain Star Trail Connection	No name	Open to hikers, mtn. bikers, equestrians	Major connection to Star from parking lot and trail; more of a pathway than trail
Monument Trail	Monument Trail	Open to hikers, mtn. bikers, equestrians; combine with Terra Alta	Good sidehill trail; good connectivity; combining the two will simplify trail system.
Terra Alta Trail	Monument Trail	Open to hikers, mtn. bikers, equestrians; combine with Monument	Good sidehill trail; good connectivity; combining the two will simplify trail system.
Watchtower Trail	Watchtower Trail	Open to hiking only	Good width and grade, but steps required to connect to Mill Mountain Greenway/Prospect Road

Name Used During Inventory	Recommended Name	Recommended Use	Rationale
Garden City Side			
ATV Trail - Unauthorized	No name	Close	Illegal Parkway access; too steep; not sustainable.
Bear Here Trail	No name	Close	Too steep; not sustainable
Better Yet Trail	No name	Close	Too steep; not sustainable; no access on downstream end
Contour Road - Garden City -#1	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Good sidehill trail; dual track; sustainable. Need connections on each end to form continuous trail from Yellow Mtn. Road to water tower and Riverland Rd. Trailhead
Contour Road - Segment #2	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Combine with segment #1 above.
Contour Road - Segment #3	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Combine with segment #1 above.
Contour Road - Segment #4	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Combine with segment #1 above.
Contour Road - Segment #5	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Combine with segment #1 above.
Contour Road Spur #1	No name	Not recommended	Connects to J.P. Fishburn Parkway, but guardrail blocks users.
Contour Road Spur #2	No name	Not recommended	Connects to J.P. Fishburn Parkway, but guardrail blocks users.
H ₂ O Trail	No name	Do not open	Currently grown up; do not open; connection to Hillside trails not recommended.
Hilltop Contour Road	No name	Close	Too steep; very eroded in places; not sustainable; provides illegal access to ATVs and motor bikes
Hilltop Loop Trail	No name	Close	Too steep; not sustainable
NPS Monument Trail	Wood Thrush Trail	Open to hikers, mtn. bikers, equestrians	Sustainable; connection from Contour Road Trail to Yellow Mtn. Rd.; used by NPS for boundary maintenance
Neighborhood Loop	No name	Close	Dead end into a yard on Estate St.
Virginia Pine Lane	Virginia Pine Trail	Open to hikers, mtn. bikers, equestrians	Needs rehabilitation, but could be sustainable and provides best access to Garden City neighborhood.
Mapped Trails			
ATV Trail 2 - Unauthorized	No name	Close	ATV created; significant erosion and stream degradation.
ATV Trail 3 - Unauthorized	No name	Close	ATV created; stream degradation.
ATV Trail 4 - Unauthorized	No name	Close	Too steep; dead end into a yard.
Crown Point Connector - new	No name	Do not open	Trail access at Hartsook instead. No need to build if access closed.
Fern Park Trail - new	Fern Park Trail	Build	Provides connection from Fern Park Trail to Chestnut Ridge and thus Ridgeline Trail.
Kepley Trail (New to replace road)	Ridgeline Trail	Future	Possible short connection in future if road walk on Morrison becomes problematic.
Powerline Trail	No name	Close	Steep; not sustainable; illegal motorized use.
Tower-Flat Connector	Ridgeline Trail	Build	Connection from Contour Road Trail/Flat to water tower and Riverland Rd. Trailhead; provides connection for multi-use on Garden City side.
Yellow Mtn. Connector	Ridgeline Trail	Build	Connection from NPS Monument Trail to Yellow Mtn. Rd for multi-use trail. Need NPS approval.

B. Trail Names and Termini

The team reviewed the existing colloquial and inventory names and the City standard practices for naming facilities. The trail recommendations above involve combining several of the trails into continuous sections. The following names are recommended for the trail system.

