

**NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT**  
**(FERC NO. 2485-063)**  
**Letter of Support for Study Request (Accession No. 20130301-5029)**

Dear Federal Energy Regulatory Commission,

Northfield Mountain, site of the pumped storage hydroelectric facility owned and operated by FirstLight Hydro Generating Company, is an integral part of Franklin County. It currently boasts over 26 miles of shared-use trails that are loved by many for summertime activities ranging from hiking, trail running and mountain biking to rock climbing and horseback riding. In the winter, the cross country skiing is some of the best in New England (if there's snow). Beautiful scenery, impressive lookouts and a combination of green meadows, deep forests, bubbling streams, ledges and rock features give this park its unique character that attracts visitors from near and far.

The 26 miles of trails consist of a combination of unpaved roads, double track and single track shared-use trails. At the time the last license was issued for Northfield Mountain, mountain biking was still a fairly young sport but it has gained popularity ever since and now represents 20% of all outdoor recreation in the US<sup>1</sup>. A 2006 survey revealed that more than 1 million Massachusetts residents mountain bike<sup>2</sup>. While Northfield Mountain allows mountain biking, the trails were designed for activities like hiking, horseback riding and snowshoeing, and strategic addition or alteration of some of the existing trails would greatly improve the riding experience. In addition, the science of sustainable, low-impact, low-maintenance trail design has come a long way over the past forty years. Given the importance of mountain biking to the Franklin County community, it should be integrated into the new license, and a study evaluating the trail system at Northfield Mountain should be conducted as part of the pre-license proceedings.

Trail conditions should also be assessed for safety hazards. For example, over the past few years, deep water bars have been dug diagonally across the 10<sup>th</sup> Mountain road at Northfield Mountain to help with drainage. These water bars have been challenging to negotiate on a bike or on horseback from the beginning, and I have personally witnessed two accidents that resulted in extensive road rash, bruising, whip lash and concussion-like symptoms. After these accidents, the water bars have been dug out even further, making traveling on 10<sup>th</sup> Mountain extremely dangerous. For public safety, the condition of this trail should be carefully assessed and alternative drainage solutions considered (i.e., underground water pipes).

The variety of terrain, pitch and naturally occurring features at Northfield Mountain make it a perfect candidate for an exciting, well-balanced trail system of beginner, intermediate and expert shared-use trails. The National Scenic Trail crosses Northfield Mountain, connecting Northfield to other area trail networks. Northfield Mountain's proximity to major highways, the spacious lodge and abundance of parking add to its appeal, and with all these pieces in place Northfield Mountain could be developed into a supreme outdoor recreation destination. Outdoor recreation in the United States is an almost \$700 billion industry, and despite the economic

recession has grown about 5% annually between 2005 and 2011<sup>3</sup>. The US Department of Agriculture Economic Research Report found that recreation and tourism development contributes to rural well-being, increasing local employment, wage levels, and income, reducing poverty, and improving education and health<sup>4</sup>. If Northfield Mountain was developed into an outdoor recreation destination it could bring a substantial, sustainable inflow of cash to the Pioneer Valley. The area surrounding Kingdom Trails in East Burke, VT has greatly benefitted from visiting mountain bikers, with approximately \$5 million spent by Kingdom Trail visitors in 2011<sup>5</sup>. The impact tourism could have on the socioeconomic state of the region makes this project a high priority of public concern.

We anticipate that the assessment of the interest and need for mountain bike trails at Northfield Mountain could be included in other proposed studies to assess the recreational offering at Northfield Mountain using standard survey methods for needs assessment. We would gladly collaborate and assist in outreach efforts for survey information from our membership.

Thank you for your time and for taking our comments into consideration. Please contact me at any time.

Sincerely,

Stefanie Krug

President, New England Mountain Biking Association (NEMBA), Pioneer Valley Chapter

[pvnemba@gmail.com](mailto:pvnemba@gmail.com)

### References:

- [1] Outdoor Industry Foundation. 2004. *The Active Outdoor Recreation Economy*. Boulder, CO.
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# Department of Conservation and Recreation

## Trails Guidelines and Best Practices Manual



*The Metacomet-Monadnock trail to Mt. Norwottock*

The health and happiness of people across Massachusetts depend on the accessibility and quality of our green infrastructure - our natural resources, recreational facilities, and great historic landscapes. The Department of Conservation and Recreation (DCR) provides vital connections between people and the environment with over 3,000 miles of trails and 145 miles of paved bikeways and rail trails. Consistent and clearly defined trail policies, procedures, and program guidelines can provide inspiration and direction to managing, enhancing, and developing a successful and sustainable trail system for Massachusetts.

## Table of Contents

	Page
<i>Implementation Schedule</i> .....	iii
<i>Definitions</i> .....	iv
<b>Section I: Introduction</b> .....	2
<i>Trail Policy and Program Mission</i> .....	2
<i>Importance of Trails</i> .....	2
<i>Striving for Sustainable Trails</i> .....	2
<i>Promoting Stewardship</i> .....	3
<i>Past Trail Practices with the Agency</i> .....	4
<i>Consistency with other plans and regulations</i> .....	4
<i>Trends in Recreational Trail Demand and Uses</i> .....	8
<i>Trail Regulations</i> .....	8
<i>DCR Approved Trail Uses</i> .....	8
<i>Additional Types of Trails</i> .....	9
<i>DCR Trail Team</i> .....	10
<b>Section II: Trail System Planning and Development</b> .....	11
<i>Assessing and Planning an Existing Trail System</i> .....	11
<i>Assessing Requests for New Trails or Changes in Trail Designation</i> .....	14
<i>Additional Trail Development Concepts</i> .....	15
<i>Principles of Ecologically Sustainable Trails</i> .....	17
<i>Building Sustainable Trails</i> .....	21
<i>Building an Enjoyable Trail Experience</i> .....	23
<i>Building Accessible Trails</i> .....	26
<i>Permitting</i> .....	28
<i>On the Ground; Putting It Together</i> .....	30
<i>Trail Design and Construction Resources</i> .....	32
<b>Section III: Trail System Management, Maintenance and Monitoring</b> .....	34
<i>Trail Classification</i> .....	34
<i>Trail Maintenance</i> .....	37
<i>Trail Signage</i> .....	43
<i>Trail Mapping</i> .....	52
<i>Partnerships, Friends and Volunteers</i> .....	54
<i>Understanding and Managing Conflicts</i> .....	55
<i>Special Trail Uses</i> .....	57
<b>Appendix A: Trail Planning and Management Fundamentals</b>	
<b>Appendix B: Trail Proposal and Evaluation Form</b>	
<b>Appendix C:</b>	
<b>Appendix D:</b>	
<b>Appendix E: MA DCR Volunteers in Parks Program Draft (1-1-12)</b>	
<b>Appendix F: USFS Trail Design Parameters (6/18/2002)</b>	
<b>Appendix G: Mapping Trails the DCR Way</b>	
<b>Appendix H: Biodiversity Conservation Initiative; Conditions Guidance Codes</b>	
<b>Appendix I: Additional Maintenance Specifications</b>	
<b>Appendix J: Erosion and Sedimentation Control Techniques</b>	

## ***Implementation Schedule (Revised March, 2012)***

The initial edition of the DCR Trails Guidelines and Standards Manual was completed, approved and distributed at the 2008 DCR Trail School.

The Manual was reviewed and revised by the DCR Trail Team in January of 2010 and 2012, and will continue to be reviewed and revised every two years.

Some elements of the Manual will require years to fully implement. The following table proposes a timeline for implementation.

<b>Element</b>	<b>Implementation Date</b>	<b>Comments</b>
Trail Regulations	2012	DCR CMRs continue to be reviewed and should be completed in 2012
Trail Team	January 1, 2008	DCR Trail Team was established in January 2008 and meets approximately 3 times each year.
Trail Planning and Development Standards	October 21, 2008	Trail planning and development guidelines and standards for different uses and classes of trail were complete in the 2008 edition
Complete Trail Inventory	2012	The trail inventory is a critical milestone in trail management and is on track for completion in 2012
Implementation of Trail Maintenance Standards	2013	Maintenance standards implementation for all trails is dependant on staffing levels and DCR priorities; however, maintenance standards will establish a benchmark for basic levels of trail management.
Trail Signage	- 2008 for new trails and new signs - 2012 for main intersections - Full implementation by 2015, all parks and trails	Implementation should follow the prioritization outlined in the Signage section
Maps	Unknown	Final standards to be developed in cooperation with DCR Graphics and GIS staff
Partners and Volunteers	2012	Procedures for engaging partners and volunteers in trail maintenance or development will be finalized in 2012

## **Definitions**

### **Compaction**

The downward force that compresses soil caused by trail use.

- Heavier modes of travel and higher amounts of trail use cause greater compaction.
- Some compaction is desirable to harden tread and reduce displacement, but
- Highly compacted soils cause trail tread to sink, reducing natural infiltration and the ability for soils to drain.

### **Displacement**

The sideways movement of soils caused by inevitable kicking, grinding, and acceleration of feet, hooves and wheels.

- Amount of displacement is a function of grade and force exerted on tread.
- The steeper the grade the faster soil particles move downhill.
- Displacement tends to increase erosion by loosening soil particles.
- Reduce displacement by limiting trail grade or modes of travel.

### **Erosion**

The movement of soil caused by the forces of water or sometimes wind moving with enough force to transport soil particles. Erosion is a natural process, so expect it and learn how to accommodate it.

### **Grade**

The slope of the trail. Measured as a percentage, it is the rise of the trail divided by the horizontal distance of that rise.

- Percent grade formula = rise over run multiplied by 100.
- The steeper the grade, the more likely it is to erode.
- Avoid the shortest route down a hill (fall line) and flat areas that do not drain.
- Generally, average trail grade of 10% or less is most sustainable.
- Half rule – a trail's grade should not exceed half the grade of the side slope that the trail traverses. *For example if the side slope is 30% the trail grade should not exceed 15%.*

### **Trails**

Trails are designated, marked and signed routes that people use recreationally for such activities as walking, running, hiking, biking, horseback riding, off-highway vehicle use, snowmobile riding, cross-country skiing and snowshoeing. Other special uses include wheelchairs or similar "mobility devices," carriages, dogsleds, and in-line skaters. Trails may or may not serve other, non-recreational forest purposes such as forest management, fire control, and emergency access. Other special types of trails include accessible trails, water trails, historic trails, educational, or interpretive trails.

### **Trail System**

A Trail System is the sum of all of the recreationally used, designated, and marked routes in and connecting to a continuous area - park, forest, reservation or management unit. Trail systems are usually managed cohesively.

### **Trail Corridor**

A Trail Corridor contains the traveled pathway (tread), and surrounding land that protects and enhances the trail experience. Trail Corridors are often associated with long-distance trails traveling through diverse landscapes and multiple land owners. For example, the Appalachian Trail, a long-distance trail of 2174 miles that traverses the

peaks and valleys from Georgia to Maine, is protected by a corridor with an average of 500 feet on each side. This corridor protects the footpath as well as the natural setting of the trail experience.

### **Tread Watershed**

The trail tread between a local high point (crest) and local low point (dip), plus the land area that drains into this tread segment.

- Tread watershed is a function of topography and location of trail on the landscape.
- The larger the tread watershed, the more water it collects from rain or snow and the greater potential for erosion.
- Small tread watersheds help limit how much water reaches and stays on the trail.
- Design trails to reduce the length of the tread watershed – take advantage of rolling contours and build in grade reversals.

### **Tread Texture**

The composition of soil, rock and other tread materials.

- Knowing tread texture helps you to predict how a tread accommodates physical forces in wet and dry conditions.
- The most erosion-resistant treads have a well-compacted mix of all textures including gravel and larger particles.
- More soil separates (clay, silt, sand, loam, gravel, stones...) the tread has, the stronger it is.

### **Tread Width**

The cleared traveled surface.

- Varies depending on trail types and allowed uses.
- On multi-use trails, clear tread for maximum width standard.
- However, the wider the tread, the more surface exposure and potential to generate run-off and tread erosion.

***The following definitions are drawn generally from the USDA Forest Service Trail Planning and Management Fundamentals (See Appendix A for more detail).***

### **Trail Type**

Is the fundamental trail category (only one per trail segment) that indicates the predominant trail surface or trail foundation, and the general mode of travel.

Four fundamental trail types within DCR include:

- ***Standard Natural Surface Trail:*** The predominant surface is ground, and the trail is designed and managed for ground-based travel.
- ***Paved Surface Trail:*** The surface is paved, and the trail design and managed for multiple uses including mechanized wheeled uses. (This type is added to the Forest Service definitions).
- ***Snow Trail:*** The foundation is snow, and the trail is designed and managed for snow-based travel.
- ***Water Trail:*** The foundation is water, and the trail is designed and managed for water-based trail use. There may be portage segments of water trails.

The DCR Road and Trail Inventory classified roads / trails along the following types:

- ***Administrative Road:*** A road accessible to DCR administrative vehicles, but not open to the public.

- **Forest Way / Trail:** A route that potentially serves as both a trail and as access for forest management activities.
- **Trail:** A pathway that is used for recreational trail use.

### Trail Class

Is the prescribed level of trail development, representing the intended design and management standards of the trail. Five trail class categories are defined in terms of tread, obstacles, constructed elements, signs and typical recreation experience:

- *Class 1 Trails:* Minimal/undeveloped trails
- *Class 2 Trails:* Simple/minor development trails
- *Class 3 Trails:* Developed/improved trails
- *Class 4 Trails:* Highly developed trails
- *Class 5 Trails:* Fully developed trails

These general categories are used to identify applicable trail design, management, and maintenance standards and appropriate managed uses. Section III includes a more detailed table of trail classes and their management attributes. Appendix E includes tables on trail design parameters by class and use.

### Trail Condition

The DCR Road and Trail Inventory has classified all roads and trails by “condition” as good, fair or poor. “Good” trails have no or only very minor maintenance needs. “Fair” trails have management and maintenance needs of a typical nature. “Poor” trails have areas of significant trail damage and repair needs.

### Managed Use

Managed Uses are the modes of travel that are actively managed and appropriate, considering the design and management of the trail. There may be multiple Managed Uses for any given trail segment. Managed Use represents a *management decision or intent* to accommodate or encourage a specific type of trail use.

### Designed Use

Designed Use is the intended use that controls the design of the trail, and determines the subsequent maintenance standards for the trail. There is only one designed use of any given trail segment. Of the multiple Managed Uses of a trail, the Designed Use is the single use that drives the design and maintenance standards. The Designed Use is often the Managed Use that requires the highest level of development. Types include:

- |                   |                         |
|-------------------|-------------------------|
| ➤ Walking         | ➤ Cross-country Ski     |
| ➤ Hiking          | ➤ Snowshoe              |
| ➤ Mountain Biking | ➤ On-road bike          |
| ➤ Equestrian      | ➤ Accessible Trails     |
| ➤ OHV             | ➤ Paddling              |
| ➤ Snowmobile      | ➤ Motorized water craft |

### Design Parameters

Design Parameters are the technical specifications for trail construction and maintenance, based on the Designed Use and Trail Class. The national Trail Design Parameters represent a standardized set of commonly expected construction and maintenance specifications based on Designed Use and Trail Class. Design Parameters include technical specifications regarding:

- |               |               |
|---------------|---------------|
| ➤ Tread Width | ➤ Cross-Slope |
| ➤ Surface     | ➤ Clearing    |
| ➤ Grade       |               |
| ➤ Turns       |               |



# ***Section I: Introduction***

## ***Trail Policy and Program Mission***

The Mission of the Department of Conservation and Recreation (DCR) is *to protect, promote and enhance our common wealth of natural, cultural and recreational resources.*

The DCR's Trails Program seeks to provide a safe, quality recreation experience for a diverse range of trail users while practicing sound stewardship of the Commonwealth's natural and cultural resources. This "Trails Guidelines and Best Practices Manual" meets this responsibility by providing a consistent set of trail management policies, guidelines, procedures, and best practices in sustainable trail development.

Specific goals of this document are to:

- Promote state-wide consistency in how trails are classified, planned, designed, developed, managed, and maintained
- Enhance the management of our trails to serve the diverse needs and capabilities of visitors
- Ensure that trail experiences are safe and enjoyable
- Reduce costs through the use of practical and sustainable methods for developing and maintaining trails

## ***Importance of Trails***

Trails contribute significantly to the Commonwealth's health, economy, resource protection, and education.

- **Trails connect people to the natural environment:** place to place, person to person, and neighbor to neighbor. Trails connect us to scenic landscapes, natural wonders, and cultural resources.
- **They make our communities more livable:** improving the economy through tourism and civic improvement, and building support for land protection and stewardship.
- **Trails provide opportunities for multiple-use recreation:** promoting physical activity to improve fitness and mental health. They provide access for other recreational opportunities such as hunting or rock-climbing.
- **They enhance educational opportunities:** providing opportunities to improve and test skills, to be challenged, or to learn about our natural or cultural environment. Trails present opportunities for observation, enjoyment, and exploration.
- **Trails strengthen each of us:** offering opportunities for solitude, contemplation, and inspiration. To some, trails provide a sense of freedom, personal accomplishment, self-reliance, and self-discovery.
- **Trails can even help protect rare habitats and sensitive resources:** by concentrating use on designated, sustainable pathways.

*For the DCR, trails are the intersection of conservation and recreation.* They are one of our most used facilities. They deserve a high level of attention.

## ***Striving for Sustainable Trails***

Trails offering a rich and enjoyable experience don't just happen. Creating a sense of place and a sequence of events that add interest and offer challenge are essential to good trail design.

Moreover, the placement of any trail on the landscape has an ecological impact. The challenge is to keep impacts to a minimum while providing the desired experience. To be sustainable, a trail must serve the needs of users for generations to come, while preserving the sense of place and protecting the quality of the surrounding environment.

Sustainable trails begin with thoughtful planning, good design, and meticulous layout. Many of our trails suffer from lack of planning and poor design. Many are user created pathways, or leftover routes from historic farm roads and logging activities that are not appropriate for long-term recreational use. Improperly planned and constructed trails need frequent maintenance, can require significant investment in time and money, and still may not meet the needs of the user or protect the surrounding natural resources. A sustainable trail will require little rerouting and minimal maintenance over extended periods of time. A successfully designed trail will entice visitors back time and again.

To be successful, a trail must be designed to be physically, ecologically, and economically sustainable.

#### **Physical Sustainability**

Designing trails to retain their structure and form over years of use and under forces of humans and nature is a key factor in sustainability. Trail use promotes change, so trails must be designed in anticipation of change to ensure that they remain physically stable with appropriate maintenance and management.

#### **Ecological Sustainability**

Minimizing the ecological impacts of trails, and protecting sensitive natural and cultural resources is fundamental in sustainable trail design and development.

#### **Economic Sustainability**

For any trail, the implementing agency or advocacy group must have the capacity to economically support it over its life cycle. Developing and committing to a long-term maintenance strategy is a critical aspect of a successful trail program.

## ***Promoting Stewardship***

Instilling users and the public with a sense of ownership and responsibility for stewardship of trails is a key element of a sustainable trail system.

#### **Education and Information**

Education and information can and should be an integral part of any strategy to improve the quality of outdoor recreation experiences, and must be expanded and tailored to encompass a wide variety of age groups, learning abilities and special needs. Information, especially emphasizing the appreciation and careful stewardship of natural resources, will help to ensure the public's long-term enjoyment of, and support for, conservation and recreation.

#### **Partnerships and Volunteerism**

Trails, in particular, offer a powerful avenue for encouraging volunteerism and stewardship in our parks. People love to volunteer on trails, and trail management can greatly benefit from volunteers. User groups can help create, maintain, restore, or close trails. Friends groups can raise money and advocate for funding. Individuals and organizations can adopt trails. However, for volunteerism to be effective, it must be guided, directed, and managed (see Section III for a further discussion).

## ***Past Trail Practices with the Agency***

DCR was created by the merger of two separate agencies. As such, different operations divisions have, in the past, undertaken trail design, development, management, and maintenance using differing standards. For example, Urban Parks, given their location in the Boston metropolitan region and the types of uses that they see, have never allowed motorized trail recreation. They are also not actively managed for forest products. Urban Parks tend to have a greater number of hard surfaced trails and may have experienced some different management issues, such as levels of trail use and vandalism. On the other hand, the State Parks, may have a larger percentage of natural surface trails, and lower levels of use. Some state parks allow various types of motorized trail use. Most facilities in State Parks are managed for forestry, and they have had to accommodate some different kinds of recreational uses such as hunting. Water Supply lands are primarily managed to provide clean water, and trails and recreational uses are secondary and restricted in some areas.

In addition, these divisions operated and in some cases, continue to operate with different sets of regulations, with different sets of resources and under different management frameworks. The result, from the trails management point of view, is that a variety of trail designation, marking, and management standards are currently in place across the agency.

This can be confusing for users and staff alike. This document establishes a consistent set of trail guidelines and standards which DCR can apply across divisions, regions and facilities. However, these guidelines also provide flexibility that can accommodate different recreational settings, resources, and mandates.

## ***Consistency with other plans and regulations***

Trails are not just recreational facilities, they are an integral component of our forests, parks, reservations and the communities within which they are located. Planning, developing, and managing a trail system must therefore be consistent with the mission, goals, plans, and regulations of our department, surrounding communities, and the Commonwealth.

**Massachusetts Greenway and Trail Vision: *Commonwealth Connections*** is a vision for a coordinated network of greenways and trails in Massachusetts, and includes specific steps for making this vision a reality. It was developed in 2001 by DCR in partnership with the Appalachian Mountain Club, the National Park Service and a broad group of stakeholders from across Massachusetts.



*Commonwealth Connections* reflects the collective priorities of the greenway and trail community. The plan includes seven statewide recommendations and regional priorities for securing the Greenway Vision that can help shape the future of trails in Massachusetts. *Commonwealth Connections* is available at <http://www.mass.gov/dcr/stewardship/greenway/connections.htm>.

### **Resource Management Plans (RMP)s**

Resource Management Planning forms the framework for land management based upon an inventory and assessment of environmental and recreational resources, an identification of the unique characteristics of a property or management unit, the development of management goals and objectives, and recommendations to guide the short and long-term actions. Management plans include guidelines for operations and land stewardship, provide for the protection of natural and cultural resources, and ensure consistency between recreation, resource protection, and sustainable forest management.

Trail development and management should be consistent with the agency's RMPs. For facilities where an RMP does not currently exist, trail development and management should be consistent with this guidelines manual.

Specific Trails Plans (see Section II of this manual) may also be developed prior to, as a part of, or following an RMP. Such trails plans should consider available environmental, cultural, social and recreational information; may recommend significant changes to existing trail systems; and will guide trail development and management at that facility.

### **Reserves, Parklands and Woodlands**

DCR is in the process of designating all of its facilities as Reserves, Parklands or Woodlands. For each of these designations, DCR has developed guidelines for management. Designations and guidelines are available at <http://www.mass.gov/dcr/ld/landscapedesignations.htm>.

### Recreation Opportunity Spectrum

A model for decision-making, the Recreation Opportunity Spectrum (ROS) recognizes that land managers provide “experiences” to users not simply “activities” such as hiking, camping, or boating. A recreation experience is determined not only by the activity itself but, more importantly by the environment or “setting” within which the activity takes place, and this setting is defined by physical attributes such as topography and vegetation; social attributes such as visitor volumes and behaviors; and management attributes such as the fees, facility maintenance, signage, or staffing. It is the combination of these factors that truly determine the quality and character of the recreational experience.

The ROS recognizes that the DCR system encompasses settings ranging from primitive to highly developed/urban. Accordingly, we provide and should manage for a “spectrum” of recreational experiences.

ROS Class	Primitive	Semi-primitive	Semi-developed Natural	Developed Natural	Urban
<b>Setting</b>	Setting appears unmodified environment of large size. Evidence of other users is minimal. Area free from management controls.	A medium to large natural appearing environment. Interaction between users is low. Management controls are subtle.	Area is natural appearing, but sights and sounds of people and interactions with others are moderate. May include more developed areas.	Area is substantially modified. Interaction with others is moderate to high. Includes facilities designed for many people.	Substantially developed area, with urban elements common. Vegetation is often manicured. Large numbers of users present.
<b>Experience</b>	Users experience a high degree of isolation, independence, and self-reliance. Opportunities for challenge and risk are high.	Users experience a moderate degree of isolation, independence, self-reliance. Opportunities for challenge and risk present.	Equal degree of isolation and encountering others. Opportunities for interaction with nature. Challenge and risk are not important.	Encounters with others are common. Access is convenient. Physical setting is less important than the activities provided.	Presence of others is expected and desired. Observing natural appearing elements is important.

The ROS can also provide standards for management across the spectrum that are appropriate for each park’s setting and resources. It can provide critical information for addressing recreational use conflicts and become an essential ingredient in the agency’s expanding resource management planning and forest management planning efforts. ROS can provide a framework for managing trails across a spectrum of settings and experiences.