Mill Mountain Trail System Names

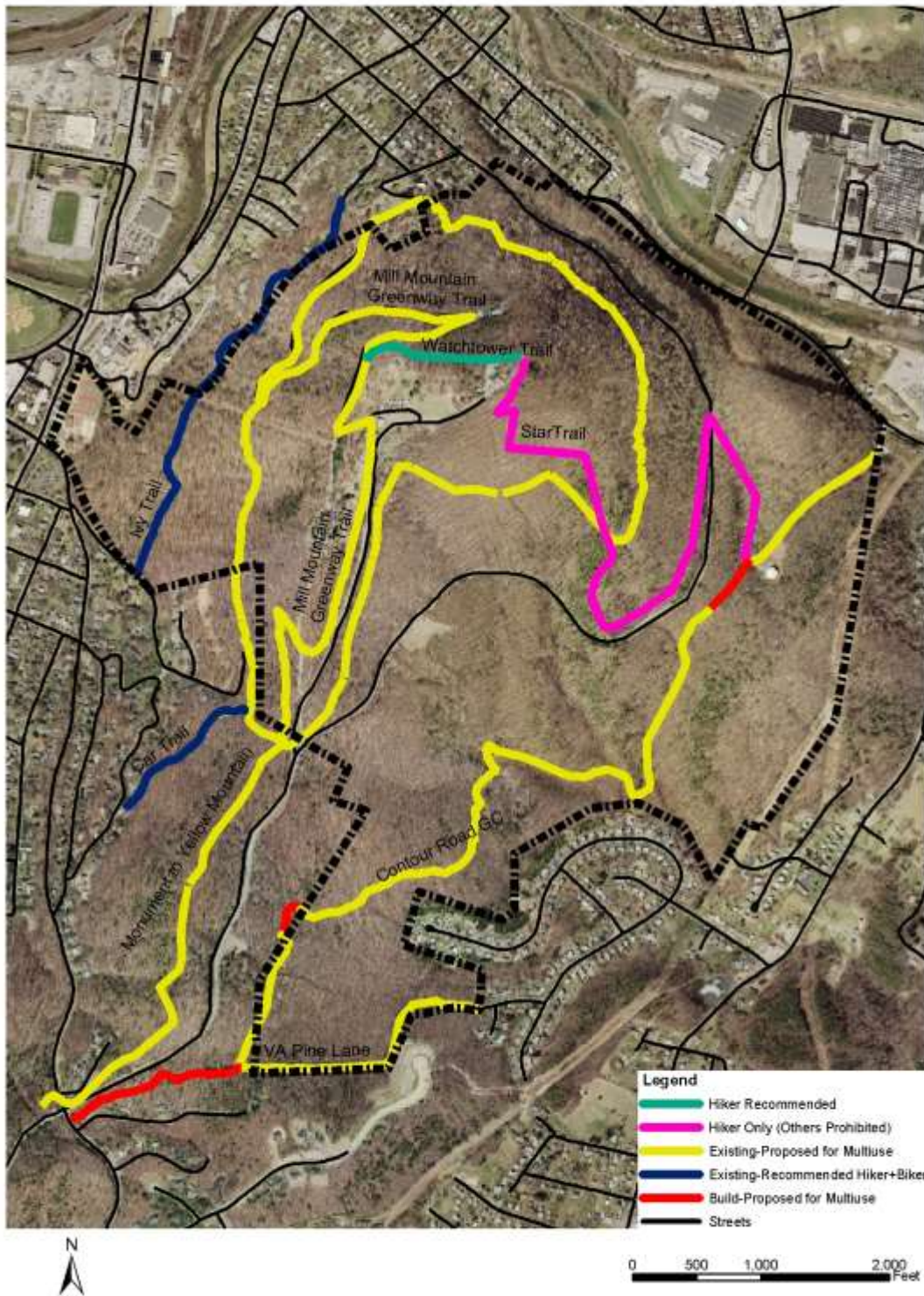
Name Used During Inventory	Official Name
West Side	
Car Trail	Big Sunny Trail
Connecting Trail	Riser Trail
Ivy Trail	Crystal Spring Trail
Kepley Trail	Ridgeline Trail
Mill Mountain Greenway	Mill Mountain Greenway
Mill Mountain Greenway Extension	Ridgeline Trail
Mill Mountain Star Trail - Lower	Wood Thrush - Star Access Trail
Mill Mountain Star Trail - Upper	Star Trail
Mill Mountain Star Trail Connection	No name
Monument Trail	Monument Trail
Terra Alta Trail	Monument Trail
Watchtower Trail	Watchtower Trail
Garden City Side	
Contour Road Trail - Segments 1-5	Wood Thrush Trail
NPS Monument Trail	Wood Thrush Trail
Virginia Pine Lane	Virginia Pine Trail
Tower-Flat Connector	Wood Thrush Trail
Yellow Mtn. Connector	Wood Thrush Trail

The termini of the official trails are shown in the table below.