### Trail Corridors and Forest Management Activities

Many of our existing trails exist on ways that were historically developed and are currently managed, at least partly, for forest management. Many of these ways also offer valuable recreational experiences to users and those users understandably become attached to the sights, sounds and character of the trail environment. Dramatic changes to the trail corridor, such as harvesting, may therefore be met with public concern and resistance. In

order to minimize public concern, within woodlands, DCR Foresters and Facility Managers should take extra care and coordinate information when trail development or forest management activities are planned to occur. The forester/facility manager team should:

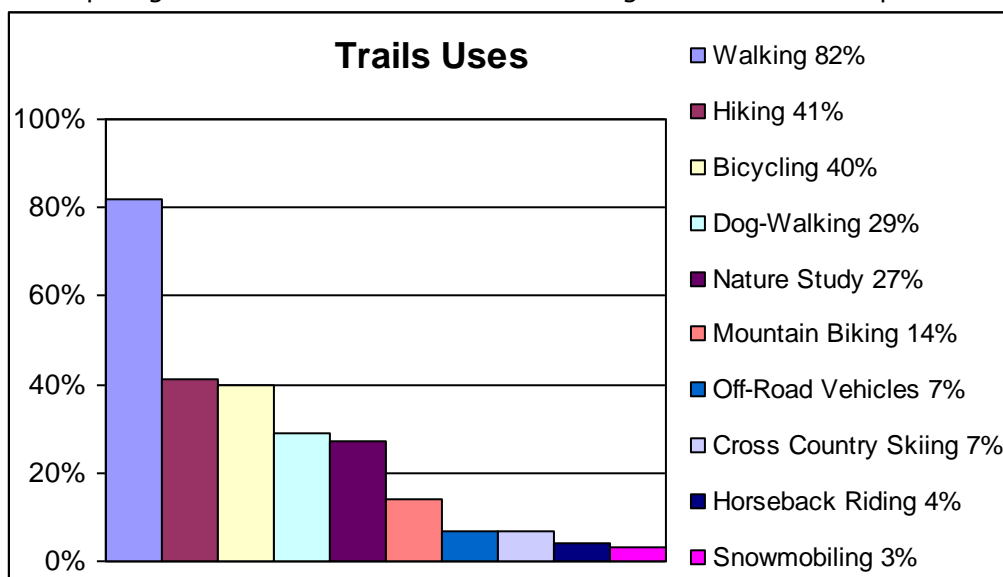
- Assess the potential for trail recreation impacts or conflicts, before any marking of trees occurs.
- Distinguish between forest roads and recreational trails. Forest roads which have been adopted for recreational use should be expected to experience a higher level of forest management activity than a trail.
- Ensure that any new trail development is consistent with forest management plans.
- Integrate a trail corridor protection into the cutting plan. Trail corridors may vary in width depending on the significance of the trail; however, within the designated corridor, extreme care should be applied to ensure that the trees and other landscape features which serve as "gateways" or "anchors" or otherwise significantly contribute to the character or flow of the trail are protected.
- Require in the plan that harvesters do not use the trail as a skid path or forwarding route and require that trees harvested from within the corridor (if any) are removed in a manner which minimizes disturbance to the trail.
- Discuss any concerns or anticipated conflicts with District or Regional Managers.
- Consider scheduling a public meeting to discuss the plan and reach out to friends groups, neighbors, trail volunteers and other stakeholders to participate in the meeting. The Forestry Bureau already has established procedures for public outreach on cutting plans. This outreach plan may be the ideal opportunity to invite trail interests to participate in the discussion. Utilize the opportunity to educate stakeholders about the benefits of forest management in maintaining a healthy forest and ecosystem diversity.
- Ensure that adequate signage or warnings are provided at the trail head or key intersections to protect the public during harvesting operations.

Ideally, forest management and trails management can be integrated to support each other. New sustainable trails could be developed through forestry management, and unsustainable trails closed. Trails signage and interpretation can be used to support education of the benefits of forest management. And forest ways can support both forest management and recreational trail activities.

## Trends in Recreational Trail Demand and Uses

It is important to recognize and anticipate changes in trail use patterns, demand, and types of activities to ensure that trails remain relatively stable with appropriate maintenance and management. Recognizing and accommodating these changes can also help to promote safety and reduce conflicts.

A 2004 survey of Massachusetts park users - *The Public's Use of Outdoor Resources in Massachusetts* showed that 54% of contacted households had used a park, recreational area, or public space at least once in the past 12 months. This figure represents a statistically significant increase from the 42% reported in the previous study in 1994. Of that 54% of households, 52% visited public trails. Among all the activities that respondents participate in, those that can be associated with the use of trails are shown below. Most visitors participate in non-motorized recreational uses of public lands and clearly these figures can help to guide future decisions in trail management and development.



In terms of usage of parks/recreational facilities, 64% of the respondents indicated that the opportunity for healthful experiences was very important and trails are among the most popular places that command repeat use.

## Trail Regulations

DCR is currently reviewing and revising its CMR's to integrate regulations promulgated under the DEM and MDC. Once finalized, the regulations pertaining to trail activities will be included in this manual.

## DCR Approved Trail Uses

Approved trail uses on DCR lands include walking, running, hiking, mountain biking, horseback riding, cross-country skiing, and snowshoeing. Snowmobile use is allowed in some State Parks in designated areas and trails, but not in Urban Parks or Watershed lands. Cross-country skiing is not allowed in the Quabbin Reservation.

Other special uses allowed include interpretive uses, wheelchairs or similar mobility devices, carriages, dogsleds, bicycles, rollerblades, and roller skis.

Currently, eight state forests include All Terrain Vehicle (ATV) or Off Highway Motorcycle (OHM) trails. Recognizing the potential impacts, conflicts and maintenance challenges associated with these uses, DCR has adopted a special policy and procedure for designating trails which are open to these vehicles. The procedures include evaluating the property and specific trails according to more than thirty environmental, design and management criteria through a coarse and fine filter process. The DCR web site includes the agency policy for siting ATV and OHM trails at [http://www.mass.gov/dcr/recreate/ohv\\_policy.pdf](http://www.mass.gov/dcr/recreate/ohv_policy.pdf). For further information regarding these uses, contact DCR's Bureau of Recreation.

## ***Additional Types of Trails***

### **Long Distance Trails**

Massachusetts' Long-Distance Trails are the primary spine of our greenway and trail system. Massachusetts' Long-Distance Trails include:

- Taconic Crest Trail
- National Scenic Appalachian Trail
- Mahican – Mohawk Trail
- Metacomet – Monadnock- Mattabesett Trail
- MidstateTrail
- Mass Central Rail Trail
- Warner Trail
- Bay Circuit Trail
- SAM (Snowmobile Association of Massachusetts) Corridor

Long-Distance Trails provide important long-distance recreational opportunities. They connect communities, features, and parks and forests along their route. They serve as destinations for trails that connect to them, and they bind together critical elements of our scenic landscapes. Of these, only the Appalachian Trail is permanently protected. All of the others, approximately 700 miles in all, are in danger of fragmentation as unprotected segments are lost to development or closed to the public. Protecting and promoting these resource will require a coordinated effort by multiple stakeholders, but within DCR, we should take the lead in promoting, connecting to, managing and protecting these trails as the backbone of our greenway and trail system.

### **Bikeways and Rail Trails**

Bikeways are generally hard surfaced trails developed for multiple uses, but with on-road bicycling as a main designed use. Rail Trails specifically refer to bikeways that have been developed on former rail corridors. DCR currently manages several rail trails including the Cape Cod, Norwottuck, Ashuwillticook, and Nashua River Rail Trails. These trails often connect communities and provide a particular kind of developed trail experience that is becoming increasing popular.

### **Water Trails**

Water trails are designated routes, features and access points along rivers, streams, estuaries, coastal areas, and ponds. Water trails do not usually require the development of the trail itself, as the designation, user information and interpretation that assists users in enjoying them. They can provide a special and scenic trail experience for users of both motorized and non-motorized watercraft. Examples of existing water trails include the Connecticut River Water Trail and the Great Marsh Coastal Water Trail network.

### **Historic Trails**

Historic trails often involve the designation of a route along or past various features of historic or cultural importance. These trails may make use of existing roads, sidewalks or walkways, and usually include self-guided users information on the features.



Examples might include the Freedom Trail in Boston or the Knox Trail through Western Massachusetts.

### **Interpretive/Nature Trails**

Often short trails are specifically designed to provide natural or cultural interpretation of an area. These types of trails included signage, brochures or other kinds of written information to provide this interpretation. New formats of interpretation include podcasts or cell phone interpretation. Some examples of these kinds of trails may include self-guided nature trails, "discovery" trails, or interpreter guided trails.

### **Accessible Trails**

We discuss accessibility guidelines elsewhere in this manual. However, some trails are specifically developed to provide an accessible trail opportunity. These are specifically sited, designed, constructed and marketed for this purpose. Examples of these within DCR include the accessible trails at DAR State Forest, Dunn State Park and the Pittsfield State Forest's Tranquility Trail.

## ***DCR Trail Team***

In 2008, several DCR staff from across the agency assembled to review the first draft of the Trails Guidelines and Standards Manual. This group proved invaluable in identifying best practices in place across the management divisions and steering the development of this document. This group has come to be known as the DCR Trail Team. It has become clear that the Trail Team will continue to play a role in the ongoing implementation of these guidelines, future revisions, and trail-related training associated with them. The Bureau of Recreation in conjunction with the Greenways and Trails Program will coordinate the ongoing activities of the Trails Team and ensure that the group includes the various interests from across the agency and that their work is integrated with other related agency initiatives.

## ***Section II: Trail System Planning and Development***

Instead of considering each trail individually, the trails in and around DCR facilities should be viewed as components of an integrated system or network. Trails are integral to the activities and services, and resources we are protecting at each facility.

Each **Trail System** should effectively contribute to three primary goals:

- Highlighting ecological, scenic, and cultural features within our facilities
- Providing specific, enjoyable recreational experiences to users
- Connecting important trail corridors, destinations, and population centers both within and outside of our facilities

Each **Trail System** should effectively achieve the above goals while simultaneously:

- Avoiding sensitive areas
- Meeting the expectations of users
- Minimizing ecological impacts
- Minimizing maintenance requirements

### ***Assessing and Planning an Existing Trail System***

Trail system planning does not need to take a lot of time or resources. With a few good maps, knowledgeable staff, and some strategic decision-making, we can make a great deal of progress in planning for more effective trail systems.

A more formal Trail Plan can also be developed using a public process.

Below are the basic steps to trail system planning.

#### **Get to Know Your Trails**

**1. Walk Your Trails:** The most important piece of information to have when assessing an existing trail system is a first hand knowledge of the trails. While out on the trail, examine and document existing conditions, problem areas, types and number of users, available parking, signage and marking, etc.

**2. Gather Maps:** Compile appropriate maps. Ideally, you will want to compile or request maps that depict:

- Existing trails, developed areas, roads, facilities, park boundaries, etc.
- Rare and endangered species habitats
- Streams and wetlands
- Steep slopes
- Historic/cultural resources
- Special management areas/zones
- Soils restricted for trail development

You may already have much of this information available on existing maps, or be able to request these maps from DCR's GIS program.

**3. Identify Forest Management Ways:** Recognize that many of the forest roads or ways that exist within a facility may have been developed to support forest management activities. While an area may not have been cut for many years, it may be due for active forest management at some point in the future. Consult your management forester and identify segments of your trail system that coincide with forest

management ways and that may be used for that purpose from time to time. See page 7 for additional information regarding trail corridors and forest management activities.

**4. Describe Use Patterns and Demand:** Identify which trails are designated for which uses, and what types of use you specifically want to manage for. Identify what types of trail uses currently exist within and around your facility and the use types wherein unmet demand lies. This could be done by formal observation, informal interviews, or by user surveys. Local community Open Space and Recreation Plans can also provide valuable information on community needs and desires. It is helpful to then prioritize the uses you want to manage for and identify key characteristics of each use.

#### **Identify Features and Experiences**

**5. Identify Scenic, Recreational and Cultural Features:** On your map(s), highlight the scenic, recreational and cultural features within your park that you want to draw visitors to, such as water resources, ridge lines, summits, vistas, long-distance trails, notable environments, historic structures, cultural landscapes, geologic features, etc.

**6. Identify Your Main Parking and Access Points:** The trail system needs to have appropriate parking and access points. Both too few and too many access points will result in management difficulties. In addition, parking and access points need to be designed appropriately for the given managed uses of the trail system. For example, for a trail system that allows motorized use, parking will need to be provided that can accommodate trailers and motorized trail vehicles, but you may also want to provide separate access points for non-motorized trail users.

**7. Identify Recreational Experiences:** Based on the features of your facility and the types of use you want to manage for, describe some of the high priority recreational experiences you hope to provide. For example, if there is a demand for mountain biking at your facility and sufficient space, you may want to provide the experience of a range of distances and challenges for mountain bikers. Or, if you have a large number of day users seeking a short but educational pedestrian experience, you may want to provide some short, fully accessible, nature trail experiences.

Keep in mind that different users may be seeking a range of experiences from shorter, safer, more developed settings to more remote and isolated settings. Also remember that different user groups will require different trail distances and be able to handle different levels of challenge. See the section above on "types of trails" for some general guidelines and the "Minnesota Trail Planning, Design and Development Guidelines" for a more complete discussion of user needs and expectations.

**8. Identify Connections:** Identify main destinations within your facilities (such as day use areas, and campgrounds), main trail corridors that you want to link to (such as long-distance trails, or community trails), and nearby communities, neighborhoods, or population centers that you could connect to.

Remember that it is important to look beyond our borders and think about how we can connect people to our parks through more than just roads and parking lots.

Also remember that too many connections between trails make trail systems confusing and difficult to patrol.

#### **Identify Constraints, Issues and Problem Areas**

**9. Highlight Sensitive Areas:** Now using the maps and existing knowledge, identify (draw a red circle around perhaps) areas where existing trails intersect sensitive areas

such as priority habitats, steep slopes, and wet areas. In addition, highlight specific trails or trail segments that have become persistent maintenance issues.

**10. Highlight Problem Areas and Redundant Trails:** Highlight trails or trail areas that are in poor condition or have become persistent maintenance problems. Many of these might be “fall-line” trails, those that go directly down the slope. You should also identify trails or trail segments that are redundant.

**11. Involve Stakeholders:** At this stage, it is useful to involve various stakeholders – park users, trail groups, advocates, etc. For example you might hold a public meeting on trail issues, or attend a “Friends” group meeting. These individuals and groups can help you identify features, use patterns, demand, opportunities, and connections.

#### **Make a Plan**

**12. Designate Trail Use:** Each trail should be designated for a certain use or uses, and these designations should be clearly identified at trailheads, intersections and on trail maps. Keep in mind that different modes of travel may impact other trail users, treadway, and resources; and often require different levels of trail maintenance and management. Review trail use designations to ensure that each makes sense.

**13. Identify Potential Closures:** In many DCR facilities, new trails have been developed over time without careful planning and/or adequate construction. These trails often have persistent maintenance and safety issues, user conflicts, or unacceptable environmental impacts. Considering the existing trails and highlighted areas of concern, identify trail segments that could be closed without significantly impacting the user experience, interrupting the trail corridor, or compromising the trail system.

**14. Re-route and Restore Trails:** At the same time, you may identify trails that are maintenance sinks or in areas of concern, but that are also critical for connections, or providing a user experience. These may be candidates for re-routes (i.e., moving the trail up-slope) or restoration (i.e., adding drainage structures) so that they can become more sustainable. Identifying and prioritizing these projects is an important step in developing maintenance and capital improvement plans.

**15. Highlight Potential New Trails:** Given the features you want to highlight, connections you want to make, and experiences you hope to provide, identify potential opportunities for new trails. This will be your guide in assessing future trail requests and additions. However, before one can consider new trail construction, it is essential to correct existing trail problems.

**16. Identify Stewardship Partners:** Lastly, within your trail system, you may be able to identify particular user groups, friends groups, scout troops, or other stakeholders who will be able to assist in the stewardship, monitoring and maintenance of particular types or sets of trails. It will be helpful to identify these groups in your trail plan.

Ideally, with a simple trail plan that includes maintenance priorities, closures, re-routes, potential new trail opportunities, and potential adopters, we will be able to effectively improve our trails system, access resources for improved trail development, and respond appropriately to requests for new trails.

## ***Assessing Requests for New Trails or Changes in Trail Designation***

Unfortunately, we are often faced with requests for new trails or new allowed uses from advocacy groups before we have had the opportunity to carefully consider the trail system needs in a Trail Plan or a Resource Management Plan. Before considering new uses or new trail development, we should ensure that the existing trail system is working to its full potential and that the new trail will, in fact, contribute to the goals of our network.

In addition, given the agency's limited ability for maintenance, we should ensure that we have the capacity to build and maintain a new trail over its entire life cycle. Developing and committing to a long-term maintenance strategy is a critical aspect of initial trail planning and fundamental to successful trail system management.

Important basic questions to ask before developing a new trail include:

- Why do you need a new trail? How does it contribute in a new way to the user experience or how does it offer a critical connection?
- What will the trail's designated uses be and what is the demand?
- Will this trail be designed to the accessibility standards?
- Who will design and build the trail?
- Who will fund the trail?
- Who will maintain the trail?

If, in planning your new trail, we find that we cannot answer these questions or balance these components, it is probably not wise to build the trail at all.

If we find that we can easily answer these questions and provide the commitment to sustainably design, build, and maintain a new trail then proceed to *Trail Proposal and Evaluation Form* (Appendix A). The *Trail Proposal and Evaluation Form* is the next step for gathering important information and seeking approval for a new trail proposal. The information in this form will then be used by facility supervisors, managers, and foresters to evaluate and either approve or disapprove the request.

In cases where a significant change in the trail system is being proposed (for example changes that might affect 25% or more of a trail system), then DCR will likely want to engage in a Trail System Planning or Resource Management Planning process to fully assess the proposed changes.

## ***Additional Trail Development Concepts***

**Multiple-Use versus Single-Use Opportunities:** Trails that are designed and managed for multiple uses differ somewhat from those that are designed and managed for single uses. Certain uses are more compatible with each other than others. See further discussion in Section III.

Multiple-use trails will likely be more expensive to develop in a sustainable manner, but given that more uses can be accommodated on fewer trail miles, may lead to lower long-term maintenance costs. They will also be able to provide recreational opportunities to more diverse users, but the user experience may be more uniform. On the other hand, some single-use trails may be easier to maintain per mile and may provide a more rewarding user experience to particular users.

Ultimately, you may want to consider developing a mixture of multiple-use and single-use trails at your facility depending on the features you wish to highlight and the user experiences you want to provide. For example, a particular park may want to specialize in offering opportunities for cross-country skiing or mountain biking and thus develop some longer single use trails to provide quality experiences in backcountry areas of the park, but may maintain a number of multiple use trails in the park's core area.

**Core Area versus Backcountry Trail Opportunities:** Most DCR facilities have core area(s) with significantly higher usage and more developed facilities, as well as back country area(s). Trails in the core area should be more accessible, and designed, marked, and maintained to a higher Trail Class standard as they are likely to see higher usage. Backcountry area may be appropriate for longer distance trail opportunities, single use trails, and a lower level of management. Trails in backcountry areas offer a more intimate experience with fewer visitors, a greater challenge, and sometimes higher risk. Risk is associated with difficulty and remoteness of a trail, the probability of meeting others, and the level of management.

**Trail Management along the Recreational Opportunities Spectrum:** The Recreational Opportunities Spectrum (ROS, see Section I for more details) recognizes that the user experience and expectations will vary along a continuum from primitive facilities to semi-developed sites to urban areas. Some DCR facilities are naturally going to provide a more urban or sub-urban recreational experience and some a more natural or even semi-primitive experience. The facilities (including trail facilities) across this spectrum will obviously be managed differently, with different standards and different levels of management.

The ROS helps provide management guidelines across this continuum. In urban and sub-urban settings: Accessible, multi-use hard surfaced paths may be more appropriate with a relatively high level of use, and greater signage and management presence.

In developed and semi-developed natural settings: Users may expect a diversity of trail types and experiences from woodland only pedestrian trails to mountain biking trails to soft-surface multi-use trails, but they will also expect to encounter a variety of users, especially in core areas.

In semi-primitive settings: Expectations will vary depending on whether the facility allows motorized use or not. In non-motorized areas, trails will tend to be narrow and more rugged with a minimum of management presence. Users will expect to find a certain level of solitude and may not expect many other users.

**Connecting to Neighboring Communities:** Where feasible and appropriate, consider using trails to connect state parks and forests to neighboring communities. Trail connections beyond our borders are important as recreational opportunities and as transportation alternatives. They also allow us to expand the numbers of miles and types of user experiences we can provide and help strengthen ties to local user and advocacy groups.

Trails connecting outside of our borders should be carefully developed only in partnership with a local community or trail group, with that group taking the lead. Important considerations before any new connecting trail is developed include property ownership, landowner permission, maintenance responsibility, and issues around controlled access.

## ***Principles of Ecologically Sustainable Trails***

*(This section is drawn and adapted from the Minnesota DNR Trails and Waterways Trails Planning, Design and Development Guidelines with additional information relevant for Massachusetts.)*

Trails are our most important tool for linking conservation and recreation. As such, they must be developed and maintained in ways that avoid negative impacts to the ecological resources of the Commonwealth, especially those that the DCR directly stewards.

All development, including trails, has direct and indirect impacts to the environment. To help minimize these impacts, we propose the following “**guiding principles**” when developing and maintaining trail systems:

- 1. Avoid Sensitive Ecological Areas**
- 2. Develop Trails in Areas Already Influenced by Human Activity**
- 3. Provide Buffers to Protect Sensitive Ecological and Hydrologic Systems**
- 4. Develop Appropriately when Trails Do Intersect with Sensitive Areas**
- 5. Use Natural Infiltration and Best Practices for Stormwater Management**
- 6. Limit tread erosion through design and construction**
- 7. Provide Ongoing Stewardship of the Trails**
- 8. Ensure Trails Remain Sustainable**
- 9. Formally Decommission and Restore Unsustainable Trail Corridors**

### **1. Avoid Sensitive Ecological Areas**

When developing and maintaining trails, avoid sensitive ecological systems or take sufficient steps to minimize impacts on these systems. Ecologically sensitive systems include:

- Known and estimated locations of rare and endangered species and their habitats as identified by the Massachusetts Natural Heritage and Endangered Species Program,
- Priority Natural Communities and vernal pools as identified by the Massachusetts Natural Heritage and Endangered Species Program,
- Wetlands, lakes, rivers and streams,
- Public water supplies,
- Forest Reserves and Wildlands,
- Steep slopes and soils that are identified as restricted for trail or road development as defined by the Natural Resources Conservation Service,
- Unique or important geologic features, formations, and designated state geologic waysides, and
- Cultural and historic resources as determined by the DCR archeologist in consultation with Massachusetts Historic Commission.

### **2. Develop Trails in Areas Already Influenced by Human Activity**

Consistent with the first guiding principle, where feasible, it makes most sense to site and maintain trails in areas that have already been influenced by human activity provided that you can meet your other objectives while doing so. These include:

- Already existing trails,
- Existing or historic wood roads and logging roads,
- Abandoned railroad corridors, often make appropriate multi-use trail corridors,
- Previously developed or disturbed areas.

### **3. Provide Buffers to Protect Sensitive Ecological and Hydrologic Systems**

Maintaining buffers between trails and adjacent sensitive natural areas is essential to ensuring their long-term ecological quality, diversity, and habitat value. Irrespective of how well they are aligned and designed, trails have an impact, including habitat fragmentation, soil compaction, increased runoff and erosion, and introduction of non-



native plant species. For these reasons, the use of buffers is an essential part of trail planning and design.

Recommended buffer widths, however, will vary in response to a number of conditions, including:

- Sensitivity of the ecological systems being impacted,
- Extent of the natural open space or greenway corridor being traversed,
- Type of trail being proposed and its potential for creating ecological impacts,
- Grade and soils types, and
- Desired trail experience.

Recommended buffer widths may range from 50-200 feet depending on conditions. For a more detailed discussion see the Minnesota DNR Trails and Waterways *Trails Planning, Design and Development Guidelines*

Consult with MNHESP to determine appropriate buffer to rare, threatened and endangered species. Consult with Historic Resources to determine appropriate buffer to historic/cultural resource. Activities within wetland resource buffer areas are regulated by Massachusetts Wetland regulations and local conservation commissions. Projects within 100 feet of a wetland or within 200 feet of a perennial stream will require the submission of a Request for Determination of Applicability form to the local conservation commission.

#### **4. Develop Appropriately when Trails Do Intersect with Sensitive Areas**

The above discussion notwithstanding, trail development and maintenance across, along, and within sensitive areas is often desirable and justifiable. Streams need to be crossed, slopes traversed, and features interpreted.

Allowing controlled access to sensitive ecological areas may be an integral part of educating the public about the value of protecting them. Most often, this takes the form of routing a corridor trail on the periphery of a sensitive area (with adequate buffers) and allowing more direct access to specific settings only in very select locations, and with appropriate trail forms (such as boardwalks and bridges) for closer observation. This approach provides reasonable access while limiting the potential for environmental impact and can also be developed in conjunction with an environmental education program. In addition, any trail development should also be consistent with Resource Management Plans.

#### **5. Use Natural Infiltration and Best Practices for Stormwater Management**

Whether paved or natural trails, one of the most critical components of trail design and management is to keep the trail away from the water and the water off the trail.

On highly developed trails, the use of natural, dispersed infiltration systems such as vegetated swales and "rain gardens" offers advantages over engineered stormwater control structures such as storm drains and catch basins.

#### **6. Limit Tread Erosion through Design and Construction**

To minimize trail erosion and impacts to water resources use sustainable trail design and construction techniques such as: reducing the "tread watershed", "outslope" the trail (slope it away from the bank) to facilitate natural drainage across the trail, and provide appropriately spaced waterbars and drainage dips. See the *Elements of Design* section for more details.

#### **7. Provide Ongoing Stewardship of the Trails**

Trail stewardship begins with an appropriate, sustainable design, and continues with ongoing maintenance and monitoring, and if necessary restoration or closure.

Historically, DCR has put too few resources into trail stewardship, and this has to change. Trails are one of our most important recreational assets. Trail stewardship generally involves providing a safe and satisfying trail experience, minimizing trail conflicts, maintaining a stable, dry and firm trail tread, maintaining clearance zones, signing and marking trails, and insuring that there are no impacts to adjacent natural systems.

Stewardship of DCR trail resources will need to encompass a three-pronged approach:

- Ongoing trail monitoring and basic maintenance by DCR staff,
- Ongoing trail monitoring and basic maintenance by user and other stakeholder groups, and
- Capital trail restoration and closure projects to either make trails sustainable or close unsustainable trails.

### **8. Ensure Trails Remain Sustainable**

A sustainable trail is one that can be indefinitely maintained for its intended purposes, assuming routine management and stewardship is provided consistent with the type of trail. If a trail is well designed and appropriately used, site impacts will stay within acceptable limits.

Over time, all trail treads will change shape with use and forces of nature. Anticipating and reacting to this change before significant damage occurs, is key to maintaining a sustainable trail system.

A trail becomes unsustainable when its physical condition passes a threshold where site impacts are no longer acceptable. Under these circumstances, action is required to avoid continued degradation of the trail and adjoining ecological systems.

In practice, all natural trail types tend to exhibit similar physical signs of being either sustainable or unsustainable, as reflected by rutting, erosion, by-passing, and impacts to adjoining ecological systems and hydrology.