Termini of Trails in Mill Mountain System

Trail Name	Termini
Big Sunny Trail	Mill Mtn. Greenway/Prospect Rd to Robin Hood Rd
Crystal Spring Trail	Ivy St. to Woodcliff Rd
Mill Mountain Greenway	Sylvan Rd. to Discovery Center
Monument Trail	The Monument to Sylvan Rd.
Ridgeline Trail	Discovery Center to Yellow Mtn. Rd.
Riser Trail	Big Sunny Trail to Mill Mtn. Park entrance
Star Trail	Wood Thrush-Star Access Trail to Star
Tower Trail	Riverland Road Trailhead to water tower
Virginia Pine Trail	Hartsook Blvd. to Wood Thrush Trail
Watchtower Trail	Star to Mill Mtn. Greenway/Prospect Rd.
Wood Thrush Trail	Wood Thrush - Star Access Trail to Yellow Mtn. Rd.

Official Mill Mountain Trail System



Update by adding P for Parking; make Star Trail green; label green “Hiker Only”, label Blue “Hiker + Mtn.Bike”, label Red “Build for Hiker, Mtn. Bike, Equestrian”, label Yellow “Existing-Hiker, Mtn.Bike, Equestrian”; names brighter; dots at trail termini.

C. Trails by User Group

The table below shows facilities open to each user group.

Hikers	Mountain Bikes	Road Bicycling	Horses
Big Sunny Trail	Big Sunny Trail	J. P. Fishburn Parkway	Big Sunny Trail
Crystal Spring Trail	Crystal Spring Trail	Mill Mountain Greenway	Mill Mountain Greenway
Mill Mountain Greenway	Mill Mountain Greenway	Mill Mountain Spur Road	Monument Trail
Monument Trail	Monument Trail		Ridgeline Trail
Ridgeline Trail	Ridgeline Trail		Riser Trail
Riser Trail	Riser Trail		Virginia Pine Trail
Star Trail	Virginia Pine Trail		Wood Thrush Trail
Virginia Pine Trail	Wood Thrush Trail		Wood Thrush - Star Access Trail
Watchtower Trail	Wood Thrush - Star Access Trail		
Wood Thrush Trail			
Wood Thrush - Star Access Trail			

D. Specific Trail Improvement Recommendations

The recommendations in the table below are in addition to general recommendations above and signage issues.

Trail Name	Recommendations
Big Sunny Trail	1. Acquire a permanent easement across the Pace property. 2. Widen trail sections near Prospect Road to 24-36".
Crystal Spring Trail	1. Improve surface for trail use.
Mill Mountain Greenway	1. Install entrance sign. 2. Provide brochures at Discovery Center.
Monument Trail	1. Widen any areas that are not yet 24". 2. Post warning signs on steep slopes near Sylvan.
Ridgeline Trail	1. Install grade reversal at top of steep hill. 2. Complete trail with relocation of zoo fence. 3. Consider a side trail to views from the rocks.
Riser Trail	1. Post for one way use uphill by mtn. bikes and horses. 2. Consider improvement/alternatives to accommodate two way use.
Star Trail	1. Revise termini to start at end of gravel road near water tower. 2. Rehabilitate eroded sections, eliminate braided sections, install reverse grades where needed. 3. Establish a nature trail section or loop near the Discovery Center, incorporating a wildflower section.
Virginia Pine Trail	1. Rehabilitate, installing grade reversals, access control, and drainage features.
Watchtower Trail	1. Install steps at wall on Prospect Road.
Wood Thrush Trail	1. Build three sections of trail to provide continuous route. 2. Coordinate with Blue Ridge Parkway on construction of section near Yellow Mtn. Rd., including improvements at Yellow Mtn. Road with directional signage and map of trail network.
Wood Thrush - Star Access Trail	1. Improve surface for trail users or consider alternate location.




Connections to Other Systems	
Fern Park Trail	1. Complete new connection from Fern Park to Chestnut Ridge Trail with signage to Ridgeline Trail. 2. Regrade intersection of upper and lower trails.
Chestnut Ridge Trail	1. Provide connections and signage at Yellow Mountain Road on east and west sides.
Roanoke River Greenway	1. Provide connection from Riverland Road Trailhead to Roanoke River Greenway.

E. Trail Difficulty Rating

Trails on Mill Mountain were given difficulty ratings based on trail assessment data and the Team’s input. Rating each trail’s difficulty can: 1) help users make informed decisions, 2) encourage visitors to use trails that match their skill level, 3) minimize risk and injuries and 4) improve visitors’ experiences. Trail difficulty ratings should be posted on trails, kiosks, and maps.

The difficulty of the trail will vary depending on the user and mode of travel. Hikers can negotiate most obstacles. Mountain bikers are more affected by trail surface obstacles. Horses are less affected by distances, but restricted by clearances. In general, the following factors are important in rating trail difficulty: tread width, trail clearance, tread surface, trail grade, natural obstacle, and technical features.