In general, trails are considered sustainable if the following conditions are found:

- Trail tread is stable and compacted, with a constant outsloped grade preferred (the depression on a well-worn trail should average less than 3 inches in most soil types),
- Displacement of soils from the trail tread is minimal relative to the use and soil type (only limited berming on the outside of curves),
- Tread drains well with minimal to no signs of ongoing erosion,
- Tread does not restrict site hydrology and impact surface- or ground-water quality, and
- Impacts to surrounding ecological systems is limited to the trail tread and directly adjacent clearance zone, with no bypassing and cross-country travel occurring.

When a trail becomes unsustainable, there are three options. Re-design and restore the trail, restrict use/re-classify the trail, or decommission the trail.

### **9. Formally Decommission Unsustainable Trail Corridors**

Closing or decommissioning is often necessary to ensure an effective and sustainable trail system and reduce maintenance costs and user conflicts. Decommissioning a trail involves more than just a sign or barrier. When a trail is closed or a trail segment is rerouted, at a minimum the visible ends of the old trail should be re-graded back to the

original slopes, the eroded soil there should be replaced, and the trail end should be replanted with native plants. The use of a physical barrier and reducing the visibility of the old trail tread are both necessary to effectively close a trail. Experience has shown that relying solely on fences and gates to block entrances of decommissioned trails is not very effective.

The Minnesota Department of Natural Resources' *Trail Planning, Design, and Development Guidelines* provides guidance on different methods of closing trails including using dense planting at entrances, creating closure berms to block access, using slash to reinforce closures, ways to re-naturalize corridors after closure, and public information and education. In many cases, these closures can be done in conjunction with forest management and integrated into a forest management plan.

## ***Building Sustainable Trails***

In the previous section we discussed broad principles of planning sustainable trails. But how do these translate on the ground?

While there are many factors that can influence the sustainability of trails, when you get to actually putting them or managing trails on the ground, they should achieve the following objectives.

- **Connect positive, and avoid negative, control points**  
A sustainable trail will lead users to desired destinations such as water features, historic sites, vistas, interesting landforms and user facilities; while avoiding wet areas, steep slopes, critical habitats, and other culturally or environmentally sensitive areas.
- **Keep water off the trail**  
As we have noted, erosion is the number one problem for sustainable trails. It damages trails, is expensive to repair and diminishes the user experiences. In New England, water is the primary erosive force. Trails that collect water or channel water will be both environmentally and economically un-sustainable.
- **Follow natural contours**  
Trails lie on the land in three ways – along a fall-line (in the direction of the slope), on flat ground, or along the contour (perpendicular to the slope). Of these types of trails, **only the contour trail** on the side-slope easily sheds water and is thus sustainable.
- **Keep users on the trail**  
When users leave the trail tread, they widen it, create braided trails, and create social trails. These can cause environmental damage and raise maintenance costs. Users leave the trail when it becomes eroded or wet, or when the trail does not meet their needs or expectations.
- **Meet desired user experiences**  
Sustainable trails and trail systems must meet different users' needs and expectations. If they do not, users may abandon the trails and / or create their own, less sustainable trails.

Ultimately, a sustainable trail design will most often be a trail that connects desired control points by roughly contouring along the sides of slopes.

### **Designing Sustainable Contour Trails**

The contour trail is the most sustainable design, but how does one specifically lay out and create these trails so that they do not collect or channel water? A sustainable contour trail should conform to the following five "rules:"

1. **Outslope:** The trail tread should be outsloped (sloped away from the hillside) by 5%. This will allow water that comes on to the trail to flow off downhill and not be channeled down the trail.
2. **Grade Reversals:** While the trail will generally follow the contour of the land, it will also most likely either be climbing or descending slightly. However, a sustainable trail should also reverse its grade often (from down to up and vice versa, "surfing the hillside"). This will reduce the watershed of any given section of trail, prevent water from collecting and running down the trail, and reduce any erosion potential. Most trails should include grade reversals every 20 to 50 feet.

3. Half Rule: A trail's grade (percent slope) should not be any greater than half the grade of the hillside that it contours along. For example, if the slope of the hill the trail runs along is 16%, then the grade of the trail should be no more than 8%. This will allow water to flow across the trail, off the trail and continue down the slope. This is especially important along gentle slopes.
4. Ten Percent Average Grade: An average trail grade of 10% or less will be most sustainable, on most soils and for most users. This does not mean that shorter sections can't be steeper.
5. Maximum Sustainable Grade: The maximum sustainable grade is the steepest grade the trail will attain, and should be determined early in the planning process. Typical maximum grades may vary from 15% to 25%, but this is site specific and depends on factors such as soils, rainfall, the half rule, grade reversals, user type, desired difficulty level, and number of users.

## ***Building an Enjoyable Trail Experience***

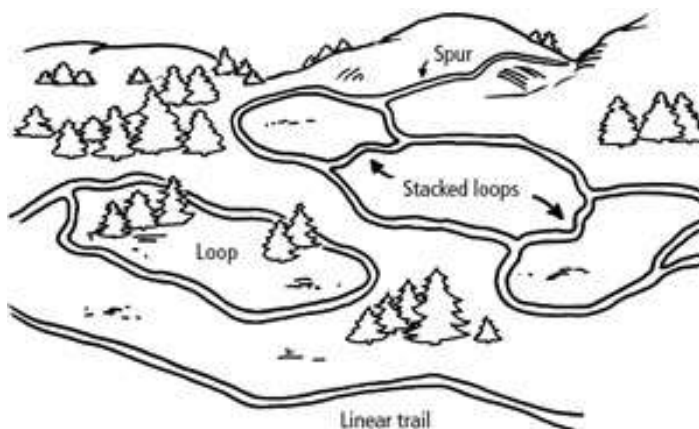
Beyond the issue of trail sustainability, the most successful trails are a reflection of the settings and landscapes they traverse. People purposefully choose specific settings for the experience they seek, and the trail should reflect those expectations. The more natural the setting, the more the trail needs to be shaped by nature. The more urban the setting, the more the trail needs to highlight local landmarks and points of interest and provide a social atmosphere.

Well-designed trails will also use natural and built elements to create sequences of visual, physical, and emotional experiences that are pleasing to the trail user. All aspects of a site – its topography, viewsheds, water features, ecological communities, cultural sites, developed areas, roads, and trails – should be perceived as part of the sequence of events that give the trail its character. To be successful, the collective sequence must also meet the expectations of the visitor in terms of desired mode of travel, setting, level of difficulty, and length of trail.

**Managing Viewsheds:** Managing the views as one progresses along a trail is an important consideration. Taking advantage of compelling views and downplaying those that detract from the trail is all part of controlling the sequence of events that enhances the trail's recreational value. Managing viewsheds is also an ongoing maintenance issue and may, at times, conflict with vegetation management. In these instances, it is important to define which viewsheds are important to the trail experience and how those will be preserved over time as part of the vegetative management program for the trail.

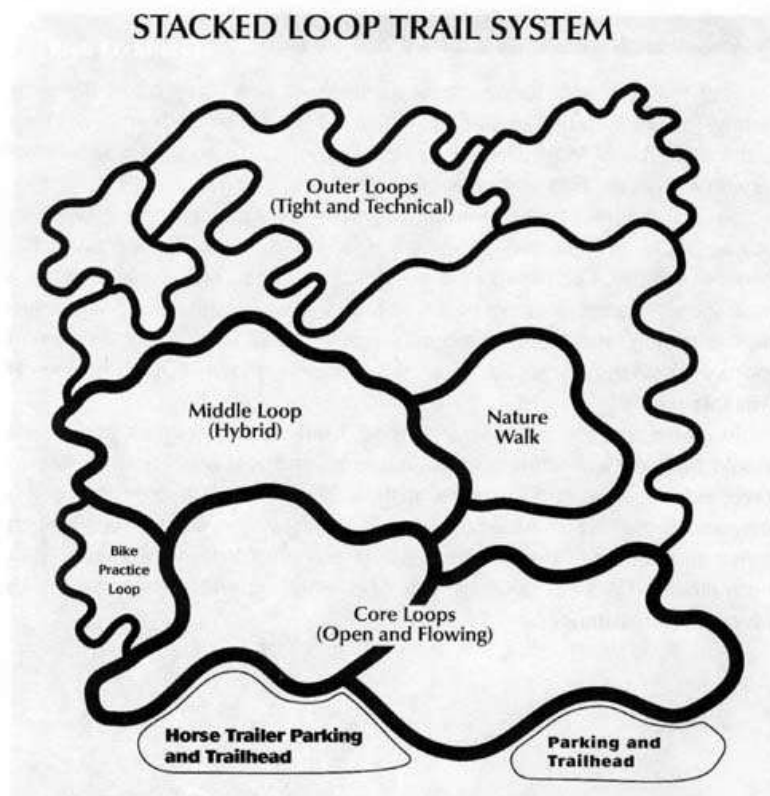
**Trails "Shapes" and Layouts:** Trail "shapes" are defined by their purpose and topography, but they also help to create a recreational experience relative to the trail's setting. Understanding the emotional response that various shapes induce is critical to designing trails that successfully mesh with the larger landscape experience.

Bikeways often follow old rail lines, and are therefore straight with little grade change. This provides a particular type of linear trail experience, and often meshes with more urbanized settings. Long-distance trails tend to be fairly linear as they connect features and destinations over a long distance, and will tend to follow ridgelines and river corridors. Spurs take the user to a particular destination and back. Loop trails allow for users to end up where they started without repeating any part of the trail.



(Graphic from "Trail Design for Small Properties"  
[www.extension.umn.edu/distribution/naturalresources/DD8425.html#1](http://www.extension.umn.edu/distribution/naturalresources/DD8425.html#1))

Within DCR's parks, stacked loop trails (a series of loops that build upon each other or a large loop with different cut-offs along the way) can be an efficient design that allows you to offer a variety of trail distances and experiences in a relatively compact area.



(Graphic from NEMBA [www.nemba.org/digitalnemba/images/StackedLoopTrails2.jpg](http://www.nemba.org/digitalnemba/images/StackedLoopTrails2.jpg))

### Taking Advantage of Landscape Features:

In addition to the broader concepts of trail layout, good trail design also takes advantage of landscape features along the way that help to create the sequence of events and define the user experience. The four primary design elements are listed below.

**Terminus and Destinations:** Every trail should have a clear beginning and ending. Loop trails may just have a single beginning and ending, but may also have "destination" points along them. Terminus points should give the user a clear sense of initiation and accomplishment. Destinations should be features that entice the user on, and should leave the user with a sense of having achieved a goal.

**Gateways:** Gateways occur when natural or human structures constrain the trail and thus create a sense of "entrance." A bridge, a passage between two large trees, or a railroad cut into a ledge, all create a visual gateway. Ideally, gateways will also occur or be created at or near trailheads to give a sense of trail entrance.

**Anchors:** Landscape anchors are any vertical feature (a tree, boulder, wall, hill, valley, sign, etc.) that visually help to tie the landscape scene together and give it interest and balance. Anchors can also serve as stand alone points of interest that draw attention and provide continuity from one visual sequence to the next. Designing the trail to take advantage of natural landscape anchors and wrapping the trail from one anchor to the next, provides the trail with a sense of flow and purpose.

**Edges:** Edges are borders between landscape features or between ecological zones. The trail itself creates edges within the site (one along each side).

Examples include borders between:

- land and water,
- steep slopes and level ground,
- woodlands and grasslands,
- forest types or habitats, and
- human created linear features like fence lines and roadways.

Edges often offer rich opportunities for trails. Following or crossing edges enables the user to experience different aspects of a site in unison. Edges are also often ecologically rich and provide habitats for diverse plants and wildlife.

**Constraints:** Within each property there are also constraints and obstacles around which trails need to be designed. Streams, property lines, wetlands, steep slopes – all form constraints that define where the trail can go.

For a more detailed discussion, see the Minnesota Department of Natural Resources' *Trail Planning, Design, and Development Guidelines*.



## ***Building Accessible Trails***

Trails are about providing people access to the land. Our facilities offer a wide range of recreational opportunities, settings and experiences. DCR is committed to integrating accessibility into the range of recreation opportunities while protecting natural resources and settings so that all people, including people who have disabilities, have the opportunity to enjoy and experience what our public lands have to offer.

How does accessibility fit into the range of settings we provide? We certainly don't want to pave the wilderness, nor do people with disabilities only wish to experience highly developed settings. When the decision is made to construct or alter a trail or other facility, we must ask, "Will a person with a disability have an equal opportunity to use this trail?" Are there existing conditions that may limit a trail's ability to meet accessibility standards (see Accessible Trail Standards Conditions for Departure)? The key is to ask these questions before the trail has been designed and built. Then we can provide trails for use by all people.

To achieve this goal, DCR proposes to adopt the Forest Service Trail Accessibility Guidelines (FSTAG) available at <http://www.fs.fed.us/recreation/programs/accessibility/FSTAG.doc>.

These guidelines provide accessibility standards for trails, but they will only apply to:

- New or altered (re-designed or re-developed) trails that;
- Have a Designed Use of pedestrian/hiker, and
- Connect directly to a currently accessible trail or trailhead.

Trail maintenance is not subject to these guidelines, although, through regular maintenance, we should attempt to enhance accessibility. For example, if an opening in a downed tree needs to be cut, we should make sure we cut it at least 32" wide, or if a bog bridge is installed, we should attempt to make it 32" wide.

In addition, there are several conditions under which trail designs may depart from the standards in the accessibility guidelines. There are also general exceptions and several existing trail conditions which may be "limiting factors" in a trail's ability to meet the design standards. The FSTAG provides a flow chart which guides trail managers through the process of determining whether and which of the accessibility guidelines apply, and DCR's Universal Access Program can assist trail managers in determining the application and implementation of these guidelines.

For those trails or trail segments that do apply, they should be designed and maintained to meet the general standards in the chart on the following page.

Examples:

Imagine you wanted to create a new walking trail, from a day use area, around a pond. This is envisioned as a class 3 (improved) trail, and construction to the accessibility standards would not harm any cultural, historical or significant environmental resources. In this case, you would likely need to construct the trail to the below standards.

Imagine you needed to develop a new access trail from a road to the Appalachian Trail. This is envisioned as a class 2 (simple) hiking trail. The terrain climbs steeply, and the soils are not firm in many places with natural obstacles. Constructing this trail to the accessibility standards with substantially change the physical setting and the trail class, and would be impractical due to terrain. This would lead to conditions for departure and you would not need to build this trail to the full standards.

**Massachusetts DCR Universal Access Program's  
SUMMARY OF GUIDELINES FOR ACCESSIBLE TRAILS**

(Based on Forest Service Trail Accessibility Guidelines, May, 2006)

This chart should be used as a guide only. Contact DCR's Universal Access Program for assistance in evaluating, designing and developing new or altered trails.

**ACCESSIBLE TRAIL STANDARDS**

Trail Grade (max) (*1)		w/ resting intervals (*2)	Cross Slope (max)	Obstacle Height (max)	Trail Tread
<ul style="list-style-type: none"> <li>• 5% max. for any distance</li> <li>• 8.3% for 200' max.</li> <li>• 10% for 30' max.</li> <li>• 12.5% for 10' max.</li> </ul>		N/A, not required @ 200' max. @ 30' max. @ 10' max.	5% (*2)	2" height max.	Firm & stable
Clear Width	Openings	Passing Space Interval	Edge Protection	Protruding Objects	Signs
36" (*3)	½" max. diameter	Every 1000' when clear width less than 60". 60"x60" min. or T-shape min. 48"	3" min. height (where edge protection provided)	80" min. clear head space (or provide barrier to warn blind)	At trailhead; identify total length of trail & first point of departure

\*1 No more than 30% of the trail shall exceed 8.3%

\*2 Resting interval: 60" minimum in length by minimum width of trail width, 3% max. grade. For routes: 5% max. cross slope allowed for proper drainage.

\*3 May be reduced to 32" or less with allowable exceptions.

\*4 May be no less than 32" for a distance of 24" max. with one of four conditions

**There are several "Conditions for Departure," "Limiting Factors" and "Exceptions" that will affect the degree to which these standards are applicable.**

**Conditions for Departure:**

The following four conditions for departure allow deviation from the standards where exceptions apply.

1. Where compliance would cause substantial harm to cultural, historic, religious, or significant natural features or characteristics.
2. Where compliance would substantially change the physical or recreation setting or the trail class, designed use, or managed uses of the trail or trail segment, or would not be consistent with the applicable land management plan.
3. Where compliance would require construction methods or materials that are prohibited by federal, state, or local law, other than state or local law whose sole purpose is to prohibit use by persons with disabilities.
4. Where compliance would be impractical due to terrain or prevailing construction practices.

**Exceptions and Limiting Factors:**

Where one or more limiting factor exists and one or more conditions for departure exist, then there may be exceptions from following the guidelines. Limiting factors include:

- a) The combination of trail grade and cross slope exceeds 20% for over 40 feet (6100 mm).
- b) The surface is not firm and stable for a distance of 45 feet or more.
- c) The minimum tread width is 18 inches or less for a distance of at least 20 feet.
- d) A trail obstacle of at least 30 inches (770 mm) in height extends across the full width of the trail.

## Permitting

Any disturbance to the natural environment has impacts, and trails are no exception. When we construct or maintain trails, we should make every effort to do no harm. As discussed above, ideally trails should be routed to avoid sensitive resources such as streams and wetlands, rare species habitats, and sensitive cultural sites. However, trail development within or alongside of sensitive areas is often necessary and justifiable. Streams need to be crossed, steep slopes traversed, and unique features interpreted. Allowing controlled access to sensitive ecological or cultural areas may also be an integral part of educating the public about the value of protecting these resources. When sensitive areas cannot be avoided we, as trail builders, have legal and ethical obligations to minimize our impacts by going through the proper regulatory procedures. Below are some of the state regulations and permits that you need to consider when you develop a trail.

**Streams, Rivers and Wetlands:** In Massachusetts, activities occurring within 100-feet of a coastal or inland wetland or within 200-feet of a perennial stream or river are governed by the Wetlands Protection Act. Among the many activities regulated by this act are changing run-off characteristics, diverting surface water, and the destruction of plant life – activities commonly associated with trail building and maintenance. If your trail building activities will occur within 100-feet of a wetland or 200-feet of stream or river you **must** file a “Request for Determination of Applicability” (RDA) form (<http://www.mass.gov/dep/water/approvals/wpaform1.pdf>) with you local conservation commission. Your local Conservation Commission can explain the state regulations and local bylaws; they can also provide guidance on completing your RDA.

How do you know if your trail project will occur near a wetland? A good starting point is the wetlands on-line viewer, which is available at <http://maps.massgis.state.ma.us/WETLANDS12K/viewer.htm>. If your project occurs near a wetland identified on this map, you will need to submit an RDA. Be advised that not all wetlands are indicated on this map, so an RDA may be required even if no wetlands are indicated on the on-line viewer.

**Threatened and Endangered Species:** Over 440 species of plants and animals are protected under the Massachusetts Endangered Species Act (MESA). MESA protects state-listed rare species and their habitats by prohibiting the “Take” of any species that is listed as Endangered, Threatened, or of Special Concern. A “Take” is any activity that directly kills or injures a MESA-listed species, as well as **activities that disrupt rare species behavior and their habitat**.

Trail building activities are subject to review by the Massachusetts Natural Heritage and Endangered Species Program (<http://www.mass.gov/dfwele/dfw/nhosp/nhosp.htm>) if they occur in areas that have been delineated as “Priority Habitat.” You can determine if your project will occur within Priority Habitat with the help of the Priority Habitat on-line viewer ([http://www.mass.gov/dfwele/dfw/nhosp/regulatory\\_review/priority\\_habitat/online\\_viewer.htm](http://www.mass.gov/dfwele/dfw/nhosp/regulatory_review/priority_habitat/online_viewer.htm)). If your trail project is located within priority habitat, you **must** file a MESA project review checklist. This checklist may be found at [http://www.mass.gov/dfwele/dfw/nhosp/regulatory\\_review/pdf/mesa\\_proj\\_review\\_check\\_elect.pdf](http://www.mass.gov/dfwele/dfw/nhosp/regulatory_review/pdf/mesa_proj_review_check_elect.pdf).

**Archeological and Cultural Resources:** Any soil disturbance activities, such as trail building, that are on state property or funded **through state or federal funds** (including Recreational Trails Grants) require review from the Massachusetts Historic Commission (MHC; <http://www.sec.state.ma.us/mhc/>) and you **must** file a Project Notification Form. This form may be found at <http://www.sec.state.ma.us/MHC/mhcform/formidx.htm>. If the project is not in an area

with archeological and/or cultural resources, the MHC will not require anything further. If the project is in such an area, the MHC may request an archaeological survey, and you will need to hire a private archaeologist complete this.

**Historic Landmarks:** In certain cities and town, all or some of the parks have been designated as local historic landmarks. Chestnut Hill Reservation for instance, is considered a Boston Landmark. Any work in the area, design and construction, has to be reviewed by the local historic landmark board before work can begin.

Note that these review processes treat trail construction and alteration similarly. Alterations include significantly changing the trail's grade, width, or surface, adding bridges, adding a spur to serve a new destination, and changing the trail's use, such as from horses to hikers. The following checklist will help you determine if your trails project requires regulatory review.

#### Massachusetts Regulatory Review Checklist

- |                                                          |                                                                                                                                                                                      |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Yes <input type="checkbox"/> No | Will any work occur within 200 feet of a stream or river or within 100 feet of a wetland?<br>If yes, contact your local conservation commission for help preparing an RDA.           |
| <input type="checkbox"/> Yes <input type="checkbox"/> No | Does the project area intersect with any Priority Habitat Area?<br>If yes, file a MESA Project Review Checklist with the NHESP.                                                      |
| <input type="checkbox"/> Yes <input type="checkbox"/> No | Will the project disturb any soil <u>and</u> will it occur on state property or be funded with state and/or federal funds?<br>If yes, file a Project Notification Form with the MHC. |

## ***On the Ground; Putting It Together***

With a basic understanding of sustainable, enjoyable, and accessible trails concepts, it is now time to put that knowledge to work on the ground. A brief, but good description of these steps is also included in the USDA Forest Service *Trail Construction and Maintenance Notebook* at <http://www.fhwa.dot.gov/environment/fspubs/00232839/index.htm>.

### **1. Scouting the Trail:**

Scout the potential trail corridor in the trail's primary season of use. To clearly see landscape details, scout when deciduous trees have lost their leaves. If possible, scout in all seasons to reveal attractive features and hazards that may affect location, construction, or maintenance. Look for:

- Spring: high water, ephemeral ponds, flowers
- Summer: dense foliage, normal water level
- Fall: foliage color
- Winter: icicles, snow scenes, frozen water

Note existing trails and roads, control points, obstacles, points of interest, and anchor points. Take notes and mark locations on a map or record GIS coordinates.

### **2. Establishing Your Trail Design Standards:**

After exploring the trail corridor, but before flagging the exact trail location, establish your design standards. Design standards are based on the trails Designed Use and Trail Class. These will be affected by your desired managed uses; the setting; the quality of experience you want to offer, including the level of risk; and your construction resources, including budget and expertise.

Consider these aspects of the trail design such as trail configuration, trail length, tread surface, tread width, obstacles, clearing width, clearing height, grade, cross slopes, turning radius, sight distance, water crossings, and special requirements.

USDA Forest Service trail design parameters are included in Appendix C.

Recommended trail design standards are also suggested in the University of Minnesota *Recreational Trail Design and Construction Manual* at [www.extension.umn.edu/distribution/naturalresources/DD6371.html#trail1](http://www.extension.umn.edu/distribution/naturalresources/DD6371.html#trail1).

### **3. Flagging Your Trail:**

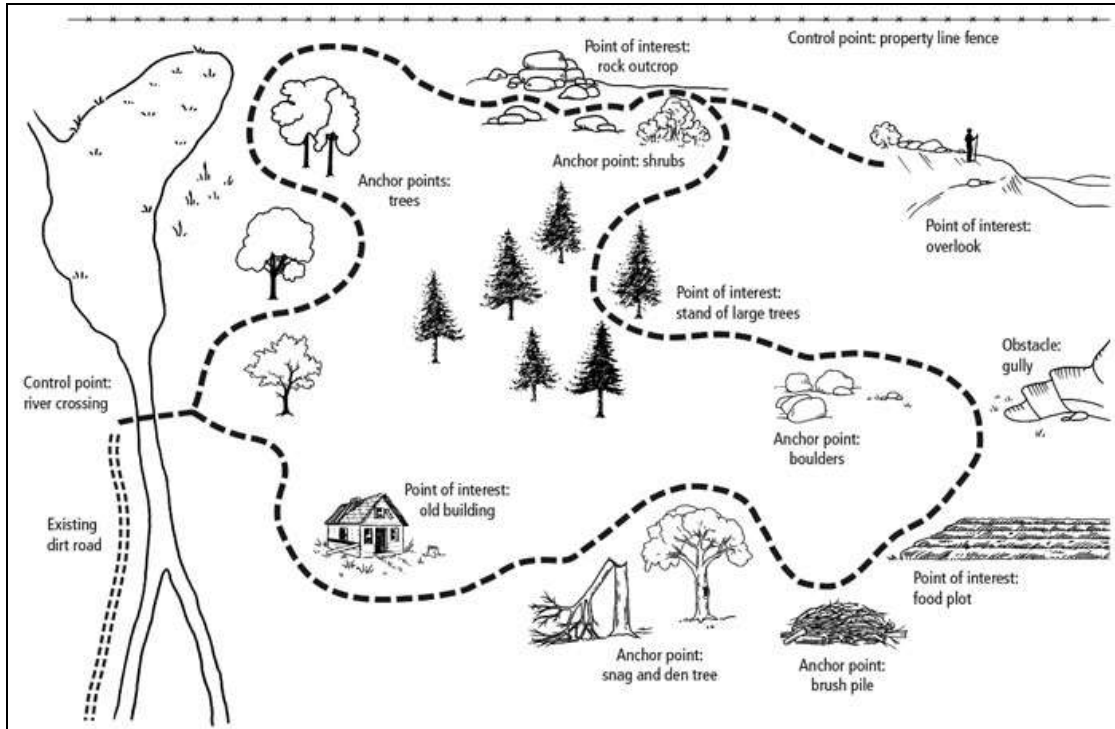
Now it is time to flag your trail on the ground. A trail that follows natural contours, gently curving and bending around obstacles, and that disturbs the site as little as possible, is aesthetically pleasing and more enjoyable to travel. Mark the route with brightly colored plastic flagging tape tied to trees and shrubs. Use a clinometer to maintain desired trail grade and GPS to help locate and connect trails. You may want to revisit and revise your marking more than once or with more than one person. Remember one of the principle rules of sustainable trails, "keep the trail away from water and the water off the trail."