Trail difficulty ratings are assigned under ideal conditions and are based on difficulty compared to other routes in the area. A trail rated easy by local standards could possibly be rated moderate or difficult elsewhere. Conditions are always subject to change due to weather and other unusual conditions. The following system will be used on Mill Mountain trails.

	(Easy) These routes are appropriate for novice through advanced users. They generally follow obvious, well-marked trails and roads. Grades are gentle, and few obstacles will be encountered.
	(More Difficult) These routes are appropriate for intermediate through advanced users. Terrain may be steeper, trails narrower, and some obstacles may be encountered.
	(Most Difficult) These routes are recommended for physically fit users. Terrain is steep, and technical obstacles may be encountered.

The following table shows the recommended trail difficulty rating by user group for the Mill Mountain Trail System.

Trail Name	Degree of Difficulty			
	Hiker	Horseback	Mountain Bike	Road Bicycling
Big Sunny Trail				n/a
Crystal Spring Trail		n/a		n/a
Mill Mountain Greenway				
Monument Trail				n/a
Ridgeline Trail				n/a
Riser Trail				n/a
Star Trail		n/a	n/a	n/a
Tower Trail				n/a
Virginia Pine Trail				n/a
Watchtower Trail		n/a	n/a	n/a
Wood Thrush Trail				n/a
Roads				
J.P. Fishburn Parkway	n/a	n/a	n/a	
Mill Mountain Spur Road	n/a	n/a	n/a	
		= Easy		
		= More Difficult		
		= Most Difficult		

F. Access and Parking

Existing access and parking options facilitate dispersed use of the Park trails. Limited or dedicated parking should be allowed at all on-street access points. All of the parking lots are full on occasion, but restriction of parking is one technique to prevent overcrowding on trails.

Parking Improvements

Parking Lots	
Discovery Center Parking Lot	1. Provide clear signage for access to trails. 2. Install kiosks with maps, trail routes and difficulty, rules, and contacts. 3. Continue to allow trailers to park in bus slots.
Mill Mountain Star Parking Area	1. Provide clear signage for access to trails. 2. Finish kiosk.
Riverland Road Trailhead	1. Enlarge to accommodate horse trailers. 2. Install kiosks with maps, trail routes and difficulty, rules, and contacts.
On-street Parking	
Crown Point St.	1. Close to parking.
Fern Park/Jefferson St.	1. Continue to allow parking and consider expansion.
Fishburn Parkway at Monument	1. Retain; sign trails.
Fishburn Parkway at Star Tr.	1. Retain.
Hartsook Blvd.	1. Provide trail signage and kiosk.
Morrison Street	1. Allow on-street parking.
Robin Hood Road	1. Allow on-street parking.
Woodcliff Road	1. Allow on-street parking.
Yellow Mtn. Rd. Parking	1. Improve parking area with accommodation for horse trailers.
Walk/ride-in Access	
Ivy Street	No parking.
Prospect Road at Big Sunny	No parking.
Prospect Road at Sylvan	No parking.
Yellow Mtn. Rd. - west side	No parking.

Equestrian users are currently the ones for whom parking is most difficult. Vehicles with trailers require longer parking spots and larger turning radius. The following recommendations should be considered in addressing equestrian parking:

1. Work with the Blue Ridge Parkway in establishing horse trailer parking at Chestnut Ridge Overlook or Roanoke Mountain Campground.
2. Enlarge or redesign the Riverland Road Trailhead to accommodate horse trailers.
3. Explore parking options in partnership with AEP.
4. Allow trailers to park at the Discovery Center parking lot, and consider horses in any re-design of parking areas.
5. Explore improvements to the Yellow Mountain Road pull off to make it accessible for horse trailers.

VII. Trail Management Recommendations

The team discussed issues related to specific trails as well as many management issues. The Team proposes the following recommendations for implementation of the plan.

- A. Minimize illegal uses and activities.
- B. Develop an operations and maintenance schedule for the trails.
- C. Develop a volunteer program.
- D. Establish trail management guidelines for resource protection
- E. Improve trails with signage
- F. Enhance educational program.

A. Illegal Uses

Numerous illegal activities were noticed during inventory of the trails. These include ATV and motor bike use, littering, dumping, and destruction of vegetation. There should be a multi-pronged approach to reduce illegal activities on Mill Mountain Park Trails.

1. Signs should be erected at borders where access challenges are most prevalent.
2. Signage at trailheads should indicate rules of the trail.
3. Signage at trailheads should give contact information for reporting trail conditions and illegal activities.
4. Park staff should coordinate with Roanoke City Police Department for assistance in law enforcement, including regular patrolling of parking lots, ticketing illegal activities, and trail patrolling with police on bikes and horses.
5. Volunteer monitoring should be encouraged.
6. Because dumping encourages more dumping, staff should utilize clean-up programs such as Clean Valley Day and inmate labor to clean up existing problems.
7. An “Adopt-A-Trail” program is highly recommended to provide more frequent monitoring.