### **4. Putting It All Together:**

The graphic below illustrates how you can put these design elements together to create a sequence of events and a more satisfying trail experience.

- This design uses the trailhead at the end of the dirt road to create a single access point that can be monitored and controlled, and also provides a single trail terminus. The trail also provides an overlook as a destination about half way along.
- The bridge over the stream at the beginning of the trail will serve as a trail gateway. An additional gateway is created as the trail moves between the boulders in the north section.

- You can see how this trail makes use of anchors and points of interest along the way, both curving around and away from various elements to create a sequence of trail events.
- Finally, the trail makes use of edges in a couple ways. It goes along the edge of the wetland and fence line in north-west of the property, and along the edge of the food plot in south-west. It also crosses in and out of the stand of evergreens in the middle to create a set of transitions between forest types.



## **Trail Design and Construction Resources**

- The USDA Forest Service "**Trail Construction and Maintenance Notebook**" at <http://www.fhwa.dot.gov/Environment/fspubs/00232839/index.htm> includes excellent descriptions and diagrams of various trail construction and maintenance techniques from tread maintenance to grade dips to switchbacks to bridges.
- Appalachian Mountain Club's - **The Complete Guide to Trail Building and Maintenance** 3rd Edition by Carl Demrow and David Salisbury. Includes the essentials for creating environmentally sound trails: how to plan, design, build, and maintain trails; protective gear; choice of tools for each job; building ski trails, bridges, stiles, and ladders. Updated techniques focus on stonework, drainage, and erosion control, and working with private landowners. Photos and illustrations are also included.
- The Appalachian Trail Conservancy's - **A.T. Design, Construction, and Maintenance** by William Birchard, Jr., Robert D. Proudman, and the Regional Staff of the Appalachian Trail Conservancy. Second edition (2000) of the definitive handbook on trail work, from landscape values to the nitty-gritty of moving rock.
- Student Conservation Association's **Lightly On The Land: The SCA Trail Building and Maintenance Manual**, 2nd Edition by Bob Birkby. For half a century, the Student Conservation Association (SCA) has inspired people of all ages to take part in projects that enhance the environment. In settings from city parks to backcountry wilderness, the practical skills presented in its pioneering handbook have been tested in the field by volunteer and professional work crews throughout the nation. Their input enriches every chapter of the new edition with fresh approaches, new ideas, and modern applications of traditional skills.
- **Minnesota Department of Natural Resources' Trail Planning, Design, and Development Guidelines** manual provides guidelines for developing sustainable motorized and nonmotorized trails. Extensive attention is given to developing trails that are physically, ecologically, and economically sustainable. A newly-developed trail classification system is described to enhance consistency in how different types of trails are planned and designed. The principles of trail design emphasize the art of designing trails to make them more visually appealing and enjoyable. Technical design guidelines for various types of trails are also extensively considered in the manual. Click the link below to download--CAUTION! This is a very large file, almost 700 MB. <http://www.bestpracticesmn.org/presentations/NRW9-20-06/FULL%20DOCUMENT%20no%20cover.pdf>
- **USDA Forest Service Accessibility Guidebook for Outdoor Recreation and Trails** is a guidebook intended to help users apply the Forest Service Outdoor Recreation Accessibility Guidelines and Forest Service Trail Accessibility Guidelines. Available at: [www.fs.fed.us/recreation/programs/accessibility/htmlpubs/htm06232801/index.htm](http://www.fs.fed.us/recreation/programs/accessibility/htmlpubs/htm06232801/index.htm)
- **University of Minnesota Trail Design for Small Properties** provides simple, inexpensive solutions for designing, building, and maintaining sustainable trails—trails for hiking, horseback riding, bicycling, cross-country skiing, snowmobiling, off-highway motorcycles (OHMs), and all-terrain vehicles (ATVs). <http://www.extension.umn.edu/distribution/naturalresources/DD8425.html>
- **University of Minnesota Recreational Trail Design and Construction Manual** is a guide for private woodland owners, organizations, and businesses (including nature centers, youth groups, schools, conservation clubs, and resorts) that are interested in designing and constructing trails. It describes step-by-step construction methods, ways

to handle trail obstacles, and recommended standards for the most common types of trails. <http://www.extension.umn.edu/distribution/naturalresources/DD6371.html>

- **American Trails Resource Library on Trails Design and Construction**  
<http://www.americantrails.org/resources/trailbuilding/index.html>
- **International Mountain Bike Association's - Trail Solutions** IMBA's Guide to Building Sweet Singletrack. This book combines trailbuilding techniques with proven fundamentals in a colorful, easy-to-read format. The new book expands greatly on IMBA's popular 2001 handbook "Building Better Trails" and breaks new ground by providing detailed advice on banked turns, rock armoring, mechanized tools, freeriding, downhill, risk management, and other pioneering techniques. The book is divided into eight sections that follow the trailbuilding process from beginning to end. Readers will be guided through the essential steps of trail planning, design, tool selection, construction, and maintenance.
- **Natural Surface Trails by Design** by Troy Scott Parker Physical and Human Design Essentials of Sustainable, Enjoyable Trails. This first book in a series captures much of the detailed knowledge of skilled trail designers. It presents eleven generative concepts as the foundation for a concise process that explains, relates, and predicts what actually happens on all natural surface trails. The concepts cover the essential physical and human forces and relationships that govern trails—how we perceive nature, how trails make us feel, how trail use changes trails, how soils and trail materials behave, and how water, drainage, and erosion act.



# ***Section III: Trail System Management, Maintenance and Monitoring***

## ***Trail Classification***

The DCR Road and Trail Inventory classified roads / trails along the following types:

- ***Administrative Road:*** A road accessible to DCR administrative vehicles, but not open to the public.
- ***Forest Way / Trail:*** A route that potentially serves as both a trail and as access for forest management activities.
- ***Trail:*** A pathway that is used for recreational trail use.

Identifying and distinguishing between forest ways, which may serve a forest management as well as a recreational function and recreational trails will be important in determining how we manage, protect and educate users on each type of trail.

Each trail should also be classified into one of five trail classes. Trail class is the prescribed scale of trail development, representing the intended design and management standards of the trail. The five categories classify trails along a spectrum of development and are defined in terms of tread, obstacles, constructed elements, signs and typical recreation experience.

These prescriptions (adapted from the USDA Forest Service) take into account user preferences, setting, protection of sensitive resources, and other management activities. The general criteria in the table below define each trail class and are applicable to all system trails. Appendix C provides additional Criteria specific to motorized trails, equestrian trails, snow trails, and water trails.

Trail Class descriptions define "typical" attributes, and exceptions may occur for any attribute. Apply the Trail Class that most closely matches the managed objective of the trail.

### Trail Class Attributes

Trail Attributes	Trail Class 1 <i>Minimal/ Un developed Trail</i>	Trail Class 2 <i>Simple/ Minor Development Trail</i>	Trail Class 3 <i>Developed/ Improved Trail</i>	Trail Class 4 <i>Highly Developed Trail</i>	Trail Class 5 <i>Fully Developed Trail</i>
<b>General Criteria</b>					
<b>Tread &amp; Traffic Flow</b>	<ul style="list-style-type: none"> <li>♦ Tread intermittent and often indistinct</li> <li>♦ May require route finding</li> <li>♦ Native materials only</li> </ul>	<ul style="list-style-type: none"> <li>♦ Tread discernible and continuous, but narrow and rough</li> <li>♦ Few or no allowances constructed for passing</li> <li>♦ Native materials</li> </ul>	<ul style="list-style-type: none"> <li>♦ Tread obvious and continuous</li> <li>♦ Width accommodates unhindered one-lane travel (occasional allowances constructed for passing)</li> <li>♦ Typically native materials</li> </ul>	<ul style="list-style-type: none"> <li>♦ Tread wide and smooth with few irregularities</li> <li>♦ Width may consistently accommodate two-lane travel</li> <li>♦ Native or imported materials</li> <li>♦ May be hardened</li> </ul>	<ul style="list-style-type: none"> <li>♦ Width generally accommodates two-lane and two-directional travel, or provides frequent passing turnouts</li> <li>♦ Commonly hardened with asphalt or other imported material</li> </ul>
<b>Obstacles</b>	<ul style="list-style-type: none"> <li>♦ Obstacles common</li> <li>♦ Narrow passages; brush, steep grades, rocks and logs present</li> </ul>	<ul style="list-style-type: none"> <li>♦ Obstacles occasionally present</li> <li>♦ Blockages cleared to define route and protect resources</li> <li>♦ Vegetation may encroach into trailway</li> </ul>	<ul style="list-style-type: none"> <li>♦ Obstacles infrequent</li> <li>♦ Vegetation cleared outside of trailway</li> </ul>	<ul style="list-style-type: none"> <li>♦ Few or no obstacles exist</li> <li>♦ Grades typically &lt;12%</li> <li>♦ Vegetation cleared outside of trailway</li> </ul>	<ul style="list-style-type: none"> <li>♦ No obstacles</li> <li>♦ Grades typically &lt;8%</li> </ul>
<b>Constructed Features &amp; Trail Elements</b>	<ul style="list-style-type: none"> <li>♦ Minimal to non-existent</li> <li>♦ Drainage is functional</li> <li>♦ No constructed bridges or foot crossings</li> </ul>	<ul style="list-style-type: none"> <li>♦ Structures are of limited size, scale, and number</li> <li>♦ Drainage functional</li> <li>♦ Structures adequate to protect trail infrastructure and resources</li> <li>♦ Primitive foot crossings and fords</li> </ul>	<ul style="list-style-type: none"> <li>♦ Trail structures (walls, steps, drainage, raised trail) may be common and substantial</li> <li>♦ Trail bridges as needed for resource protection and appropriate access</li> <li>♦ Generally native materials used in Wilderness</li> </ul>	<ul style="list-style-type: none"> <li>♦ Structures frequent and substantial</li> <li>♦ Substantial trail bridges are appropriate at water crossings</li> <li>♦ Trailside amenities may be present</li> </ul>	<ul style="list-style-type: none"> <li>♦ Structures frequent or continuous; may include curbs, handrails, trailside amenities, and boardwalks</li> <li>♦ Drainage structures frequent; may include culverts and road-like designs</li> </ul>
<b>Signs</b>	<ul style="list-style-type: none"> <li>♦ Minimum required</li> <li>♦ Generally limited to regulation and resource protection</li> <li>♦ No destination signs present</li> </ul>	<ul style="list-style-type: none"> <li>♦ Minimum required for basic direction</li> <li>♦ Generally limited to regulation and resource protection</li> <li>♦ Typically very few or no destination signs present</li> </ul>	<ul style="list-style-type: none"> <li>♦ Regulation, resource protection, user reassurance</li> <li>♦ Directional signs at junctions, or when confusion is likely</li> <li>♦ Destination signs typically present</li> <li>♦ Informational and interpretive signs may be present</li> </ul>	<ul style="list-style-type: none"> <li>♦ Wide variety of signs likely present</li> <li>♦ Informational signs likely</li> <li>♦ Interpretive signs possible</li> <li>♦ Trail Universal Access information likely displayed at trailhead</li> </ul>	<ul style="list-style-type: none"> <li>♦ Wide variety of signage is present</li> <li>♦ Information and interpretive signs likely</li> <li>♦ Trail Universal Access information is typically displayed at trailhead</li> </ul>
<b>Typical Recreation Environments &amp; Experience</b>	<ul style="list-style-type: none"> <li>♦ Natural, unmodified</li> <li>♦ ROS: Often Primitive setting, but may occur in other ROS settings</li> <li>♦ WROS: Primitive</li> </ul>	<ul style="list-style-type: none"> <li>♦ Natural, essentially unmodified</li> <li>♦ ROS: Typically Primitive to Semi-Primitive setting</li> <li>♦ WROS: Primitive to Semi-Primitive</li> </ul>	<ul style="list-style-type: none"> <li>♦ Natural, primarily unmodified</li> <li>♦ ROS: Typically Semi-Primitive to Semi-Developed Natural setting</li> <li>♦ WROS: Semi-Primitive to Transition</li> </ul>	<ul style="list-style-type: none"> <li>♦ May be modified</li> <li>♦ ROS: Typically Semi-Developed Natural to Developed Natural setting</li> <li>♦ WROS: Transition</li> </ul>	<ul style="list-style-type: none"> <li>♦ Can be highly modified</li> <li>♦ ROS: Typically Developed Natural to Urban setting</li> <li>♦ Commonly associated with Visitors centers or high-use recreation sites</li> </ul>

**Operation and Maintenance Considerations by Class**

Trail operation and maintenance considerations (adapted from the USDA Forest Service) are intended to complement the trail class general criteria. These considerations can be regarded as general guidelines to assist in developing trail prescriptions, and subsequent program management, operations and maintenance.

<b>Trail Attributes</b>	<b>Trail Class 1 Minimal/Undeveloped Trail</b>	<b>Trail Class 2 Simple/Minor Development Trail</b>	<b>Trail Class 3 Developed/Improved Trail</b>	<b>Trail Class 4 Highly Developed Trail</b>	<b>Trail Class 5 Fully Developed Trail</b>
<b>Trail Management</b>	<p>Typically managed to accommodate:</p> <ul style="list-style-type: none"> <li>♦ Low use levels.</li> <li>♦ Highly skilled users, comfortable off-trail.</li> <li>♦ Users with high degree of orienteering skill.</li> <li>♦ Some travel modes and ability levels may be impractical or impossible, and may not be encouraged.</li> <li>♦ Water Trails: Users require high level of navigation/orientation and paddling skills.</li> </ul>	<p>Typically managed to accommodate:</p> <ul style="list-style-type: none"> <li>♦ Low-to-moderate use levels</li> <li>♦ Mid-to-highly skilled users, capable of traveling over awkward condition/obstacles</li> <li>♦ Users with moderate orienteering skill.</li> <li>♦ Trail suitable for many user types, but challenging and involves advanced skills.</li> <li>♦ Water Trails: Moderate to high level of navigation/orientation and paddling/piloting skills required.</li> </ul>	<p>Typically managed to accommodate:</p> <ul style="list-style-type: none"> <li>♦ Moderate to heavy use.</li> <li>♦ Users with intermediate skill level and experience.</li> <li>♦ Users with minimal orienteering skills .</li> <li>♦ Moderately easy travel by managed use types.</li> <li>♦ Random potential for accessible use.</li> <li>♦ Water Trails: Basic to moderate navigation and paddling/piloting skills required.</li> </ul>	<p>Typically managed to accommodate:</p> <ul style="list-style-type: none"> <li>♦ Very heavy use.</li> <li>♦ Users with minimal skills and experience.</li> <li>♦ Users with minimal or no orienteering skills.</li> <li>♦ Easy/comfortable travel by managed use types</li> <li>♦ May be (or has potential to be made) accessible.</li> <li>♦ Water Trails: Basic navigation and paddling/piloting skills required.</li> </ul>	<p>Typically managed to accommodate:</p> <ul style="list-style-type: none"> <li>♦ Intensive use.</li> <li>♦ Users with limited trail skills and experience.</li> <li>♦ Trail typically meets agency requirements for accessibility</li> <li>♦ Includes "Pedestrian Trails".</li> </ul>
<b>Maintenance Frequency &amp; Intensity</b>	<ul style="list-style-type: none"> <li>♦ Infrequent or no scheduled recurring maintenance.</li> <li>♦ Maintenance interval is typically 5 or more years, or in response to reports of unusual resource problems requiring repair.</li> </ul>	<ul style="list-style-type: none"> <li>♦ Maintenance scheduled to preserve the trail facility and route location.</li> <li>♦ Maintenance interval typically 3-5 years, or in response to reports of unusual problems.</li> </ul>	<ul style="list-style-type: none"> <li>♦ Trail cleared to make available for use early in use season, and to preserve trail integrity.</li> <li>♦ Maintenance interval typically 1-3 years, or in response to reports of trail or resource damage or significant obstacles to managed use type and experience level.</li> </ul>	<ul style="list-style-type: none"> <li>♦ Trail cleared to make available for use at earliest opportunity in use season.</li> <li>♦ Typically, maintenance performed at least annually.</li> </ul>	<ul style="list-style-type: none"> <li>♦ Maintenance performed weekly, or as needed to meet posted conditions.</li> <li>♦ Major damage or safety concerns typically corrected or posted &lt;24 hours of notice.</li> </ul>

## **Trail Maintenance**

Trail maintenance comes in two forms, routine or periodic maintenance performed as a regular duty of park staff, seasonal staff or some form of trail crew or volunteers; and larger capital trail repair or reconstruction.

### **Routine Maintenance**

High-quality and timely maintenance will greatly extend the useful life of a trail. The primary tasks of routine maintenance are to:

- Direct water off the tread / Maintain drainage structures
- Remove debris and obstacles
- Maintain clearances
- Maintain clear trail edges
- Remove debris
- Replace and maintain trail signs and route markers
- Keep users on the trail
- Monitor and report conditions and serious problems

Of course, there is always too much work for the time you have to spend. How do you decide what to do? To prioritize, it's important to:

- Monitor the trail conditions closely
- Decide what can be accomplished as basic maintenance
- Determine what can be deferred
- Identify what area will need major work

This 'trail triage' is critically important if your maintenance dollars are going to be spent keeping most of the tread in the best possible condition.

The first priority for trail work is to correct truly unsafe situations. This could mean repairing impassable washouts along a cliff, or removing blowdown from a steep section of trail or repairing trail structures such as bridges, steps and railings.

The second priority is to correct things causing significant trail damage – erosion, sedimentation, and off-site trampling – or problems which if left will create compounded future problems.

The third priority is to restore the trail to the planned design standard. This means that the ease of finding and traveling the trail matches the design specifications for the recreational setting and target user. Actions range from simply adding "reassurance markers" to full-blown reconstruction of eroded tread or failed structures.

Whatever the priority, doing maintenance when the need is first noticed will help prevent more severe and costly damage later.

### **Trail Crews**

Trail Crews may be regular park staff, season staff, special season crews such as the Western Region Trail Crew funded by the Recreational Trail Program Grants, SCA – Mass Parks Crews, or hired professional crews such as the AMC Pro-Crew. Professional crews can assist in larger and more technical trail projects.

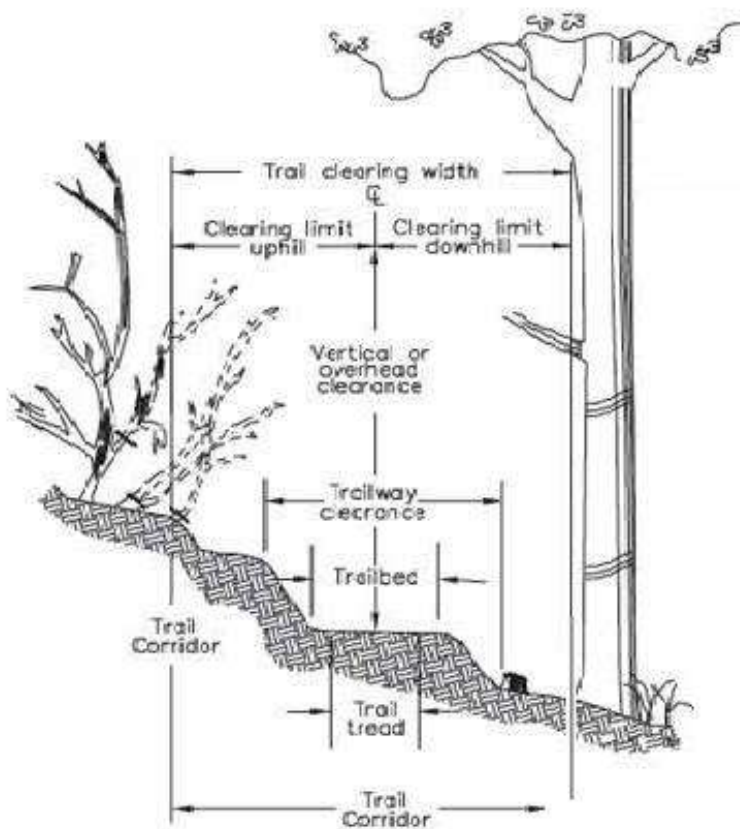
The best trail maintainers are those with "trail eye," the ability to anticipate physical and social threats to trail integrity and to head off problems.

### Maintenance Activities

Trail maintenance activities on DCR's natural surface trails fall into the following categories:

- Trail Corridor Vegetation Clearance
- Trail Tread Maintenance
- Simple Drainage Structure Installation and Maintenance
- Moderate Drainage Structure Installation
- Steep Slope Structure Installation
- Trail Closures
- Trail Re-routes
- Wet Area Crossings
- Minor Stream Crossings (<20')

### Trail Cross Section and Terms



Trail Cross Section

### Trail Corridor Vegetation Clearance

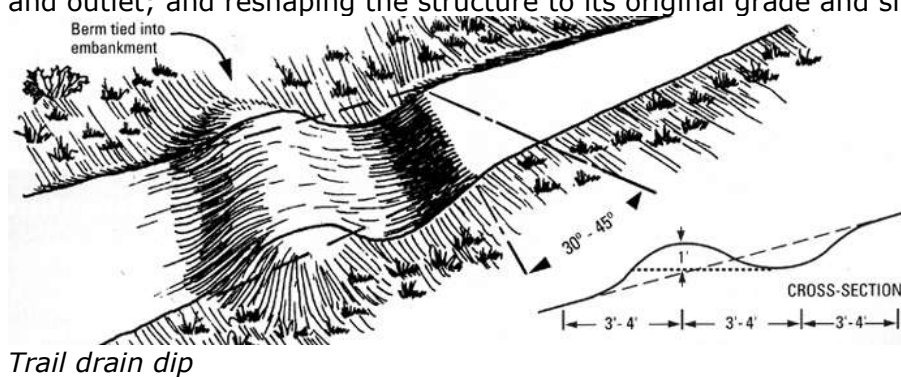
As vegetation falls or grows into the trail corridor, it must periodically be trimmed or removed to maintain a trail corridor clear of obstacles. This activity includes cutting, trimming and removal of vegetation within up to 18" of the existing trailbed width, and up to a vertical height of 6' to 9'. Tree branches that grow into the trail corridor are pruned back to the nearest larger branch or trunk.

### Tread Maintenance

Occasionally, the existing trail tread requires maintenance to remove obstacles, and maintain proper grading and outslope for drainage. This activity includes removal of obstacles such as stones, roots or small stumps in the existing tread, reshaping the existing tread with hand tools such as shovels and rakes, and bringing in fill to cover exposed roots and rocks and fill mudholes. It does not involve work outside of the existing trailbed. (See Appendix I for further specifications.)

### Simple Drainage Structures (drain dips and water bars)

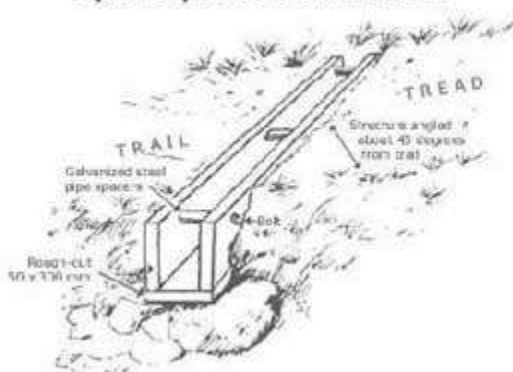
This activity includes the maintenance of existing and installation of new simple drainage structures within existing trailbed. This may involve digging within the existing tread to a depth of no more than 12 inches to create a drainage dip, and / or the installation of logs, stones or other natural or imported materials to create a water bar. Most work is within the existing tread, but this activity may involve some digging and soil removal within 3' of the existing tread, particularly on the downslope side. Rock water bars may also involve the collection and moving of large stones from the immediate area. Native wood structures may include felling and utilizing local timber. Maintenance involves clearing debris from within the drainage structure and outlet; and reshaping the structure to its original grade and slope.



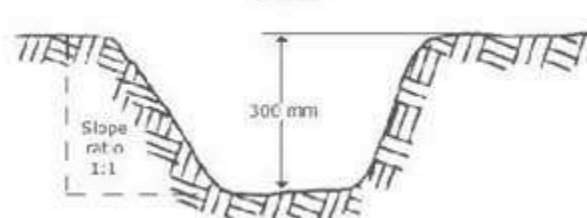
### Moderate Drainage Structures (ditches, culverts and turnpikes)

Ditches and culverts may be installed and maintained to move water from one side to another and keep water off the trail. Ditches may be dug to a depth of 12" within 2' of the trail tread. Open cross ditches may be dug across the existing tread and within 3' on either side. Culverts (typically 9" to 12") may be installed digging into the tread (up to 15") and digging and installing rock headers on either end within 3' of the existing tread. Turnpikes lift the trail tread above saturated soil. They are often combined with ditches and culverts to relieve a trail of water from seeps and streams, reduce erosion and provide dry footing. Building a turnpike involves digging a trench on either side of the trail (usually 24-48' apart) and setting stone or logs securely in each trench. Length of turnpike depends on local conditions. After the parallel rows of rock or logs are in place, the area between is filled with small stones and crushed rock. A layer of mineral soil may be added to the top. Material to build turnpikes may be found from adjacent trail corridor or imported to site.

#### Open-Top Cross Drain Culvert

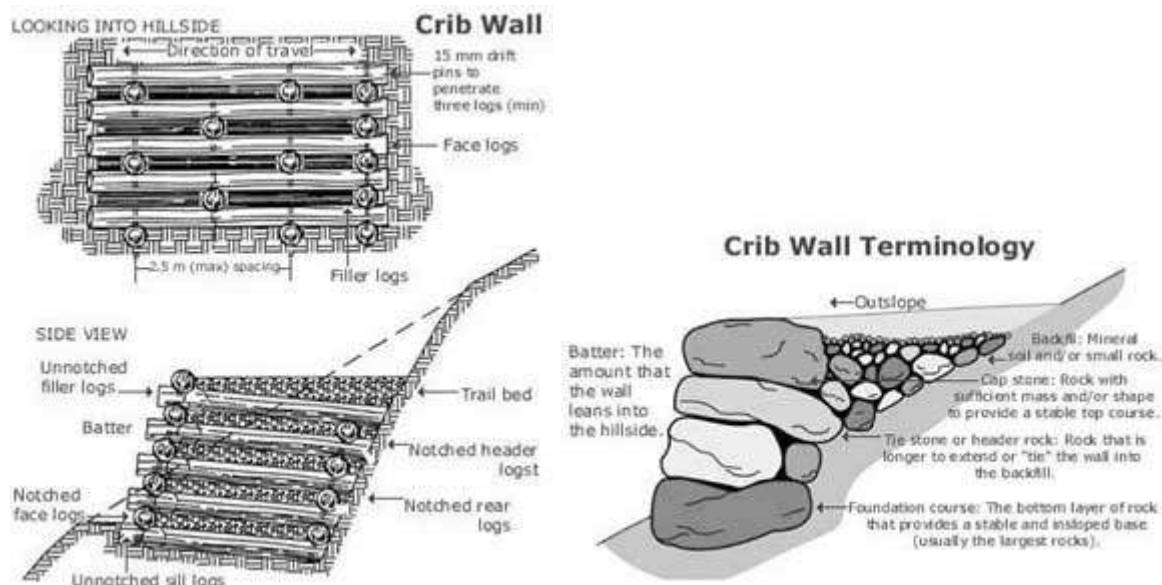


#### Ditch



### Steep Slope Structures (crib or retaining walls, check dams and steps)

On steep slopes, retaining walls, check dams and steps are occasionally required to stabilize the trail tread, keep users on the trail and reduce erosion. Retaining walls can help to support turning platforms on switchbacks, shore up trails across rough terrain and steep side slopes, and reinforce the outer edge of a partial bench. Retaining walls may be constructed of either wood or rock. Some excavation will be required to establish a footing for the rock or wood. Depth of excavation depends on the slope and size of material used to build retaining wall. Excavated soil may be used for back fill. Rocks and peeled logs are then securely layered to the desired height to create wall. The back of the wall is filled with small stones or crushed rock and mineral soil. Check dams help to slow the flow of water in gullies, allowing silt to build up behind structures and prevent further erosion. They are effective tools for salvaging badly eroded tread and for restoring closed trails and damaged slopes. Check dams are built from large rocks or peeled logs securely installed perpendicular to the tread. Some excavation is necessary to secure rock or logs into the tread way. Filling behind the rock or logs with small stones or mineral soil will allow check dams to be used as steps. Large rocks (weighing from 40-100 lbs), timber and fill material may be obtained locally (see diagrams).



### Trail Closures

Trails that are seriously eroded, difficult to maintain, and poorly located can impact natural resources values and the user experience. Best management practices may call for closing these trails. Closing an existing trail to prevent future use may involve blocking or disguising the trail with available fallen wood or the felling of nearby trees. Brushing in the closed trail helps to retain leaf litter and soil. Closing may also involve some re-grading of the tread to a more natural grade or re-vegetation using local plant material. Closing a trail may even involve installation of check dams to restore damaged slopes.

### Trail Re-Routes

Occasionally, trail re-routes are required to improve existing trail conditions that cannot be solved with the above maintenance techniques or to avoid environmentally

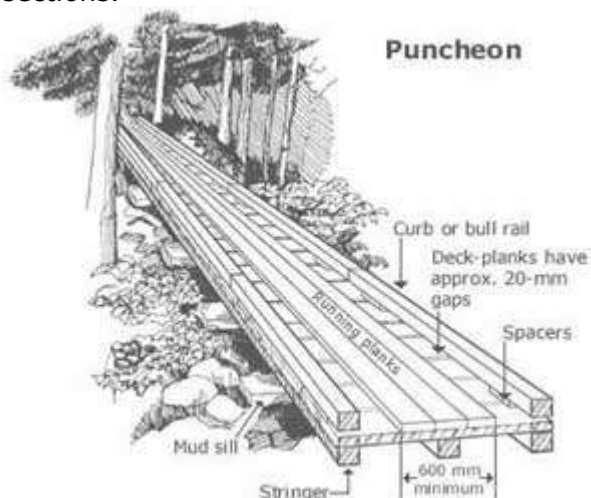
sensitive areas. Trail re-routes may involve flagging a proposed route, trimming and removal of vegetation, and excavation of organic material and sometimes mineral soil on side slopes to a depth of not more than 12". Excavated material may be broadcasted on the side of the trail or retained for use as fill. Constructing a reroute may also involve removal of obstacles such as rocks and roots, and installation of the above trail structures. The width of soils disturbance and vegetation clearing is dependant upon the designed trail use (see DCR Guidelines and Best Practices Manual), but ranges from 12" to 48" (tread width) and up to 10' and 18" outside of the tread width (vegetation clearance).

### **Trail Maintenance in Potential Wetland Resources Areas**

*Any trail maintenance activities that result in an alteration of a wetland resource area will use Best Management Practices for controlling erosion and sedimentation, will be submitted to the local Conservation Commission for review, and/or shall be in compliance with an approved MOU with DEP.*

### **Wet Area Crossings (bog bridges, puncheons)**

Trails occasionally cross areas that have seasonally saturated soils or wet areas. In order to minimize impacts to vegetation and soils, and keep trail users dry, a number of different types of structures can be installed and maintained. Stepping stones are simple low-maintenance ways for trails to cross through wet areas. Installation of stepping stones includes excavation of 12' of soil and setting of a large stone(s) for stepping. Large rocks will most likely be collected from along or nearby the trail corridor. Bog bridges and puncheon are simple wooden boardwalk structures. Stone or wooden sills are place on top of or dug into the soils to a depth of no more than 6" and a width of 18-36". Side by side planks, peeled logs or stringers with decking are laid on top of the sills. These structures are no more than the existing tread width. Maintenance typically involves replacement of rotted sections.



### **Minor Stream Crossings (culverts and minor bridges (<20'))**

Trails typically cross streams on fords, bridges or culverts. The size of such structures depends on the size of the stream and the surrounding terrain. Installation of bridges may include excavation of soils adjacent to the stream to install stone or timber abutments. Bridge stringers are then securely attached to the



abutments and then the top is decked. Stone and or timber may be collected from the immediate area. Culverts may be wood, stone, metal or plastic and will be laid in the stream. Maintenance will involve cleaning debris from culverts and may involve replacement of rotted materials. (See Appendix I for further specifications.)

### **Capital Project Repairs**

Major trail repairs and reconstruction that cannot be performed through routine maintenance or trail crews will need to be planned in conjunction with the Bureau of Engineering and funded through the capital budget process or by grants.

### **Alternative Funding Sources**

#### Federal Sources

- Recreational Trails Program
- NPS Rivers, Trails and Conservation Assistance Program
- Transportation Enhancements

#### State Sources

- State Natural Resource or Park Agency Grant Programs
- State Transportation Agency Grant Programs
- Land and Water Conservation Funds
- State Public Health Grant Programs
- Conservation Trust Fund
- Parks Trust Fund

## Trail Signage

*"Signs are probably the quickest and easiest way to leave the trail user with a positive impression. If the signs are high quality, well maintained, and properly located, other trail problems are often over-looked. Consistent signs are the quickest way to increase the trail's identity and the public's support for the trail."  
(National Park Service)*

### Current DCR Trail Marking

As noted in the introduction, DCR properties and divisions have historically used a variety of different types of trail signage and marking systems from plastic blazes that designate trail uses, to painted or routed trailhead signs, to aluminum trail rules signs, to numbered intersections. This section proposes trail signage and marking standards that will help improve trail management and user safety, enhance the users' recreational experience, and help create a positive agency trails identity. While achieving these standards may take years to realize, working toward them incrementally over time is an important goal.

### Why Strive for Consistent Signage?

Appropriate trail signs and markings provide information, enhance safety, and contribute to a positive user experience. Trail signage is perhaps our most important form of communication with our users, as signs are the message they see every time they visit. Consistent signage, both within DCR facilities and between similar types of facilities, enhances safety, creates a positive trail identity, helps meet user expectations, and contributes to the public's support for trails.

The broad objectives of DCR's trail signage should be to:

1. Provide consistent positive exposure of the trail system to attract users
2. Educate the user about trails and trail uses
3. Reassure / ensure that the user is on the right trail and will not get lost
4. Control trail usage, reduce conflicts, and create safer, more enjoyable, and environmentally friendly recreational experiences

However, these objectives must be balanced with aesthetic considerations to avoid "sign pollution."

We accomplish these objectives through the consistent use of the following different kinds of trail marking:

- Trailhead signs and kiosks
- Intersection directional signs
- Reassurance markers and blazes
- Interpretive displays

It is important to consider the different purposes of each type of sign and use them appropriately. For example, using reassurance blazes to indicate allowed trail uses is probably inappropriate because it may require more blazing, and is very difficult to change if the allowed uses change. On the other hand, using trailhead signage to designate allowed uses is simpler to implement, requires much less maintenance, and can be easily changed.

### Implementation Priority

Implementing the below standards fully within the DCR system will take time. The priority for implementation should be as follows:

1. Fully implement the sign standards wherever new trails are developed or constructed.
2. Fully implement the standards when trails undergo significant restoration or repair.
3. Implement the appropriate standards as possible as trails are worked on through routine maintenance. For example, when a trail is maintained, re-blaze then, remove old plastic signage and install key intersection signs.
4. Implement the intersection signage standards park-wide.
5. Implement full signage standards park-wide.

### General Trail Signage Standards

The following are DCR's general trail sign standards.

- Signage within a single DCR facility should be consistent with respect to colors, materials, and look. Ideally, adjacent facilities will also be consistent.
- The ideal trail signage standard for DCR should be **brown signs** ( ) with **white or off-white lettering**.
- For simple trailheads and intersection signage, routed wood signs are preferred as they are aesthetically appealing and resistant to damage and vandalism.
- It is also acceptable that trail signage be vinyl lettering on composite (carsonite-type) sign boards. Vinyl lettering can be ordered through the DCR sign shop at 617-727-5118 or through Carsonite signs.
- Generally, colors should be brown and white, and consistent within a facility.
- Aluminum and plastic trail signs are **not** recommended.

### Naming Trails

Trail names can be an important element of the outdoor experience and can help draw visitors onto the trail. The "Blue Heron Trail," "Skyline Trail" or the "Round the Mountain Trail" convey to the user information about the wildlife, destination or experience that lies ahead. Trails named for blaze colors, memorializing a trail advocate or designating a DCR management component may not be as appealing, functional or memorable for users. Whenever possible, utilize trail names that suggest an attractive destination; introduce natural, cultural or historical context for the trail; or otherwise capture the imagination and experience of the intended user. Please keep in mind that not all trails need to be or should be named.

### Trailhead Signs

Trailhead kiosks or signs may come in different forms depending on the setting, complexity, and information needs.

**For more developed trailheads, popular trails or high profile trails,** a designed and professionally fabricated trailhead sign is appropriate. The template (right) follows the general standards for "Wayside Signage" in the in the DCR Graphics Standards Manual. This template includes:

- A sign board of approximately 20" wide by 24" in height (5:6 portrait orientation).
- Trail Name in Frutiger Italics in a 4" (1/6) brown band at the top.



- Text message (in sabon font) with trail description and perhaps additional information placed in the upper left text box.
- A map showing features, destinations, distances and connections in the upper right.
- Standard (and edited as needed) "Trail User Etiquette" is in a brown box in the lower left.
- Allowed and prohibited use symbols are in the lower right.
- Allowed and prohibited use symbols may also be in 4" x 4" square signs mounted on the posts below the sign.
- Park name is in capitals, left justified at the bottom with the DCR logo in the lower right corner.
- The position of the map, text boxes and symbols may be flexible depending on the specific needs of each sign.
- This type of sign should be affixed with brackets to two 4x4 pressure treated wood posts planted 24" in the ground.

***On roadsides or at lower profile trailheads***, simpler routed wood signs are preferred. These should be:

- A sign board of approximately 21" wide by 15" in height (5:7 ratio landscape orientation)
- All text should be 1"
- Trail name in capital letter, underlined"
- Key trail destinations and distances
- All text shall be routed with a ¼" veining bit with a minimum depth of 1/8" and a maximum depth of ¼"State
- Park Name in caps at the bottom
- "dcr" or dcr plus logo in the lower right corner
- Information and symbols showing allowed and prohibited trail uses and trail difficulties. This information may be in 4"x4" or 3"x3"square signs mounted on the post below the sign.
- Sign should be affixed with lag bolts to a single 4x4 pressure treated wood post planted 24-36" in the ground. Top of sign should be installed 1" down from top of 4x4. Post should be the same color brown as sign.
- The top of the 4x4 pressure treated post should be beveled 45 degrees to back with 1 inch flat on top (same side as sign).
- Top of sign board should be approximately 36 inches / feet from the ground.

### **Intersection Directional Signs**

Directional signs **should** be placed at trail intersections (see examples below). Depending on the setting, trail class and trail system, these signs should either be placed at most intersections or at main intersections, decision points, and spur junctions. Ideally, intersections signs should be mounted on 4"x4" wood posts. Post type should be consistent within the site. In areas with vandalism or other issues, intersection signs **may** be mounted high on trees. Trails names and arrows **may** also be placed vertically on wood or Carsonite type posts.



***Intersection directional signs are the most important source of information for users***, and can serve to enhance safety, avoid bad user experiences, and

increase use of under-used sections of the trail. If someone knows that there is a waterfall, lake, or other attraction down the trail, they may be tempted to hike to it and thus become intrigued with the trail idea.

Intersection signs **should** include the following information:

- Sign board should be 18" by 10" (or 12" depending on the number of destinations)
- All text in 1" capitals
- All text shall be routed with a ¼" veining bit with a minimum depth of 1/8" and a maximum depth of ¼"
- Trail name, if the trail is named, underlined
- The closest significant destination (such as a view, summit, waterfalls, etc.) in each direction.
- The closest trailhead / parking area
- References should indicate the next trail intersection/major destination and be rounded to the nearest tenth of a mile.
- References shall be listed in the following order: straight, left, right.
- Total number of directional references shall not exceed four.
- "DCR" or dcr and logo in the lower right corner
- Sign should be affixed with lag bolts to a single 4x4 pressure treated wood post planted 24-36" in the ground. Top of sign should be installed 1" down from top of 4x4. Post should be the same color brown as sign.
- The top of the 4x4 pressure treated post should be beveled 45 degrees to back with 1 inch flat on top (same side as sign).
- Top of sign board should be approximately ? inches / feet from the ground.

<u>TRAIL NAME</u>	
← DESTINATION 1	1.4
← DESTINATION 2	6.0
DESTINATION 3	1.2 →
	DCR

The sign or post **may** also include:

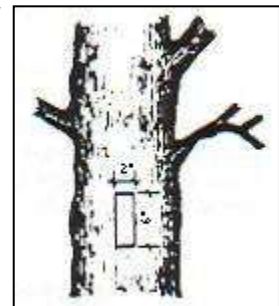
- markings for allowed or restricted uses
- trail difficulty
- intersection number in the lower left corner on sign

In complex trail systems with numerous intersections, intersection numbering can be used and these numbers listed on an accompanying trail map. Numbers should not be used instead of directional signage, but can be used in conjunction and can be placed on the intersection directional sign in the lower left corner.

### Reassurance Markers/Blazes

**Trail blazes or reassurance markers are important trail elements that allow the user to stay on trails and provide a sense of reassurance.** The recommended guidelines are consistent with best management practices for trail marking.

Official DCR trails **should** be blazed with vertical **painted blazes**. Plastic blazes should be avoided and replaced when trails are re-blazed, upgraded or maintained. Painted blazes are more vandal resistant, do less damage than nail-on blazes, and are easier to alter.



Blazes are placed on trees, slightly above eye level so that hikers, bikers or riders can see them easily when traveling in either direction. In areas where the trail receives winter use, blazes are placed higher so they are visible above the snow. Blazes should be placed immediately beyond any trail junction or road crossing. Blazes should generally be within "line of sight," i.e., when standing at a blaze marker, the user should just about be able to see the next one. It is not desirable to have more than one blaze visible in either direction at any one time. One well placed blaze is better than several that are poorly placed, and it is important to strike a balance between "over-blazing" and "under-blazing." (An exception to the line-of-sight blazing policy occurs in wilderness or primitive areas where blazing is not generally recommended.)

Standard blazes should be 2" x 6" vertical rectangles. The 2" x 6" rectangular shape is large enough to be seen easily without being visually obtrusive and is the most universally accepted style of trail blazing. Edges and corners should be crisp and sharp. Dripping paint, blotches and over-sized blazes should be avoided. On rough barked trees, the tree will first need to be smoothed using a paint scraper, wire brush, or draw knife. A high quality, glossy, exterior acrylic paint such as Sherman Williams Metalatex or Nelson Boundary Paints should be used for long durability.

It is acceptable to use different colors and shapes to denote specific trails or trail loops. For example the "Red Dot Trail" may be blazed in red circular blazes. Colors **should** be distinguishable from boundary paint colors.

Vegetation should be pruned from in front of the blazes to ensure visibility in all seasons.

In non-forested areas, blazes may be placed on wooden or Carsonite-type posts 4 feet above the ground or stone cairns may be used to mark the trail. Blazes can be painted on exposed rock, but will not be visible in the winter.

### **Colors and Shapes**

The general recommended standard for blaze colors should be white for Long-Distance Trails such as the AT or New England National Scenic Trail, blue for non-motorized trails and orange for designated ATV and Off Highway Motorcycle trails in orange (\*Non-motorized trails which are open to snowmobile use in winter should **not** be permanently blazed in orange to avoid confusion by other motorized users.)

Many trails within DCR have specific colors and/or shapes associated with their identity. For example the "Blue Herron Trail" is identified by a blue triangle, the "Midstate Trail" by a yellow triangle and the "Red Dot Trail" by a red circle. This manual does not recommend changing these. Particularly for longer distance trails that may go through a number of trail types, property ownership and across roads having a particular blazing identity can provide additional user reassurance. Also, in more complex trail systems (such as the Blue Hills or Middlesex Fells) loops blazed in a specific color can guide users on a particular user experience.

However, efforts should be made to avoid multiple colors and shapes of blazes on any particular segment of trail.

### Directional Change Indicators



Double blazes should be used in places that require extra user alertness (e.g. important turns, junctions with other trails, and other confusing locations). They should be used sparingly so that they do not become meaningless or visually obtrusive. They are unnecessary at gradual turns and well-defined trail locations such as switchbacks.

A reassurance marker should be placed so that it can be seen from the direction indicator. Be sure to mark confusing areas to guide users coming from both (or all) directions. Avoid arrows.



### Mile Markers

Rail trails and long-distance trails may have mile markers posted at each mile from their origin. These can be placed on Carsonite or similar type posts, nailed to trees, or, on rail trails, they may be on granite markers recalling whistle posts.

### Identification Markers for Identity Trails

Certain trails may have specific identities or official logos associated with them. For example, the Blue Heron Trail has a heron logo and the Mid-State Trail has a yellow triangle. These distinctive logos or identity markers

should be placed at all road crossings (even drivable woods roads), on intersection signs, and periodically along the trail to assure users. Generally they should be about 1/2 mile apart, but frequency should increase in areas where there are numerous roads and intersections. They should not be continuous. These markers may be made of plastic or aluminum for nailing to trees or posts. Stickers may be used for intersection signs. They can be used in conjunction with mile markers. A larger emblem (8"-10" diameter) for identity trails is typically used at trailheads, major roads, and other locations where more visibility is desired.

### Interpretive Displays

An interpretive sign must be part of a well thought out interpretive plan complete with goals, objectives, thematic statements and topics. The plan should be based on an audience and site analysis which will guide the selection of materials and interpretive approach. Contact the Interpretive Services section of the Bureau of Ranger Services if you are interested in developing an interpretive plan. Once you have completed your interpretive plan, you will need to confer with Interpretive Services and the DCR Graphics Team to develop specific displays. An outline of the wayside development process is available in the DCR Graphic Standards Manual.

Interpretive waysides are an important and effective way to provide information to visitors. There are two types of wayside: low profile and upright. Low profile exhibits are low, angled panels that provide an interpretive message related to a specific place or feature. They usually include one or more pictorial images and a brief interpretive text. Upright waysides typically provide general information, rather than site-specific interpretation; they are often located near a visitors center or trailhead to provide information about facilities, programs, and management policies.

The panels are fabricated from a high-pressure laminate material, which is both cost-effective and allows the use of color to create a more attractive presentation. They are generally guaranteed for 10 years by the fabricators, and are resistant to vandalism by spray paint or cutting. The Graphic Design team will coordinate fabrication through the state vendor program.

### **Sign Maintenance**

Sign maintenance is critical to the operation of a quality trail system. Well maintained signs that are repaired promptly convey a sense of pride and reduce further vandalism. Signs are a highly visible representation of the quality of the trail. Their maintenance or lack of maintenance leaves the visitor with a positive or negative impression about the trail. Signs convey many kinds of information and it is critical that they be in good shape. Special attention should be given to those that are damaged from shooting and other factors, those that are faded or brittle from long exposure, and those that are simply missing. All signs that are damaged or weathered no longer convey a good impression or serve the intended purpose, and should be repaired or replaced. Periodic painting and other maintenance is a necessity and will prolong the life of a sign.

### **Standards in Primitive Areas**

Some of the trail sign standards will be different in those forest and park areas classified as "Primitive" or "Semi-Primitive" under the Recreational Opportunities Spectrum.

These differences include:

- Minimizing signage in primitive areas and forest reserves while still providing for user safety
- Continuously blazing is not necessary or desired
- Directional signage may only occur at major intersections and may not include distances or trail names, but should include directions and major destinations
- Interpretive waysides should not be used

### **Temporary Trail Signage and Blazing**

Some uses such as seasonal snowmobiling or special events may require temporary trail blazes and signs. Temporary signs installed by DCR partners should be allowed under a Special User Permit or MOA and should follow these guidelines.

- Temporary signs shall be approved by the facility supervisor
- They should be installed on posts rather than nailed to trees
- They shall not advertise specific vendors
- They shall be removed when the seasonal or temporary use is over
- Temporary signs shall not be inconsistent with these DCR standards



## Trail Mapping

Trail maps are one of the most important tools we have for providing quality user information, managing user expectations, minimizing conflict, and promoting safe and appropriate trail use. DCR has a standard set of trail maps for most facilities (the “green maps”). DCR trail maps should show

- trail layouts
- trail use designations (if necessary)
- terrain (contours and hydrology)
- connections to other trails, trail systems or roads off of DCR property
- access points such as campgrounds, parking and trailheads
- features such as summits, vistas, and important cultural or natural sites
- a scale for distances
- key of symbols

DCR trail maps can also provide information about allowed uses, rules and regulations, trail etiquette, and cultural or natural interpretation including photos and graphics. Examples include the Cape Cod Rail Trail and the Blue Hills Mountain Biking maps.

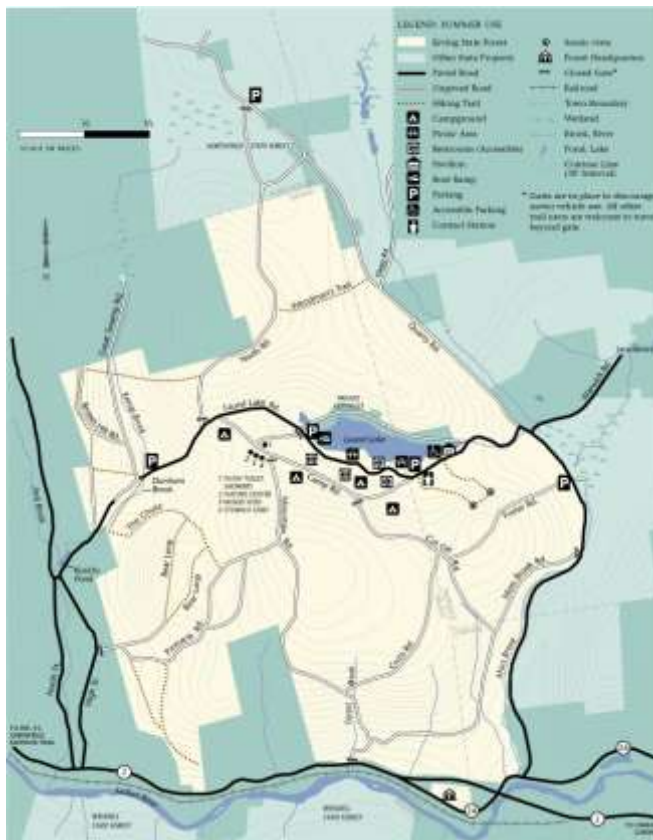
Maps can be provided to the public on trailhead signs, in paper form at park entrances and trailheads, and on the internet for download. However, if maps present too much information, are poorly designed, or are not available where the public wants them, they are not useful to the public.

Presenting excellent maps, in standard forms but multiple formats, will greatly enhance the public’s use and appreciation of DCR and our trail systems.

Additional trail map standards will be developed in the future in coordination with DCR Trails and Graphics Teams.

### Digitally Mapping Trails

Currently, DCR Bureau of Forestry is in the process of digitally mapping all of our existing trails and roads with Global Positional System (GPS) technology and creating a Geographic Information Systems (GIS) layer of trails. This data will be extremely valuable for assessing our existing trail systems, planning trail system improvements, and creating excellent trail maps and signs. In conjunction with this effort, DCR GIS Program staff recently developed a protocol for mapping roads and trails. Having a standardized method is essential for collecting complete, high-quality data that is consistent across the park system. The protocol consists of a method for the fieldwork



and office-work portions of data collection, plus a GPS application for collecting standard information about roads, trails, and other conditions in the field.

The application consists of forms for collecting line and point GPS data. Lines represent trails and roads, while points can be collected for a large number of features such as trail intersections, bridges, culverts, damaged areas, vistas, parking areas, and many other point types related to forestry, recreation, and infrastructure.

This methodology was developed based on several years of experience mapping trails in DCR's system, plus detailed input from Forestry and Trails program staff. The document "Mapping Trails the DCR Way" (Appendix G) contains a set of guidelines for choosing walking routes and determining completeness of the road and trail mapping. The document "DCR Road and Trail metadata" (Available on Request from the DCR GIS Program) contains a list of the line and point types that can be collected with GPS and the attributes that need to be recorded for each type.