B. Operations and Maintenance Plan

Parks and Recreation staff should complete a maintenance plan for the Mill Mountain Trail system and incorporate it into their annual maintenance operations. This plan will specify maintenance schedules and responsibilities, amenities and improvements needed, budgets, materials, supplies, and specific trail maintenance management staffing through the department’s Parks Maintenance Division. In addition, the process should address policies on special events, event bonding, camping, volunteers, special uses, and patrolling. Periodic coordination with other departments on search and rescue, fire prevention and suppression, access maps for emergency services, and communication channels with reports to Parks staff should also be addressed.

C. Volunteer Assistance

Roanoke is indebted to the trail volunteers who have dedicated countless hours and labor in helping to maintain the trails upon Mill Mountain. Both the Department of Parks and Recreation as well as the team recommends that the Parks and Recreation establish a cadre of Mill Mountain trail volunteers (similar to the existing team at the Carvins Cove Natural Reserve) to assist with maintenance, construction, and monitoring. This program should be established under the existing Parks and Recreation trail volunteer program and be coordinated by Parks and Recreation. Volunteers should receive training on their duties, report quarterly on standard reports, and log volunteer hours. An overseer should be assigned for each trail. The program could include an annual meeting of Mill Mountain trail volunteers and partners with a cook-out,

annual recognition of groups and departments, identification for volunteers such as t-shirts, a tool shed and inventory, and a quarterly newsletter.

D. Resource Protection Issues

Parks and Recreation staff will need to develop specific resource protection guidelines for trail management. These might include:

1. Vegetation management, including tree protection, invasive species, and protection of sensitive communities adjacent to trails.
2. Conformity with Land Use Zones in Mill Mountain Management Plan.
3. Temporary trail closures after rain events or when conditions warrant.
4. Stream crossings, using bridges over perennial streams and hardened crossings at dry stream beds.
5. Monitoring of trail conditions, using standard Forest Service methods, with annual photographs taken at key impact areas.
6. Recognition and elimination of bootleg trails.
7. Annual review of impacts to prevent tread changes and correct problem areas.
8. System for users to provide comments and input, such as kiosk and web site.
9. User counts using trail counters.

E. Signage

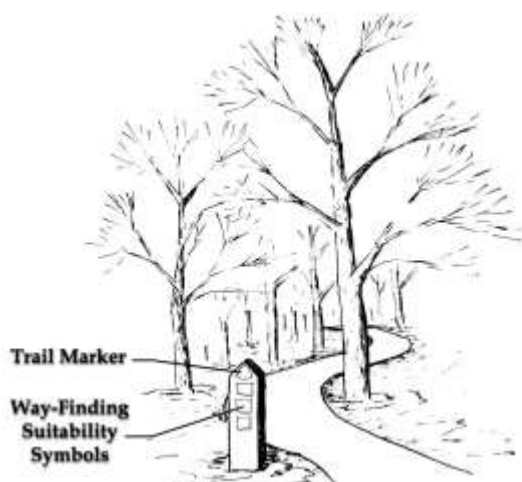
Parks and Recreation is finalizing a signage plan that will be implemented in all City owned parks, recreation facilities, greenways, trails, and front-country trails. The plan will be implemented on Mill Mountain Park's trails once complete. Signs will address:

- Wayfinding, with trail names, difficulties, and distances to destinations
- Rules and regulations
- Trail etiquette
- Interpretation of natural and cultural features

In addition, the signage program will include:

- Kiosks at trailheads
- Trail blazing, possibly with each trail in a different color
- Brochures and maps

Conceptual Samples are shown below.



F. Education

The Parks and Recreation Department has a very active educational program at the Discovery Center. Enhancement of the program in relation to trails will involve providing additional information to users and utilizing trails more for environmental education. Options include:

1. Provide trail etiquette information at all trailheads and parking areas.
2. Utilize the yield symbol on all trails and provide educational brochures on techniques for approaching horses.
3. Provide safety information on all kiosks.
4. Provide simple brochures and maps of the trail network, with permitted uses and difficulty ratings.
5. Expand birding information for those utilizing the Birding and Wildlife Trail.
6. Expand the wildflower garden to adjacent trails, using native plants. Involve partners such as Mill Mountain Garden Club and Blue Ridge Native Plants Society.
7. Expand environmental education programs for schools utilizing trails.
8. Utilize City's marketing avenues to provide information on the trails, special events, etiquette, and programs.