## ***Partnerships, Friends and Volunteers***

Trails offer the DCR a powerful avenue for encouraging volunteerism in our parks. People love to volunteer on trails, and trail management can greatly benefit from volunteers. User groups can help create, restore, or close trails. Friends groups can raise money and advocate for funding. Individuals and organizations can adopt trails. Volunteer teams can help clean-up, improve, or beautify them.

As our agency moves into the future, volunteerism is only going to become a more important avenue for accomplishing our goals. However, for volunteerism to be effective, it must be guided, directed, and managed. In fact, some of the trails problems we have today may, in part, be due to the unplanned and unmanaged volunteer enthusiasm of the past. Ideally, this manual will provide some of the guidance necessary to make most effective use of volunteers.

### **Why Use Volunteers?**

- Often land managers lack the resources and staff to adequately monitor and maintain trails
- Trail volunteers make better trail users
- Trail stewardship can foster land protection and generate funds for trail development and maintenance

### **Types of Trail Partnerships**

Partnerships and volunteer activities related to trails come in many forms. Here are a few examples of the types that exist in our system and that might be useful to encourage or create.

**Friends of:** The DCR has many friends groups, and in some cases these include "Friends of" a particular trail. Friends groups are formally (or informally) established groups whose purpose is to promote the park or the trail. They generally can be effective in four areas – organizing volunteers, raising funds, advocacy, and/or running programs. Friends groups tend to be self-directed and bring a lot of ideas and energy. They can be effective at recruiting and managing volunteers, and occasionally bring their own trail building and managing expertise. However, to be most effective, the energy of friends groups should be channeled into needed projects, and they often need hands-on training, technical assistance, and oversight.

**Activity Oriented Groups:** Massachusetts has a number of activity oriented or user groups that are organized to promote recreational opportunities around a specific use such as mountain biking or snowmobiling. User groups are often effective in mobilizing volunteers and even in-kind donations, and often bring a high level of their own technical expertise. However, user group's efforts need to be guided and channeled into completing projects that are needed from the point of view of the park supervisor and trail system plan. User groups will often want to create new trails, when, from the park's point of view, trail rehabilitation or even closures may be more important to the overall system. In some cases, user groups can also be effective in completing needed regular maintenance, such as trail grooming.

**Community Trail Committees:** A growing number of communities are establishing trail committees at the local level. These groups tend to be focused on creating new trail opportunities on community lands, but may want to create connections to state parks and forests. While these connections are valuable, they should be established and laid out in ways that contribute to the park's goals and trail system plan. Too many connections and inappropriate connections need to be avoided.

**Adopters:** Adopters can be individuals, organizations, or businesses who agree to beautify or provide regular monitoring and maintenance to a particular section of trail. For example, adopters along bikeways may regularly clean a section, mow a section, or maintain a flower bed. Along hiking trails, adopters periodically hike, clear, and perform routine maintenance. Adopter programs can be effective ways to channel volunteer interest, but they require a certain level of formality and some training and monitoring. There are two types of Adopt-a-Trail Program approaches that may occur in association with state land:

*Massachusetts Adopt-A-Trail Program:* This is a program which is facilitated by a member of the DCR staff who serves as "Supervisor" and will organize work details with individual volunteers or groups who choose to take responsibility for regular trail maintenance and enhancement on a section of trail. This program is defined, organized and facilitated by the state, in conjunction with an individual or group. Appendix E includes a brief description of the DCR Adopt-A-Trail Program.

*Organizational Adopt-A-Trail Program:* Adopt-A-Trail Programs may also be organized and overseen by parks friends groups or other similar organizations. For example, the Friends of Blue Hills has established a model Adopt-A-Trail program. They organize adopters, provide training, and oversee the program. It is the responsibility of the volunteer organization to stay in close communication with a member of the DCR staff in order to determine the trail work that is needed and permitted, but it is ultimately the organization which facilitates the program. To view the Friends of the Blue Hills Adopt-A-Trail Handbook and other information please visit their website or contact the Blue Hills Reservation Supervisor.

**Volunteer Trail Patrols/Ambassadors:** Like adoption programs, individuals and organizations may agree to regularly patrol and serve as "ambassadors" on a trail. These types of programs are particularly useful on multi-use trails. Like adopter programs, they require a certain level of formality and training to ensure that the patrols are equipped with the knowledge and materials to perform the task.

### **Guiding Volunteer Efforts**

As noted above, in partnering with volunteers in our parks, it is vital that their energy be guided into projects that are truly needed, that they are accomplished to our trail building and maintenance standards, and that they either have or are given the appropriate tools and technical training to accomplish the goals.

Strategies for insuring this include:

- DCR has a (draft) policy for working with volunteers in parks. This policy should be followed, including procedures for project approval.
- All volunteers must fill out and sign a "Volunteer Agreement and Release Form."
- New trails should not be created unless the a Trail Proposal Evaluation Form (Appendix B) has been submitted, reviewed, and approved by the appropriate people., and the new trail fits into the facility's trail system plan.
- The facility supervisor should be aware of and formally approve all volunteer trail work.
- Volunteers should adhere to the guidance included in this document including trail design, development, and maintenance standards and signage standards.
- DCR should develop formal Adopter and Ambassador programs with training and written agreements to ensure that volunteers have the necessary tools and training to effectively contribute to trails management.

### **Attracting and Keeping Volunteers**

*Reach out to your prospective work crew*

- Use the local media, start a website
- Contact local clubs and enthusiasts
- Solicit for volunteers in parks, on trails or where they congregate

*Be prepared*

- Develop clear goals, objectives and strategies
- Train crew leaders in advance
- Prepare for any kind of turnout and a variety of skill levels
- Have tools necessary for the job

*Manage your volunteers*

- Brief your crew, complete waiver (if required), sign in and out volunteers,
- Assign crew leaders to projects
- Promote safe and proper tool use and maintenance techniques
- Care for your crew – provide snacks, water...

*Keep them coming back*

- Provide sense of accomplishment
- Make it enjoyable
- Show your appreciation
- Stay in touch

**Potential Trail Partners**

- Appalachian Mountain Club
- Student Conservation Association
- New England Mountain Bike (NEMBA)/ International Mountain Bike (IMBA)
- National Off Highway Vehicle Conservation Association (NOHVCC)
- Snowmobile Association of Massachusetts (SAM)
- Bay State Trail Riders
- Local User & Community Groups
- Friends Groups
- Rails To Trails Conservancy
- American Trails
- National Hiking Society
- Local, State and National non-profit organizations

## ***Understanding and Managing Conflicts***

Conflicts on multiple-use trails have been described "as problems of success—an indication of the trail's popularity" (Ryan 1993, 158). In fact, the vast majority of trail users are satisfied, have few complaints, and return often. However, conflicts among trail users do occur, including conflicts between trail users and animals, trail users and trail managers, and even trail proponents and private landowners. If not addressed, conflicts can spoil individual experiences and threaten to polarize trail users who could be working together rather than at odds with one another. As the number of trail users grows and diversity of trail activities increases, the potential for conflict grows as well. It is the responsibility of managers and trail users to understand the processes involved in recreational conflicts and do everything possible to avoid and minimize them on multiple-use trails.

Conflict in outdoor recreation settings (such as trails) can best be defined as "goal interference attributed to another's behavior" (Jacob and Schreyer 1980, 369). As such, trail conflicts can and do occur among different user groups, among different users within the same user group, and as a result of factors not related to users' trail activities at all. In fact, no actual contact among users need occur for conflict to be felt. Trail conflict has been found to be related to

- activity style (mode of travel, level of technology, environmental dominance, etc.)
- focus of trip
- user expectations
- attitudes toward and perceptions of the environment
- level of tolerance for others
- different norms held by different users.

Conflict is often asymmetrical (i.e., one group resents another, but the reverse is not true). The following 12 principles for minimizing conflicts on multiple-use trails are recommended. Adherence to these principles should help improve sharing and cooperation on multiple-use trails.

1. **Recognize Conflict as Goal Interference:** Do not treat conflict as an inherent incompatibility among different trail activities, but goal interference attributed to another's behavior. For example, if a user's goal is to see wildlife, a group of screaming teens can interfere with that goal.
2. **Provide Adequate Trail Opportunities to Minimize Contacts:** Offer adequate trail mileage and provide opportunities for a variety of trail experiences. This will help reduce congestion and allow users to choose the conditions that are best suited to the experiences they desire.
3. **Establish Appropriate User Expectations:** If users expect to find the conditions and uses that they actually encounter, they are more likely to be tolerant of them. On the other hand, if a user expects to find a wilderness experience and finds multiple users, conflict may arise. Use signage, interpretive information, and trail design to establish appropriate expectations.
4. **Involve Users as Early as Possible:** Identify the present and likely future users of each trail and involve them in the process of avoiding and resolving conflicts as early as possible, preferably before conflicts occur. For proposed trails, possible conflicts and their solutions should be addressed during the planning and design stage with the involvement of prospective users. New and emerging uses should be anticipated and addressed as early as possible with the involvement of participants. Likewise, existing and developing conflicts on present trails need to be faced quickly and addressed with the participation of those affected.
5. **Understand User Needs:** Determine the motivations, desired experiences, norms, setting preferences, and other needs of the present and likely future users

- of each trail. This "customer" information is critical for anticipating and managing conflicts.
6. **Identify the Actual Sources of Conflict:** Help users to identify the specific tangible causes of any conflicts they are experiencing. In other words, get beyond emotions and stereotypes as quickly as possible, and get to the roots of any problems that exist.
  7. **Work with Affected Users:** Work with all parties involved to reach mutually agreeable solutions to these specific issues. Users who are not involved as part of the solution are more likely to be part of the problem now and in the future.
  8. **Promote Trail Etiquette:** Minimize the possibility that any particular trail contact will result in conflict by actively and aggressively promoting responsible trail behavior. Use existing educational materials or modify them to better meet local needs. Target these educational efforts, get the information into users' hands as early as possible, and present it in interesting and understandable ways (Roggenbuck and Ham 1986).
  9. **Encourage Positive Interaction Among Different Users:** Trail users are usually not as different from one another as they believe. Providing positive interactions both on and off the trail will help break down barriers and stereotypes, and build understanding, good will, and cooperation. This can be accomplished through a variety of strategies such as sponsoring "user swaps," joint trail-building or maintenance projects, filming trail-sharing videos, and forming Trail Advisory Councils.
  10. **Favor "Light-Handed Management":** Use the most "light-handed approaches" that will achieve area objectives. This is essential in order to provide the freedom of choice and natural environments that are so important to trail-based recreation. Intrusive design and coercive management are not compatible with high-quality trail experiences.
  11. **Plan and Act Locally:** Whenever possible, address issues regarding multiple-use trails at the local level. This allows greater sensitivity to local needs and provides better flexibility for addressing difficult issues on a case-by-case basis. Local action also facilitates involvement of the people who will be most affected by the decisions and most able to assist in their successful implementation.
  12. **Monitor Progress:** Monitor the ongoing effectiveness of the decisions made and programs implemented. Conscious, deliberate monitoring is the only way to determine if conflicts are indeed being reduced and what changes in programs might be needed. This is only possible within the context of clearly understood and agreed upon objectives for each trail area.

Source: *Conflicts on Multiple-Use Trails Synthesis of the Literature and State of Practice*, sponsored by the Federal Highway Administration and National Recreation Advisory Committee, <https://www.fhwa.dot.gov/environment/conflicts/conf1.htm>

## ***Special Trail Uses***

DCR's trails offer extensive opportunities for special events such as:

- guided hikes,
- educational programs,
- volunteer work days,
- races and rallies,
- outfitted activities, and
- commercial activities.

Any organized, special activity should be coordinated with the facility's supervisor and may require a "special use permit." Any commercial activity, race or rally, or event which might be expected to significantly affect the public use or enjoyment or the general environmental quality of any of the lands or waters of the Department will require a "special use permit."

## ***Overnight Activities on DCR Trails***

Trails, especially long distance trails, offer a unique opportunity for overnight recreational experiences such as backpacking and back-country camping. Currently, DCR offers some limited designated site camping opportunities along the Appalachian Trail. However, opportunities for developing overnight opportunities also exists along other long-distance trail corridors such as the MMM trail and Mid-State Trail, and along important greenways such as the Connecticut River Greenway.

A process for designating and managing overnight areas or facilities in other parks or along other trails will need to be established with the Bureau of Recreation.

## ***Off Trail Activities***

Trails also contribute to and intersect with various off-trail activities that occur within our parks, forests and reservations such as geocaching, orienteering, bird-watching, and hunting.

**Geocaching:** Is a questing activity in which individuals or organizations use GPS (Global Positioning Systems), compasses, and maps to find caches located within public spaces. The Department of Conservation and Recreation supports and permits geocaching in keeping with its mission to protect, promote, and enhance the Commonwealth's natural, cultural, and recreational resources. DCR has established a policy to provide management guidelines for geocaching, so as to encourage safe geocaching practices and minimize impact on the natural and cultural resources managed by the Department. This policy is available at R:\DCR Policies\DCR Policy Files\Geocache.

**Hunting:** Hunting is permitted in most state forests and parks. Hunting seasons are established by the Massachusetts Division of Fisheries and Wildlife and licenses are required. For more information, see. <http://www.mass.gov/dcr/recreate/hunting.htm>.



## Appendix A

### USFS

#### Trail Planning and Management Fundamentals

##### Trail Type ▪ Trail Class ▪ Managed Use ▪ Designed Use ▪ Design Parameters

Updated: 1/2004

In FY02, with the national introduction of the Infra 5.0 Trails Module Linear Events and TRACS (Trail Assessment and Condition Surveys), five fundamental concepts were introduced as cornerstones of Forest Service trail planning and management:

- Trail Type
- Trail Class
- Managed Use
- Designed Use
- Design Parameters

Although not entirely new, these revised concepts provide an updated and expanded means to consistently record and communicate the intended design and management guidelines for trail design, construction, maintenance and use. Before completing documentation for TRACS Trail Management Objectives (TMO), editing these Linear Events in the Infra Trails Module, or applying these concepts in trail management, it is essential that their intent is clearly understood.

#### Trail Type

*A fundamental trail category that indicates the predominant trail surface or trail foundation, and the general mode of travel the trail accommodates.*

Trail Types are exclusive, that is there can only be one Trail Type assigned per trail or trail segment. This allows managers to identify specific trail Design Parameters (technical specifications), management needs and the cost of managing the trail for particular uses and/or seasons by trail or trail segment.

When one Trail Type “overlaps” another, identify each trail or trail segment with its respective Trail Type as a separate route, with its own Trail Name and Trail Number. The “Shared System” data attribute in the Infra Trails Module will allow you to flag the route as also being used as a different type of route or Trail Type, (presumably during a different time of the year). For example, Canyon Ridge Trail 106 may be categorized as a Standard/Terra Trail from MP 0.0 to its end termini at MP 7.4. The first three miles of that same route may also function as a Snow Trail during the winter, in which case a separate record would be established for Canyon Creek Snow Trail #206 from MP 0.0 to MP 3.0. The actual naming and numbering of trails (i.e. Standard/Terra Trails versus Snow Trails) should be consistent with local unit identification protocols.

The three fundamental Trails Types include:

**Standard/Terra Trail:** *The predominant foundation of the trail is ground (as opposed to snow or water); and that is designed and managed to accommodate ground-based trail use.*

**Snow Trail:** *The predominant foundation of the trail is snow (as opposed to ground or water); and that is designed and managed to accommodate snow-based trail use.*

**Water Trail:** *The predominant foundation of the trail is water (as opposed to ground or snow); and that is designed and managed to accommodate trail use by water craft. There may be ground-based Portage segments of Water Trails.*

## Trail Class

*The prescribed scale of trail development, representing the intended design and management standards of the trail.*

- There is only one Trail Class identified per trail or trail segment.
- The National Trail Classes provide a chronological classification of trail development on a scale ranging from Trail Class 1 to Trail Class 5 (see Attachment A: Trail Class Matrix):
  - Trail Class 1: Minimal/Undeveloped Trail
  - Trail Class 2: Simple/Minor Development Trail
  - Trail Class 3: Developed/Improved Trail
  - Trail Class 4: Highly Developed Trail
  - Trail Class 5: Fully Developed Trail
- Each Trail Class is defined in terms of applicable Tread and Traffic Flow, Obstacles, Constructed Feature and Trail Elements, Signs, Typical Recreation Environment and Experience.
- Trail Class descriptions define “typical” scenarios or combined factors, and exceptions may occur for any factor. In applying Trail Classes, choose the one that most closely matches the managed objective of the trail.
- Trail prescriptions describe the desired management of each trail, based on Forest Plan direction. These prescriptions take into account actively managed trail uses, user preferences, setting, protection of sensitive resources, and other management activities. To meet prescription, each trail is assigned an appropriate Trail Class.
- There is a direct relationship between Trail Class and Managed Use (defined below), and one cannot be determined without consideration of the other.
- These general categories are used to identify applicable Trail Design Parameters (defined below) and to identify basic indicators used for determining the cost to meet national quality standards.
- Trail Classes represent a refinement and expansion of the previously used Forest Service Management Classes: Mainline/Primary, Secondary and Way Trails.

## Managed Use

*Modes of travel that are actively managed and appropriate, considering the design and management of the trail.*

- There may be more than one Managed Use per trail or trail segment.
- Managed Use indicates a management decision or intent to accommodate and/or encourage a specified type of trail use.

## Designed Use

*The intended use that controls the desired geometric design of the trail, and determines the subsequent maintenance parameters for the trail.*

- There is only one Designed Use per trail or trail segment.
- Although the trail may be actively managed for more than one use, and numerous uses may be allowed, only one use is identified as the critical design driver. The Designed Use determines the technical specifications for the design, construction and maintenance of the trail or trail segment. For each Designed Use and applicable Trail Class, there is a corresponding set of nationally standardized technical specifications or Design Parameters.
- Of the actively Managed Uses that the trail is developed and managed for, the Designed Use is the single design driver that determines the technical specifications for the trail. This is somewhat subjective, but the Designed Use is most often the Managed Use that requires the highest level of development. (ie: Pack & Saddle stock require higher and wider clearance than a trail designed for Hikers). In addition to Designed Use, managers must also determine the desired development scale or Trail Class, with Trail Class 1 being the lowest level of development and Trail Class 5 the highest. On a Trail Class 1 Hiker trail, the trail is basically a deer path and in places may disappear and be reacquired later. Trail Class 5 is most often paved, or at least hardened, and is associated with a highly developed Recreation Opportunity Spectrum classification (ROS).

## Designed Use / Managed Use Types

- All Terrain Vehicle
- Snow All Terrain Vehicle
- Bicycle
- Dogsled
- Hiker / Pedestrian
- Motorcycle
- Pack and Saddle
- Snowmobile
- Snowshoe
- Watercraft
- Motorized Watercraft
- Non-Motorized Watercraft
- Cross Country Ski

## **Design Parameters**

*Technical specifications for trail construction and maintenance, based on the Designed Use and Trail Class.*

- The national Trail Design Parameters represent a standardized set of commonly expected construction and maintenance specifications based on Designed Use and Trail Class.
- Local deviations to the Design Parameters may be established based on specific trail conditions, topography and other factors, providing that the variations continue to reflect the general intent of the national Trail Classes.
- Design Parameters are a refinement and expansion of the previously used “Easiest, More Difficult, and Most Difficult” trail categories for communicating Forest Service construction, maintenance and management specifications.

Design Parameters include technical specifications regarding:

- Tread Width
- Surface
- Grade
- Cross-Slope
- Clearing
- Turns

## Appendix B

### Massachusetts Department of Conservation and Recreation

#### Trail Proposal and Evaluation Form ([word document form](#))

1. **Requester's Information and Contact**

2. **DCR Contact and/or Park Supervisor**

3. **Location of Proposed Trail** (Specify the location or the proposed trail as exactly as possible. Also attach a topographic map showing location)

4. **Objective of trail**

If the trail exists, who does the trail serve?

Who will the new or improved trail serve?

Please explain the significance, need or value of this trail and the reason(s) for the proposed change:

5. **Description of Proposed Trail**

Upgrade of existing ( )      Relocation of existing ( )      New trail ( )      Change in Use ( )

Length: \_\_\_\_\_

What is the Class of the Proposed Trail? And the Designed Use Parameter? (See DCR Trail Guidelines Manual, Section III, Trail Classification, page 35, and Appendix F)

6. **Support and Success of Trail Project**

Who supports this initiative?

What is the evidence for the demand for this project?

Who will build, or improve this trail?

What costs are associated with this project and how will this project be funded

Who will maintain this trail project for future use

**DCR Review of Proposed Trail Project**

(To be filled out by DCR staff)

1. *Is this project supported by existing DCR plans? Is it embodied in an RMP or Trail Plan? If not, is it supported by operations and planning staff? Should it be pursued?*

2. *What are the potential short and long term management issues associated with this project?*

Design, construction and maintenance issues

Management issues (abutter concerns, user conflicts, safety, resource impacts):

3. *Would this trail need to meet FSTAG accessibility standards? Yes/No? Why? List Conditions for Departure*

4. *Site Evaluation*

Description of topography :

0-15% slope ( )      15-30% slope ( )      > 30% slope ( )

Soil description: \_\_\_\_\_

Historic, Cultural or Archeological resources/ impacts:

Forestry management resources/ impacts:

Rare, Endangered and Threatened species or natural community resources / impacts: Is it in NHESP Priority Habitat?

Other critical wetland, natural resource or wildlife habitat resources/impacts:

Other potential impacts or conflicts:

**Permitting: Massachusetts Regulatory Review Checklist**

- Yes  No Will any of the work require digging, pulling or scaring of ground surfaces?  
*If yes, DCR shall have project reviewed by DCR Archeologist. Proponent shall file permits with MHC is such as required after initial archeological review. All permits shall be reviewed by DCR prior to submittal.*
- Yes  No Will any work occur within 200 feet of a stream or river or within 100 feet of a wetland resource area?  
*If yes, contact your local conservation commission for help preparing an RDA or NOI. All permits shall be reviewed by DCR prior to submittal.*
- Yes  No Does the project area intersect with any Priority Habitat Area?  
*If yes, DCR shall send a project review request to NHESP. Proponent shall file permits if such are required by NHESP. All permits shall be reviewed by DCR prior to submittal.*

\*For additional information on permitting, please see DCR Trail Guidelines Manual.

**Approval:**

**Facility Supervisor** Approve ( ) Disapprove ( )  
Comments / Recommendations:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Management Forester** Approve ( ) Disapprove ( )  
Comments / Recommendations:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Trail Coordinator** Approve ( ) Disapprove ( )  
Comments / Recommendations:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Regional Director / District Manager** Approve ( ) Disapprove ( )  
Comments / Recommendations:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Please submit a copy of completed forms the DCR Bureau of Planning and Resource Protection, Greenways and Trails Program, Paul Jahnige, [paul.jahnige@state.ma.us](mailto:paul.jahnige@state.ma.us) for tracking purposes.

## **Appendix C**



## **Appendix D**

# Appendix E

## Massachusetts Department of Conservation and Recreation

### VOLUNTEERS IN PARKS PROGRAM DRAFT 1-1-12

#### Volunteers in Parks (VIP) Program

DRAFT 1/1/2012

NOT CURRENTLY FINALIZED OR APPROVED

#### TABLE OF CONTENTS:

Introduction.....2

Definitions.....2

Applicability.....3

Section I: General Volunteer Guidelines.....4

[Section II: Forms and Procedures For All Volunteers and Organizations.....6](#)

[Section III: Stewardship Agreements with Non-Profit Organizations.....7](#)

Section IV: Other Agreements.....9

- ATTACHMENTS:**
- A. Volunteer Project Description Form
  - B. Volunteer Release Form
  - C. Volunteer Services Log
  - D. Volunteer Services Report
  - E. Stewardship Agreement

**INTRODUCTION**

The Department of Conservation and Recreation (the “Department” or the “Agency”) is committed to welcoming, facilitating and effectively involving Volunteers in the stewardship of the Commonwealth’s natural and cultural resources in the Agency’s care. Volunteering is as old as the “Parks Movement” itself. Today, Volunteers play an important role in caring for parks across the Commonwealth and the nation. Volunteering in parks offers the opportunity for social interaction and physical exercise while performing work that reflects a Volunteer’s personal values.

As valuable as Volunteers are, they do not replace the essential management of professional staff. DCR is truly fortunate to have numerous dedicated, professional staff who lend their expertise to the Massachusetts park system. Their talents for resource protection, public service, and management of both staff and volunteers are the backbone of the Commonwealth’s park system. Appropriate volunteer management protects the Volunteer, DCR professional staff, the resources under DCR’s care and the taxpayer. Without adequate management, volunteers could injure themselves or other visitors, damage sensitive natural resources, or create liability for the Commonwealth that must be borne by the taxpayer.

This policy is guided by legislation which directs DCR to establish guidelines and standards for Volunteers to participate in stewardship activities on DCR property. In 2007, the Legislature enacted “An Act Relative to Volunteers at State Parks” which declared “that Volunteer activities and events serve an important public purpose, assist in the enhancement, preservation and improvement of the park system in the commonwealth, and that a program is required to help foster and assist in the stewardship of [DCR] properties through encouraging Volunteer activities and partnerships with nonprofit organizations.” See St. 2007, c. 208, as codified in G. L. c. 21 § 17G. The Act authorizes DCR to enter into agreements with nonprofit organizations regarding volunteers’ participation in stewardship, fundraising or special events activities on department property (“Stewardship Agreement”). Section 17G (c). The legislation also provides liability protection to Volunteers in particular circumstances; and anticipates DCR’s co-sponsorship of fund-raising and special event activities by Nonprofit Organizations when the activities promote a public purpose related to DCR and the funds generated are used to directly support or improve a DCR facility or program. By following this policy and the management procedures, DCR staff can provide Volunteers with a safe and effective stewardship experience while ensuring that park resources benefit both from the inspiration of volunteers and the professional stewardship of DCR staff.

**DEFINITIONS**

For the purposes of this policy, the following definitions shall apply:

**Co-sponsor** shall mean DCR’s determination to assume joint responsibility with a Nonprofit Organization for the events or activities set forth in a Stewardship Agreement upon due execution of said agreement.

**Nonprofit Organization** shall mean a Friends Group<sup>1</sup> or Organized Community or Activity Oriented Group<sup>2</sup> that is either (A) described in section 501(c)(3) of title 26 of the United States

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<sup>1</sup> **Friends Groups** are organized to support a specific park or group of parks and play an instrumental role in projects that include, but are not limited to, organizing events, advocating for park resources, promoting park activities, and raising money to support park programs and park infrastructure improvement.

<sup>2</sup> **Organized Community or Activity Oriented Groups** are scouts groups, civic organizations, garden clubs, trail groups and other groups that support a park or group of parks as a secondary aspect of their

Code and exempt from tax under section 501(a) of such title and which does not practice any action which constitutes a hate crime referred to in subsection (b)(1) of the first section of the Hate Crime Statistics Act (28 U.S.C. 534 note); or (B) a not-for-profit organization which is organized and conducted for public benefit and operated primarily for charitable, civic, educational, religious, welfare, or health purposes and which does not practice any action which constitutes a hate crime referred to in subsection (b)(1) of the first section of the Hate Crime Statistics Act (28 U.S.C. 534 note). See G. L. c. 21, § 17G.

**Stewardship Activity** means an activity undertaken on DCR property that does not include fundraising; such activities may include, but are not limited to, trail clearing, planting, trash pickup.

**Volunteer** shall mean an individual performing services for a Nonprofit Organization or a governmental entity (DCR) who does not receive either compensation (other than reasonable reimbursement or allowance for expenses actually incurred<sup>3</sup>) or any other thing of value in lieu of compensation, in excess of \$500 per year; such term includes a volunteer serving as a director, officer, trustee, or direct service volunteer. See G. L. c. 21, § 17G.

**Volunteer Project** shall mean the stewardship, maintenance, interpretive educational activity or any such other fundraising or special event or activity on DCR property that has been duly authorized by DCR under a Volunteer Project Description Form.

**Volunteer Project Description (VPD) Form** shall mean a form that documents a Volunteer Project as duly proposed by an individual Volunteer, Nonprofit Organization or DCR staff, attached hereto as Attachment A.

## APPLICABILITY

This Policy sets forth the conditions under which Nonprofit Organizations and Volunteers can engage in Volunteer Projects on DCR properties. This Policy also establishes guidelines, requirements and standards for: (1) authorizing and registering Volunteers to provide stewardship services; (2) the direction, control, safety and supervision of the Volunteers of a Nonprofit Organization; (3) requiring the Nonprofit Organization to provide DCR with an annual accounting of any funds generated and expenditures incurred as a result of the Volunteer Project; and (4) identifying the circumstances under which the Volunteers, while acting within the scope of their volunteer responsibilities under a Volunteer Project Description Form approved by DCR or a Stewardship Agreement duly executed by a Nonprofit Organization and DCR, are regarded as public employees within the meaning of G. L. c. 258<sup>4</sup>.

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organizational mission or purpose. These groups volunteer their skills, energy and expertise on a specific project or projects at DCR properties.

<sup>3</sup> While this reference to reimbursements is included in the federal definition of a volunteer as cited in the G. L. c. 21, § 17G., DCR is not able to reimburse volunteers for expenses incurred.

<sup>4</sup> G. L. c. 21, § 17G(d) provides:

[DCR] shall post on its website for public review and subsequently establish guidelines, requirements and standards for: (1) authorizing and registering volunteers to provide stewardship services; (2) delegating direction, control, safety and supervision of the volunteers to the nonprofit organization; (3) developing accounting and reporting procedures as required in

DCR will regard those Volunteers who are performing activities on behalf of DCR under an approved VPD Form or services for a Nonprofit Organization in accordance with a duly executed Stewardship Agreement as public employees within the meaning of G.L. c. 258.

This policy neither applies nor pertains to:

- a. Any activity by a Nonprofit Organization, or its members or individuals that is not authorized by DCR as a Volunteer Project; or
- b. The circumstances under which a volunteer performs services for a governmental agency other than DCR.

## **I. GENERAL VOLUNTEER GUIDELINES**

This section delineates the criteria, procedures and approvals required for all Volunteers and Nonprofit Organizations engaging in volunteer activities on DCR property.

### **A. Types of Volunteers**

A wide range of individuals and organizations volunteer at DCR properties. They range from Boy Scouts and Girl Scouts to senior citizens, and include individuals, families, and members of organizations such as park “friends” groups, civic groups, activity-oriented groups, community groups, corporate groups, religious organizations or youth- service organizations. The organizations may or may not be registered nonprofit (501(c) (3)) organizations.

### **B. Common Volunteer Activities**

Volunteers may perform a wide range of activities depending on the needs of the DCR property or facility. Common volunteer activities include:

- General clean-ups of an area, including litter and refuse removal.
- Greeting, welcoming and assisting park visitors by providing them with necessary information about the facility, local services, the park setting, and points of interest.
- Assisting DCR staff with educational programs or events.
- Removing invasive plant species.
- Researching historical or scientific information regarding park resources or property.
- Maintaining a park’s recycling center; sorting recyclable materials from non-recyclable materials.
- Planting flowers, trees or shrubs to enhance landscaping, create habitat or otherwise enhance a DCR property or facility.

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subsection (b); and (4) considering the volunteers, while acting within the scope of volunteer responsibilities for the department or the nonprofit organization, are regarded as public employees within the meaning of [G. L. c.] 258. In a civil action involving a volunteer who is considered a public employee, [DCR] may assert any defense or limitation on liability that the volunteer could have asserted under federal or state law.

- Performing minor trimming or weeding with hand tools.
- Performing trail maintenance activities such as removing fallen limbs, trimming brush, maintaining drainage structures, blazing trails, or creating steps or bog bridges.
- Organizing activities or events intended to promote public awareness and appreciation for park resources.

### **C. Activities Volunteers May Not Perform**

For the protection of the Volunteer and the Commonwealth, Volunteers may not perform any of the following activities:

- Operating state-owned vehicles, including pick-up trucks, “golf carts” or other vehicles. Volunteers may ride as passengers in state vehicles only while performing assigned duties or services.
- Operating state-owned power equipment.
- Operating personal or Nonprofit Organization-owned power equipment such as chainsaws, unless expressly authorized by DCR in a Stewardship Agreement.
- Collecting parking fees, camping fees or other revenue from the public, including disbursement of park funds to the public or other Volunteers.
- Wearing a DCR uniform or representing themselves as DCR employees.
- Any duty or activity that may be considered the enforcement of park rules or regulations or other state regulation or law.

In addition, any proposed Volunteer activity may be denied if, in the Agency’s opinion, the activity (a) presents a safety risk to the Volunteer, DCR employees or the general public; (b) would likely create a negative impression about the Department or the park system; (c) likely imposes additional liability upon the Department; or (d) likely imposes additional costs on the Department.

### **D. Facility Staff Responsibility**

DCR staff plays a critical role in ensuring that Volunteers have a successful and productive experience in assisting DCR with stewardship activities. DCR staff will endeavor to identify valuable volunteer stewardship activities for their respective facilities. DCR staff is often the initial point of contact for potential Volunteers and is responsible for assisting with the development of Volunteer Project Description Forms and implementation of this policy.

Subject to available resources, DCR staff shall endeavor to communicate to individual Volunteer and/or the Nonprofit Organization any applicable maintenance and quality standards associated with any applicable Volunteer Project. Unless otherwise stated in a Stewardship Agreement, DCR facility staff shall also endeavor to supervise, train, and coordinate Volunteer activities and provide the necessary tools and supplies to accomplish Volunteer Projects on DCR property.

### **E. Volunteer Recognition**

DCR shall develop a volunteer recognition program to honor volunteers based upon the number of hours of service to the Commonwealth.

## **II. FORMS AND PROCEDURES FOR ALL VOLUNTEERS AND ORGANIZATIONS**

This section describes procedures required for all Volunteers performing stewardship activities on DCR properties.

### **A. Volunteer Project Description (VPD) Form**

Any individual Volunteer or Nonprofit Organization or DCR staff member seeking to undertake a Volunteer Project shall complete a VPD Form attached hereto as Attachment A. The VPD Form ensures that DCR staff, the Volunteer and/or Nonprofit Organization have a clear and common understanding of the scale, scope and timing of the proposed Volunteer Project. DCR may approve Volunteer Projects that are part of an annual work plan, coordinated with the Facility Supervisor and detailed in the VPD Form.

The project proponent shall submit completed VPD Forms to the supervisor or manager overseeing the property on which the activity is sought to occur. The supervisor or manager will review the proposal and share with the appropriate DCR District Manager or Regional Director who will review all proposed Volunteer Projects within their jurisdiction to ensure that they meet DCR objectives and mission. The District Manager or Regional Director shall retain a copy of each VPD Form.

Volunteer projects that are limited to the activities shown in the “Common Volunteer Activities” list on page 5 may be approved at the regional level and do not require further administrative review.

Volunteer projects that involve activities beyond these common tasks shall be reviewed through these additional steps. Within two (2) business days of receipt, the District Manager or Regional Director shall forward a copy for review to the DCR Labor Relations Liaison, who will in turn make a copy available to DCR’s Office of Partnerships.

Within two (2) business days of receipt, the DCR Labor Relations Liaison shall transmit a copy of the VPD Form to the appropriate labor union representative for his/her review and comment. The appropriate labor union representative shall provide any written comments on the proposed Volunteer Project to DCR’s Labor Relations Liaison within two (2) business days of receipt. The District Manager or Regional Director shall coordinate with the Labor Relations Liaison to review any comments submitted by the union and shall, within two (2) business days of receipt of such comments, notify the project proponent in writing that the project has been approved, amended or denied.

### **B. Volunteer Release Form**

Prior to starting a Volunteer Project, each Volunteer shall complete and submit to DCR or the Non-profit Organization coordinating the activity, a Volunteer Release Form (Attachment B) for each VPD form under which they are volunteering.

To be considered a Volunteer under this Policy and to receive the liability coverage provided to an uncompensated public employee associated with the Volunteer Project (under G. L. c. 258), a Volunteer Release Form must be signed and submitted to DCR or the Non-profit Organization coordinating the activity, prior to beginning the Volunteer Project.

Volunteer Release Forms should be retained by the DCR facility with the VPD form in a file for the Volunteer Project. Any Volunteer performing an approved and ongoing Volunteer Project need only complete one Volunteer Release Form for each VPD form describing that project.

Nonprofit Organizations must ensure that all Volunteers performing volunteer services under their supervision sign Volunteer Release Forms before beginning volunteer activities. A Nonprofit Organization shall also be responsible for collecting the completed forms and delivering them to the Facility Supervisor within five days of the commencement of the approved Volunteer Project. No person may undertake volunteer activities without first having executed a Volunteer Release Form.

### **C. Volunteer Services Documentation**

Each DCR facility shall maintain a Volunteer Services Log, attached hereto as Attachment C. The log shall record the hours of volunteer service committed to all approved Volunteer Projects. Nonprofit Organizations conducting Volunteer Projects shall collect and enter the names and addresses of its participating Volunteers into the Volunteer Services Log and provide this information to the appropriate DCR staff within 7 calendar days of completion of the Volunteer Project. For those Volunteer Projects where the Volunteer is working directly with DCR, DCR shall collect and enter the names and addresses of individual Volunteers into the Volunteer Services Log. The DCR employee shall retain the Log for each project in order to complete the Volunteer Services report described below, within five (5) business days of receipt of the volunteer information contained in the Volunteer Services Log.

To be considered a Volunteer under this Policy and to receive the liability coverage provided to an uncompensated public employee associated with the Volunteer Project (under G. L. c. 258), the person's name must appear on the Volunteer Services Log; and the Volunteer must comply with the requirements of this Policy.

### **D. Volunteer Services Reporting and Review**

DCR staff shall provide a report on Volunteer service hours on a semi-annual basis (Attachment D). Reports shall be submitted to DCR Office of Human Resources, Training Unit by April 1<sup>st</sup> and October 1<sup>st</sup> of each year. The report shall identify the approved Volunteer Projects, the dates of volunteer activity, the total number of volunteer hours per Volunteer Project and the status of the project at the reporting date. DCR will also make this information available to Volunteers and Nonprofit Organizations. The DCR Labor Relations Liaison shall meet with all relevant DCR labor union representatives to discuss past Volunteer Projects.

### **E. Reimbursement**

DCR is not able to reimburse expenses incurred by volunteers.

## **III. STEWARDSHIP AGREEMENTS WITH NONPROFIT ORGANIZATIONS**



## **A. General Provisions**

DCR shall use Stewardship Agreements (Attachment E) to authorize DCR co-sponsorship of approved Volunteer Projects with those Nonprofit Organizations who seek to oversee stewardship activities on DCR properties. These agreements may allow for the delegation of Volunteer supervision to the Nonprofit Organizations and include provisions providing for the indemnity of the Commonwealth from liability that may occur as a result of Volunteer activity that has caused personal injury or property damage.

For Nonprofit Organizations that perform many volunteer projects on DCR lands each year, Stewardship Agreements can provide an efficient and effective way to plan and seek approval for several projects at one time.

In evaluating whether to execute a Stewardship Agreement with a Nonprofit Organization, DCR must ensure that the proposed stewardship activities supports a public purpose related to the Agency's mission and improves a DCR property or program.

Once DCR executes a Stewardship Agreement, the Agency shall be considered a co-sponsor and/or participant in the proposed stewardship activities; and any participating Volunteer of the Nonprofit Organization shall be deemed to be a public employee within the meaning of G. L. c. 258 while acting within the scope of authorized volunteer activities.

DCR staff shall ensure proper completion of the Stewardship Agreement and shall maintain a copy at the applicable DCR facility.

## **B. Special Procedures for Nonprofit Organization Fundraising and/or Special Event Activities - Public Purpose; Funds Used to Support DCR Facility**

Legislation permits DCR to co-sponsor and participate in an event or activity on DCR property with a Nonprofit Organization at which the Nonprofit Organization may be allowed to charge, or solicit or receive donations of funds at the event or activity. However, the event or activity must further a public purpose of DCR, and the funds generated must be used only for supporting or improving a DCR facility or program. G. L. c. 21, § 17G (b).

Nonprofit Organizations seeking DCR co-sponsorship of a fundraising and/or special event activity are subject to the following additional provisions:

1. Each Nonprofit Organization shall complete, submit and execute (i) a Stewardship Agreement (Attachment E); and (ii) a Special Use Permit Application.
2. The Nonprofit Organization should indicate on the Special Use Application that it is seeking co-sponsorship with DCR through a Stewardship Agreement. Please see <http://www.mass.gov/dcr/permits/index.htm> for details regarding DCR's Special Use Permit application process.

3. Nonprofit Organizations shall submit to DCR annually, by November 1, a record of all funds generated from co-sponsored fundraising activities or special events.

If DCR executes a Stewardship Agreement, the Agency shall be considered a co-sponsor and/or participant in the proposed stewardship, fundraising or special event activity; and any participating Volunteer of the Nonprofit Organization shall be deemed to be a public employee within the meaning of G. L. c. 258. However, as provided by G.L. c. 258, § 9, no volunteer or Nonprofit Organization shall be indemnified for intentional torts or a violation of a person's civil rights.

### **C. Activities Undertaken Absent a Stewardship Agreement – Funds Not Used to Support DCR Facility**

If DCR declines to execute a Stewardship Agreement for a stewardship, fundraising or special event, or the entity requesting co-sponsorship does not meet the definition of a Nonprofit Organization, the Agency shall not be considered a co-sponsor or participant in the event or activity for the purposes of this Policy. However, the proposed activities may proceed if the following conditions are met:

1. Where the VPD Form concerns a stewardship activity, the Volunteers sponsored by said entity may proceed with activities duly established under an approved VPD Form as provided in II.A., and such Volunteers shall be deemed to be uncompensated public employees within the meaning of G.L. c. 258 as provided therein.
2. Where the VPD Form concerns a fundraising or special event activity, DCR will proceed to make a determination on the Nonprofit Organization's pending Special Use Permit (SUP) Application. If DCR approves the SUP Application, the proposed activities may proceed without DCR sponsorship, but are nevertheless subject to the terms of the approved SUP. Note that when approved special events or fundraising activities occur on DCR property and the funds raised are not expended only for the support or improvement of DCR, Volunteers for those events or activities are not deemed uncompensated public employees and are, therefore, not afforded the protections of G.L. c. 258.

#### **IV. OTHER AGREEMENTS**

This section describes other types of agreements related to Volunteer Activities.

##### **A. Memoranda of Agreement with Volunteer Organizations**

Prior to the adoption of this policy, DCR entered into Memoranda of Agreement (MOA) with volunteer organizations. Any MOAs in effect on the effective date of this Policy shall remain in effect until so expired under the terms of the MOA. DCR will review these MOAs with each organization and determine whether to evaluate the activities it proposes through the process described in this policy. If DCR determines that the volunteer organization satisfies the definition of a Nonprofit Organization and DCR elects to co-sponsor the activities proposed by said Nonprofit Organization, DCR and the Nonprofit Organization will execute a Stewardship Agreement and DCR may delegate the supervision of Volunteers to the Nonprofit Organization. If DCR declines to co-sponsor activities proposed by the volunteer organization, or said organization does not meet the definition of a Nonprofit Organization, then said volunteer organization may proceed to apply for a Special Use Permit in accordance with Section IV.A.b.

**B. Host Camper Agreements**

Individuals interested in participating in the Host Camper Program shall complete a Host Camper Application form and comply with all relevant policies and procedures for that program.



## Attachment A

**Massachusetts Department of Conservation and Recreation  
Volunteer Project Description**

To be completed by DCR Staff and Volunteer or Non-Profit Organization

(Use additional pages if needed)

Project Title:		Region:
Location of Project:		Date of project:
<b>Project Categories:</b>		
<input type="checkbox"/> Park Conservation/ Stewardship <ul style="list-style-type: none"> <li><input type="checkbox"/> Landscaping/planting</li> <li><input type="checkbox"/> Litter removal</li> <li><input type="checkbox"/> Trail maintenance</li> <li><input type="checkbox"/> Recycling</li> <li><input type="checkbox"/> Other _____</li> </ul>		
<input type="checkbox"/> Volunteer Recruitment <input type="checkbox"/> Customer Service: Greeting or Customer Information <input type="checkbox"/> Scientific; Nature Studies, Inventory, or Observation <input type="checkbox"/> Educational: Training or Educational Program Delivery <input type="checkbox"/> Creative: Photography, Art, or Writing <input type="checkbox"/> Special Event or Fundraising (please also fill out a DCR Special Use Permit Application)		
Project Description: (general description, goals, anticipated results, examples of specific tasks) (Attach if necessary)		
Estimated Number of Volunteers:	Tools needed for project:	
Name of co-sponsor if any (Non-profit, Friends Group, etc.):		
Is this Project a: <input type="checkbox"/> One time need? <input type="checkbox"/> Seasonal need? <input type="checkbox"/> On-going need?		
If project is a seasonal or ongoing need, what is the estimated range (low to high) of total time (months, days, hours, etc.) to complete this Project?		
Months:	<b>and/or</b>	Days: <b>and/or</b> Hours:
When will there be volunteers? <input type="checkbox"/> <b>One Time Only</b> <input type="checkbox"/> <b>Temporarily</b> <input type="checkbox"/> <b>Year-Round</b>		

OR <input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> July <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec		
OR Specify Date (Start and End):		
Please identify preferred times of day or days of week for this project if applicable.		
What specific skills and/or qualifications are necessary for completion of this Project? (to be filled out by DCR staff)		
Submitted By – for DCR staff (please print)	<b>Signature</b> ➤	Date
Submitted by – for Volunteer Group:	<b>Signature</b> ➤	Date
Facility Supervisor or Manager	<input type="checkbox"/> Approved	Date:
District Manager	<input type="checkbox"/> Approved	Date:
Regional Manager	<input type="checkbox"/> Approved	Date:
Labor Relations	<input type="checkbox"/> Approved	Date:
Union	<input type="checkbox"/> Review	Date:
Office of Partnerships	<input type="checkbox"/> Review	Date:



Attachment B

Massachusetts Department of Conservation and Recreation
Volunteer Release Form

I, \_\_\_\_\_, (Your Name) a member of or participant in the activities sponsored by \_\_\_\_\_, (Name of the Organization, if applicable), understand the work that I have volunteered to do and I hereby state that I am qualified and physically capable of accomplishing the work and activities for which I have volunteered, and that I will perform them as directed by a properly authorized supervisor. I agree to comply with all DCR rules and regulations.

I hereby release the Commonwealth of Massachusetts and the Department of Conservation and Recreation (the "Department"), their employees and agents, from all claims, loss, damage, expenses and/or injuries, whether to person or to property, which may result from my actions while participating in volunteer programs and projects approved or sponsored by the Department.

I further agree to indemnify, defend and hold harmless the Commonwealth of Massachusetts and the Department, their employees and agents, from liability for any damage or injuries resulting from my actions while participating in volunteer programs and projects approved or sponsored by the Department.

I acknowledge that, by participating in such volunteer programs and projects, I have not received an appointment to state service and I will not receive a salary or payment from the Commonwealth. As such, I understand that I am not entitled to Workers Compensation for any injury suffered while involved in volunteer work or projects for the Department and, further, that I will provide my own health insurance.

I recognize that G.L. c. 21, § 17G provides that, pursuant to the provisions, requirements and limitations of G.L. c. 258 and the guidelines adopted by DCR, I shall not be liable for injury or loss of property or personal injury or death caused by my negligent or wrongful act or omission while acting within the scope of my volunteer activities. However, I acknowledge that I will not be indemnified under G. L. c. 258, Section 9 for intentional torts or for the violation of a person's civil rights

Signature \_\_\_\_\_ Date \_\_\_\_\_ Signature of Parent or Legal Guardian \_\_\_\_\_ Date \_\_\_\_\_
(For persons under 18 years of age)

Emergency Contact Information:

Name \_\_\_\_\_ Phone # \_\_\_\_\_

Relationship \_\_\_\_\_



**Attachment E**

**Stewardship Agreement**

**Between \_\_\_\_\_**

**and**

**The Department of Conservation and Recreation**

Whereas, the Commonwealth of Massachusetts, Department of Conservation and Recreation (DCR), is the owner and manager of the property known as \_\_\_\_\_ (the Facility); and

Whereas, \_\_\_\_\_ (Nonprofit Organization) is incorporated as a nonprofit organization as defined in 42 U.S.C. 14505; and

Whereas, DCR seeks to satisfy the requirements of G. L. c. 21, Section 17G(d)(2), which requires it to establish procedures for the delegating direction, control, safety and supervision of the volunteers to the Nonprofit Organization; and

Whereas, the Nonprofit Organization seeks to engage in a Volunteer Project or Projects at the Facility as defined and authorized in the DCR's Policy to Manage Volunteers on DCR Property;

Now, therefore, the parties agree as follows:

- a. This Agreement shall be effective for the scope of the Volunteer Project or Projects, as described in the Volunteer Project Description Form(s) which is/are attached and incorporated herein.
- b. DCR and the Nonprofit Organization shall comply with the procedures established in the DCR's Policy to Manage Volunteers on DCR Property.
- c. DCR staff shall coordinate volunteers at the Facility and may provide the necessary tools and supplies to accomplish the Volunteer Project.
- d. The Nonprofit Organization shall provide DCR with an annual accounting of funds and expenditures generated or otherwise associated with Fundraising or Special Events anticipated within this Stewardship Agreement and DCR's Policy to Manage Volunteers on DCR Property, provided that all funds shall be devoted to support or improve a DCR facility or program.
- e. Nonprofit Organization that conduct certain activities shall accept complete liability and responsibility for the Nonprofit Organization's use of the Facility and its actions and the actions of its volunteers in the Facility. When a Nonprofit Organization proposes to conduct the following activities<sup>5</sup>:

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<sup>5</sup> Please note that Stewardship Agreements and SUP's have different requirements for providing insurance and agreeing to indemnify DCR. If DCR enters into a Stewardship Agreement with a Nonprofit Organization, the terms of the Stewardship Agreement will apply. If DCR declines to enter into a Stewardship Agreement and instead issues a SUP, the terms of the SUP will apply.

More specifically, SUP's require that Permittees have Liability Insurance and provide DCR with a certificate of Insurance naming DCR as additionally insured. SUP's also require that Permittees agree to indemnify, defend and hold harmless DCR from any and all claims that may arise from the permitted event. Stewardship Agreements have different requirements because if DCR executes a Stewardship

- i. Stewardship activities that involve the use of certain tools or which, due to the nature of the Volunteer Project, create a risk to either the Volunteer or a member of the general public;
- ii. Provide food and beverage service to members of the general public; or
- iii. Use technical equipment (such as audio/visual equipment or amusements) when in connection with events attended by the general public, or events such as fairs, festivals, concerts, etc

they shall then carry general liability insurance having insurance coverage of at least \$100,000; and shall name DCR as an additional insured on said policy. The Nonprofit Organization will indemnify, defend and hold harmless DCR, up to the one hundred thousand dollars (\$100,000) liability limit as set forth in the Massachusetts Tort Claims Act, Mass. Gen. Laws c. 258, sec. 2, against any and all claims to the extent they arise as a result of the negligent or wrongful act or omission of the Nonprofit Organization and its volunteers in the performance of the activities authorized by this agreement.

- f. The Nonprofit Organization will not make any claims against DCR for any injury, loss or damage to persons (including bodily injury or death) or property occurring from any cause arising out of the authorized use by the Nonprofit Organization, its agents or volunteers, except to the extent those claims arise as a direct result of the negligence or wrongful act or omission of the DCR, its employees, contractors or authorized agents.
- g. Neither the Nonprofit Organization nor the Volunteer shall be indemnified under G. L. c. 258, Section 9 for intentional torts or a violation of a person’s civil rights.

I have read the forgoing conditions and provisions and approve of and agree to these terms.

\_\_\_\_\_  
Date Accepted

\_\_\_\_\_  
Nonprofit Organization:  
Title:

\_\_\_\_\_  
Date Approved

\_\_\_\_\_  
Authorized DCR Signatory  
Department of Conservation and Recreation

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Agreement, the agency shall be considered a co-sponsor and/or participant in the proposed stewardship, fundraising or special event activity; and any participating Volunteer of the Nonprofit Organization shall be deemed to be a public employee within the meaning of G. L. c. 258.



## Appendix F: USFS Trail Design Parameters

Trail Design Parameters provide guidance for the assessment, survey and design, construction, repair and maintenance of trails, based on the Trail Class and Designed Use of the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use HIKER-PEDESTRIAN		Trail Class 1	Trail Class 2	Trail Class 3*	Trail Class 4*	Trail Class 5*
Design Tread Width	Wilderness	0" – 12"	6" – 18"	12" – 24" Exceptions: May be 36-48" at switchbacks, turnpikes, fords and steep side slopes.	24" Exceptions: May be 36-48" at switchbacks, turnpikes, fords and steep side slopes.	Not applicable
	Non-Wilderness	0" – 12"	6" – 18"	18" – 48"	32" – 96"	36" – 120"
Design Surface	Type	Native, un-graded. Intermittent, rough.	Native with limited grading. Continuous, rough.	Native with some on-site borrow or imported materials.	Imported materials or hardening is common.	Uniform, firm, and stable.
	Obstacles	Roots, rocks, logs, steps to 24".	Roots, rocks and log protrusions to 6"; steps to 14".	Generally clear. Protrusions to 3"; steps to 10".	Smooth, few obstacles. Protrusions 2-3"; steps to 8".	Smooth, no obstacles. Protrusions <2".
Design Grade**	Target Range (>90% of Trail)	< 25%	< 18%	< 12%	< 10%	< 5%
	Short Pitch Max (Up to 200' lengths)	40%	35%	25%	15%	10%
	Max Pitch Density***	< 10% of trail	< 5% of trail	< 5% of trail	< 3% of trail	< 3% of trail
Design Cross-Slope	Target Range	Not applicable	5 – 20%	5 – 10%	3 – 7%	2 – 3% (or crowned)
	Maximum	Up to natural side-slope.	Up to natural side-slope	15%	10%	3%
Design Clearing	Width	Sufficient to define trail corridor.	24" – 36", with some encroachment into clearing area.	12" – 18" outside of tread edge.	12" – 18" outside of tread edge	12" – 24" outside of tread edge.
	Height	6'	6' – 7'	8'	8'	> 8'
Design Turns	Radius	No minimum.	2' – 3'	3' – 6'	4' – 8'	6' – 12'

\* Trail Classes 3, 4 and 5 may potentially provide accessible passage. If assessing or designing trails for accessibility, refer to current Agency trail accessibility guidance.

\*\* Grade variances should be based upon soils, hydrological conditions, use levels, and other factors contributing to surface stability and erosion potential.

\*\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (1/31/2005)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, repair and maintenance of trails, based on the Trail Class and Designed Use of the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>PACK AND SADDLE</b>		<b>Trail Class 1</b>	<b>Trail Class 2</b>	<b>Trail Class 3</b>	<b>Trail Class 4</b>	<b>Trail Class 5</b>
<b>Design Tread Width</b>	<b>Wilderness</b>	Not Applicable: Not designed for equestrians as primary user, although equestrians may be present.	12" – 18" Exceptions: May be to 48" at switchbacks, turn-pikes, fords and steep side slopes.	12" – 24" Exceptions: May be to 48" at switchbacks, turn-pikes, fords and steep side slopes. Up to 60" along precipices.	24" Exceptions: May be to 48" at switchbacks, turn-pikes, fords and steep side slopes. Up to 60" along precipices.	Not Applicable: Not designed for equestrians as primary user. Equestrians generally not present.
	<b>Non-Wilderness</b>		12" – 24" (With above exceptions)	18" – 48" (With above exceptions)	36" – 96"	
<b>Design Surface</b>	<b>Type</b>		Native, w/ limited grading.	Native with some on-site borrow or imported materials.	Native with some imported materials or stabilization.	
	<b>Obstacles</b>		Roots, rocks, logs to 12"	Generally clear. Occasional protrusions to 6".	Smooth, few obstacles. Occasional protrusions 2-3".	
<b>Design Grade*</b>	<b>Target Range (&gt;90% of Trail)</b>		< 20%	< 12%	< 10%	
	<b>Short Pitch Max (Up to 200' lengths)</b>		30%	20%	15%	
	<b>Max Pitch Density***</b>		< 5% of trail	< 5% of trail	< 3% of trail	
<b>Design Cross-Slope</b>	<b>Target Range</b>		5 – 10%	5%	5%	
	<b>Maximum</b>		Natural side-slope	10%	10%	
<b>Design Clearing</b>	<b>Width</b>		36" – 48"	60" – 78"	72" – 96"	
	<b>Height</b>	8' – 10"	10'	10' - 12'		
<b>Design Turns</b>	<b>Radius</b>	4' – 5'	5' – 6'	6' – 10'		

\* Grade variances should be based upon soils, hydrological conditions, use levels, and other factors contributing to surface stability and erosion potential. Due to effects of use on tread and erosion, steeper pitches should be carefully evaluated based on potential effects of these various factors.

\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (6/18/2002)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, repair and maintenance of trails, based on the Trail Class and Designed Use of the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>BICYCLE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Tread Width</b>	<b>One Lane</b>	6" – 12"	12" – 24"	18" – 30"	24" – 48"	36" – 60"
	<b>Two Lane</b>	Not applicable.	Not applicable.	48" – 60" Accommodate two-lane travel with passing lanes.	60" – 84"	72" – 120"
<b>Design Surface</b>	<b>Type</b>	Native. Rough, unstable or soft tread.	Native, with limited grading. Unstable or soft sections likely.	Native with some on-site borrow or imported materials. Some soft areas.	Likely imported or stabilized tread. Few, if any, loose or soft surfaces.	Firm, hardened surface.
	<b>Obstacles</b>	Rocks, logs and roots up to 6–12" common. Forced portages likely.	Embedded rock, protrusions to 6". Some portages may be needed.	Generally smooth with few protrusions exceeding 3".	Smooth, few obstacles. 1 – 2" protrusions.	No obstacles to wheeled transport.
<b>Design Grade*</b>	<b>Target Range</b> (>90% of Trail)	15% – 18%	< 12%	< 10%	< 8%	< 5%
	<b>Short Pitch Max</b> (Up to 200' lengths)	30% 50% on downhill-only travel.	25% 35% on downhill-only travel.	15%	10%	8%
	<b>Max Pitch Density***</b>	< 10% of trail	< 5% of trail	< 5% of trail	< 3% of trail	< 3% of trail
<b>Design Cross-Slope</b>	<b>Target Range</b>	5% – 10%	5% – 10%	5%	3% – 5%	3% – 5%
	<b>Maximum</b>					
<b>Design Clearing</b>	<b>Width</b>	24" – 36" Some vegetation may encroach into clearing area.	36" – 48" Some light vegetation may encroach into clearing area.	12" – 18" outside of tread edge.	12" – 18" outside of tread edge.	18" – 24" outside of tread edge.
	<b>Height</b>	6' – 7"	7' – 8"	8'	8' - 9'	8' - 9'
<b>Design Turns</b>	<b>Radius</b>	3' - 4'	4' – 6'	6' – 8'	8' – 10'	8' - 12'

\* Grade variances should be based upon soils, hydrological conditions, use levels, and other factors contributing to surface stability and erosion potential. Due to effects of use on tread and erosion, steeper pitches should be carefully evaluated based on potential effects of these various factors.

\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (6/18/2002)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, reconstruction and maintenance of trails, based on the Trail Class and Designed Use identified for the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>ALL TERRAIN VEHICLE</b>		Trail Class <b>1</b>	Trail Class <b>2</b>	Trail Class <b>3</b>	Trail Class <b>4</b>	Trail Class <b>5</b>
<b>Design Tread Width</b> [If sideslopes are >50%, increase widths by 6"-18"]	<b>One Lane</b>	NA – Not designed for ATV as primary user.	30" – 48" At switchbacks, > 48"	42"-60" At switchbacks, >60"	54"-72" At switchbacks, >60"	NA – Not designed for ATV as primary user.
	<b>Two Lane</b>		Typically not designed for two-lane travel. Passing areas (uncommon) - 60"	60" and/or accommodate with passing areas 60"-78".	72"-96"	
<b>Design Surface</b>	<b>Type</b>		Native, w/ limited or no grading. Commonly soft and unstable.	Native w/ some onsite barrow or imported materials. Some loose or soft sections.	Relatively firm and stable. Gravel, pavers or other imported materials possible.	
	<b>Obstacles</b>		Embedded rock, steps, waterbars, holes and protrusions to 6".	Generally smooth, with few protrusions exceeding 4". Drain dips and low waterbars.	Smooth, few obstacles. 1-3" protrusion. Drain dips or waterbars with low-angle approach.	
<b>Design Grade*</b>	<b>Target Range</b> (>90% of Trail)		<25%	<15%	<10%	
	<b>Short Pitch Max</b> (Up to 200' lengths)		35%	25%	15%	
	<b>Max Pitch Density**</b>		<10% of trail	<5% of trail	<5% of trail	
<b>Design Cross-Slope</b>	<b>Target Range</b>		5% – 10%	3% – 5%	3% – 5%	
	<b>Maximum</b>	15%	10%	8%		
<b>Design Clearing</b>	<b>Width</b> [On steep side hills, increase clearing on uphill side by 6 – 12"]	36"- 48" Some vegetation may encroach into clearing area.	8"-12" outside of tread edge.	>12" outside of tread edge		
	<b>Height</b>	5' – 6'	6' – 7'	8'		
<b>Design Turns</b>	<b>Radius</b> [Use Climbing Turns vs. Switchbacks for ATVs whenever possible]	6' – 8'	8' – 10'	>10'		

\* Grade variances should be based upon soils, hydrological conditions, use levels, and other factors contributing to surface stability and erosion potential. Due to effects of use on tread and erosion, steeper pitches must be carefully evaluated based on potential effects of these various factors.

\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (6/18/2002)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, repair and maintenance of trails, based on the Trail Class and Designed Use of the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>MOTORCYCLE</b>		<b>Trail Class 1</b>	<b>Trail Class 2</b>	<b>Trail Class 3</b>	<b>Trail Class 4</b>	<b>Trail Class 5</b>
<b>Design Tread Width</b>  [Note: If side-slope >50%, increase widths by 6" – 18"]	<b>One Lane</b>	Not Applicable: Not designed for equestrians as primary user, though equestrians may be present.	8" – 24" At switchbacks, 36 – 48"	18" – 36" At switchbacks, > 48"	30" – 48" At switchbacks, > 48"	Not Applicable: Not designed for equestrians as primary user, though equestrians may be present.
	<b>Two Lane</b>		Typically not designed for two-lane travel. Passing areas (uncommon) up to 60".	48" – 60" Occasional passing lanes to 72".	60" – 72"	
<b>Design Surface</b>	<b>Type</b>		Native, with limited or no grading. Commonly unstable and soft.	Native with some on-site borrow, pavers, or imported materials. Some loose or soft areas.	Gravel, pavers or other imported materials possible. Relatively firm, stable surface.	
	<b>Obstacles</b>		Soft sand and embedded rock, steps and protrusions up to 12".	Generally smooth with few protrusions exceeding 6".	Smooth, few obstacles. Few 2" – 4" protrusions.	
<b>Design Grade*</b>	<b>Target Range</b> (>90% of Trail)		< 25%	< 15%	< 10%	
	<b>Short Pitch Max</b> (Up to 200' lengths)		40% Rarely to 50% on downhill-only travel.	25%	15%	
	<b>Max Pitch Density***</b>		< 10% of trail	< 10% of trail	< 5% of trail	
<b>Design Cross-Slope</b>	<b>Target Range</b>		5% – 10%	5%	3% – 5%	
	<b>Maximum</b>	15%	10%	10%		
<b>Design Clearing</b>	<b>Width</b> [Note: On steep side-hills, increase clearing on uphill side by 6-12"]	36" – 48" Some vegetation may encroach into clearing area.	12" – 18" outside of tread edge.	> 18" outside of tread edge.		
	<b>Height</b>	7' – 8"	8'	8' - 9'		
<b>Design Turns</b>	<b>Radius</b>	4' – 5'	5' – 6'	6' – 8'		

\* Grade variances should be based upon soils, hydrological conditions, use levels, and other factors contributing to surface stability and erosion potential. Due to effects of use on tread and erosion, steeper pitches should be carefully evaluated based on potential effects of these various factors.

\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (6/18/2002)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, reconstruction and maintenance of trails, based on the Trail Class and Designed Use identified for the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>CROSS-COUNTRY SKI</b>		Trail Class 1	Trail Class 2	Trail Class 3*	Trail Class 4*	Trail Class 5*
<b>Design Groomed Width*</b>	<b>One Lane</b>	N/A – Not designed or managed for skiers as primary user.	3'-4'. If groomed, width of grooming equipment.	6'-8' (or minimum width of grooming equipment).	8'-10", but typically managed to accommodate two-way passage.	N/A – Not designed or managed for skiers as primary user.
	<b>Two Lane</b>		Typically not designed for two-lane travel. Employ 6'-8' passing areas in steeper sections.	>8' (or min width of grooming equipment) and/or accommodate with passing areas 8'-12' wide.	12'-14'.	
<b>Design Grooming &amp; Surface</b>	<b>Type</b>		Coarse compaction. Occasional or no grooming (may be ski-packed). Snowmobile packing sufficient. Tracklayer optional.	Groomed or compacted using implements and/or tracklayer when packed surface is snow-covered, drifted, melted or skied out.	Well-groomed with tiller and/or other implements. Groomed frequently, and when groomed surface becomes degraded or buried.	
	<b>Obstacles</b> [Caused by use, lack of grooming, melt, or surface/subsurface protrusions]		Dips, bumps, or ruts to 12" common and may be tightly spaced. Surface obstacles may occasionally require off-trail bypass.	Generally smooth. Dips, bumps, or ruts to 8" uncommon and widely spaced. Surface obstructions not present.	Consistently smooth. Small, rolling bumps, dips and rises. Surface obstructions not present.	
<b>Design Grade**</b>	<b>Target Range</b> (>90% of Trail)		<15%	<10%	<8%	
	<b>Short Pitch Max</b> (Up to 200' lengths)		25%	20%	12%	
	<b>Max Pitch Density***</b>		<10% of trail	<5% of trail	<5% of trail	
<b>Design Cross-Slope</b>	<b>Target Range</b>		<10%	<5%	<5%	
	<b>Maximum</b> [For up to 50']	20%	15%	10%		
<b>Design Clearing</b>	<b>Width</b>	4'-6' (or minimum width of grooming equipment, if larger). Light vegetation may encroach into clearing area	>1' outside of groomed edge. Light vegetation may encroach slightly into clearing area.	>2' outside of tread edge. Widen clearing at turns or if increased sight distance needed.		

Designed Use <b>CROSS-COUNTRY SKI</b>		<b>Trail Class 1</b>	<b>Trail Class 2</b>	<b>Trail Class 3*</b>	<b>Trail Class 4*</b>	<b>Trail Class 5*</b>
	<b>Height</b> [Above normal max. snow level]		6'-8' or height of grooming machinery, if used.	>8' or height of grooming machinery.	10'	
<b>Design Turns</b>	<b>Radius</b> [Use Climbing Turns versus Switchbacks for Ski trails whenever possible]		8'-10' if not snowcat-groomed. OR: Minimum based on turning limits of grooming machine.	15'-20' (Provide sufficient radius for grooming equipment).	>25'	

\* Trail Classes 3, 4 and 5 may potentially provide accessible passage. If assessing or designing trails for accessibility, refer to current Agency trail accessibility guidance.

\*\* Grade variances should be based upon factors such as common snow type, use levels, tightness of turns, and other factors contributing to surface stability and erosion potential.

\*\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## USFS Trail Design Parameters (6/18/2002)

Trail Design Parameters provide guidance for the assessment, survey and design, construction, reconstruction and maintenance of trails, based on the Trail Class and Designed Use identified for the trail. Exceptions and variances to these parameters can occur, however, when site-specific circumstances demand such exceptions.

Designed Use <b>SNOWMOBILE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
<b>Design Tread Width</b>	<b>One Lane</b>	N/A – Not designed for Snowmobile as primary user.	Typically not groomed, but commonly signed. If groomed, 4'-6' (or minimum width of grooming equipment.)	6'-8' (or minimum width of grooming equipment). On tight-radius turns, increase groomed width to >10'.	8'-10'. On tight-radius turns, increase groomed width to >12'.	N/A – Not designed for Snowmobile as primary user.
	<b>Two Lane</b>		Typically not groomed, but commonly signed. If groomed, >8' groomed width.	>11' and/or accommodate with passing areas 12'-14' wide.	12'-16'. On tight-radius turns, increase groomed width to >14'.	
<b>Design Surface</b>	<b>Type</b>		Occasional or no grooming or user-packed. Coarse compaction with cat or snowmobile. Use of implements optional.	Groomed or compacted after significant snow accumulations or when moguled/rutted. Use of implements likely.	Well-groomed with tiller and/or other implements. Groomed frequently, soon after significant snow accumulations and before surface is degraded.	
	<b>Obstacles</b> [Caused by use, lack of grooming, or surface and subsurface protrusions]		Dips/bumps/ruts to 24" common and may be tightly spaced. Obstacles may occasionally require off-trail bypass.	Generally smooth. Dips, bumps, ruts to 12" infrequent and widely spaced. Surface obstacles not present.	Consistently smooth. Small, rolling bumps, dips and rises. Surface obstacles not present.	
<b>Design Grade*</b>	<b>Target Range</b> [>90% of Trail]		<20%	<15%	<10%	
	<b>Short Pitch Max</b> [Up to 200' lengths]		35%	25%	20%	
	<b>Max Pitch Density**</b>		<10% of trail	<5% of trail	<5% of trail	
<b>Design Cross-Slope</b>	<b>Target Range</b>		<15%	<10%	<5%	
	<b>Maximum</b>	25%	15%	10%		
<b>Design Clearing</b>	<b>Width</b>	4'-6' (or minimum width of grooming equipment if used). Some vegetation may encroach into clearing area	>1' outside of groomed trail edge. Light vegetation may encroach into clearing area.	>2' outside of groomed trail edge. Widen clearing at turns or if increased sight distance needed.		



Designed Use <b>SNOWMOBILE</b>		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
	<b>Height</b> [Above normal maximum snow level]		>6' (Provide sufficient clearance for grooming equipment if used).	>7' (Provide sufficient clearance for grooming equipment).	10' (Provide sufficient clearance for grooming equipment).	
<b>Design Turns</b>	<b>Radius</b> [Use Climbing Turns vs. Switchbacks for Snowmobiles whenever possible]		8'-10' if not groomed. (Provide sufficient radius for grooming equipment if used – typically 15-20')	15'-20' (Provide sufficient radius for grooming equipment).	>25'	

\* Grade variances should be based upon factors such as common snow type, use levels, tightness of turns and others

\*\* Maximum pitch density refers to the percentage of the trail that is within 5% (+/-) of the Short Pitch Maximum Grade.

## Appendix G

### Mapping Trails the DCR Way

David Kimball, DCR GIS

[david.kimball@state.ma.us](mailto:david.kimball@state.ma.us)

617-626-1447

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This document describes the method used by DCR GIS staff to map forest and park trails using GPS (Global Positioning System).

After several years of experience mapping our agency's trail networks, we have developed a methodology that lets us obtain accurate, useful trail data. It requires a fairly high-quality GPS unit that can take point and line features with complex attributes. We have used Trimble GPS units (GeoExplorer II, GeoExplorer3 and 3c, ProXR, and more recently the GeoXM and GeoXT with ArcPad and GPScorrect software). This document does not cover a specific GPS unit; the information should be applicable to any GPS unit of adequate specifications.

The principle concept we use for mapping trails is that of a topological network. In simpler terms, the trails are individual lines that meet at trail intersection points. Lines begin and end where they meet other trails; a single line does not continue through an intersection. This approach has two major benefits: it allows the lines that meet at an intersection to be snapped to an accurate point, and it provides a measure of quality control because the intersection points are coded with an attribute showing how many trails meet there. If the GPS user doesn't map one of the trails that should come into an intersection, it is easy to tell that a trail is missing because the numbers won't match.

#### Features and Attributes

The GPS unit should be set up to collect point and line features, each of which has several attribute fields. With the Trimble units we have used, some use a file called a "Data Dictionary" which contains information on the types of features that can be collected and what attributes are needed for each, and some collect data into a shapefile, which can be customized to have a form where the user can enter in similar attribute information. In both cases some of the attributes can be chosen from a picklist (which limits the possible attribute values and ensures consistent spelling). For both feature types the current date and time are collected as attributes, and some other GPS information may be collected depending on the hardware and software.

For lines, the attributes collected are:

Type: Trail, Road, or Other

Condition: Good, Fair, or Poor

Surface: Natural, Paved, Gravel, or Other

Width: 0-5', 5-10', or 10'+

Comments: a text field that the user can type anything into

For points, the attributes collected are:

Type: Trail Intersection, Road Intersection, Trail/Paved Rd., Trail/Unpaved Rd., Paved/Unpaved Rd., Trailhead, Dead End, [those first seven are intersection types] Parking Area, Gate, Bridge, Stream Xing, Campsite, Scenic/View, Utility Lines, Wetland, Vernal Pool, or Other

Num: 0, 1, 2, 3, 4, 5, or 6+

Comments: a text field that the user can type anything into

Photo Taken: True/False – whether the user took a photo at this point (default is false)

Photo ID: If they took a photo, the number of the photo

Field Note: If they wrote a note (on paper) about this point, the number of the note

It is important to familiarize yourself with the possible attribute values (especially the many values for point Type) so that you will be on the lookout for these features in the field. For instance, you need to be aware that if you cross a stream or bridge, you should take a point there.

## Field Work

Typically your day will start at a parking lot. This is a good opportunity to take your first point of the day – Type should be Parking Area. This will also help you get back to your vehicle at the end of the day! If you start at a point that is not a parking lot, it may be a Trailhead. After taking this first point, start your first line. Walk along this line until you get to the first intersection (an intersection is anywhere that the trail splits or hits another trail or road). When you get to the intersection, stop your line and enter its attributes. These attributes apply to the entire line. If a section of trail changes dramatically at some point other than an intersection (for instance, if it goes from being gravel to dirt, or from being 15 feet wide to 4 feet wide, etc.) then you'll need to end the line at that point, enter the attributes, and then start a new line. This way the attributes will be accurate for the line they are associated with.

Now you are at an intersection. Take a point at the intersection, giving it a Type of Trail Intersection (or Road Intersection, Trail/Paved Rd. or Trail/Unpaved Rd. or Paved/Unpaved Rd. as the case may be) and then enter the number of trails that meet at this intersection into the Num field. **IMPORTANT**: this number includes all the possible ways you can go from the intersection, including the trail you came in on. A trail that splits has a value of 3; a place where two trails cross has a value of 4 (see images below). Entering this number correctly is essential.



A three-way intersection (red dot is intersection point)



A four-way intersection



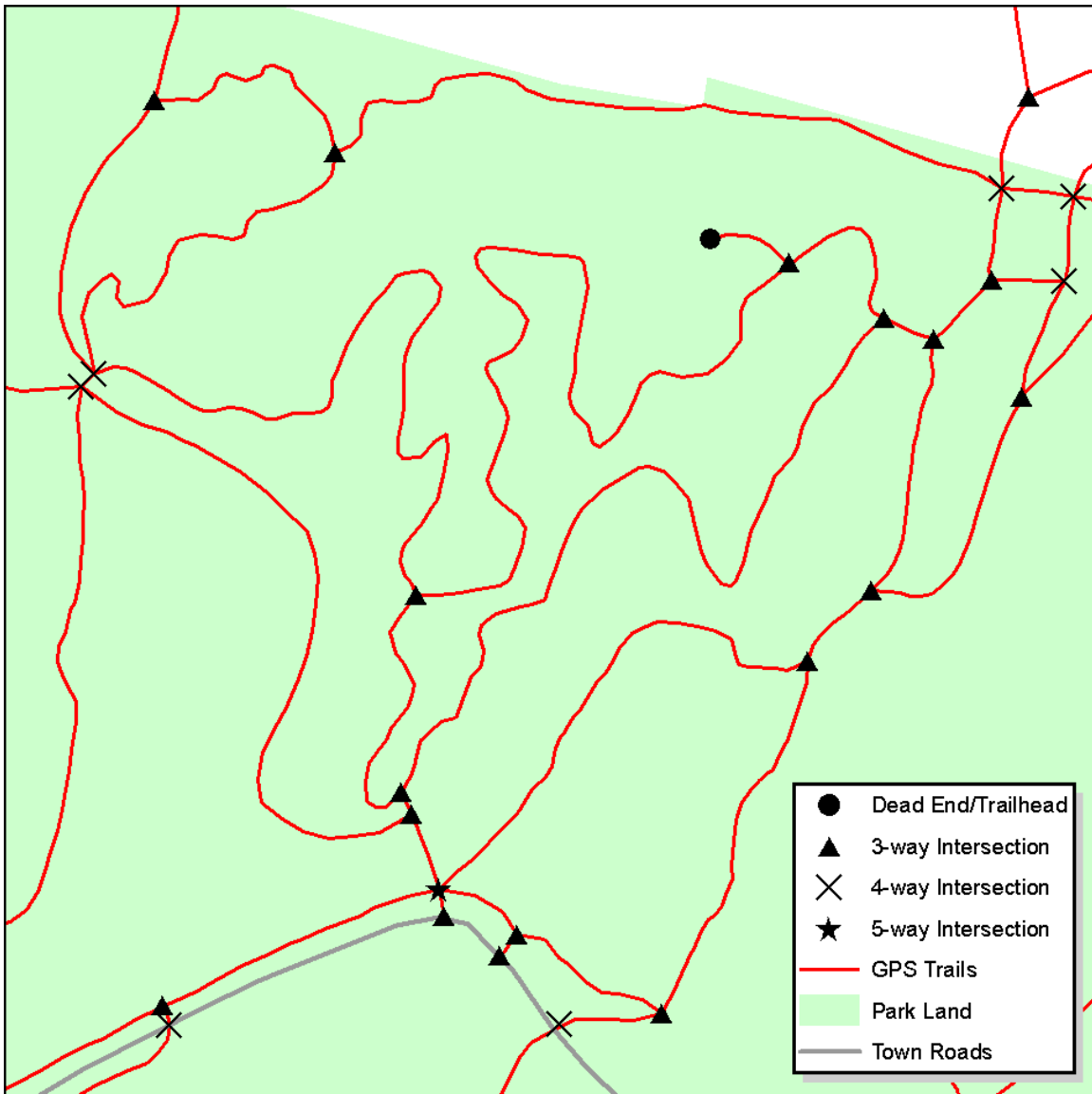
A five-way intersection



A two-way “intersection” is just a point along a trail (not actually an intersection!)

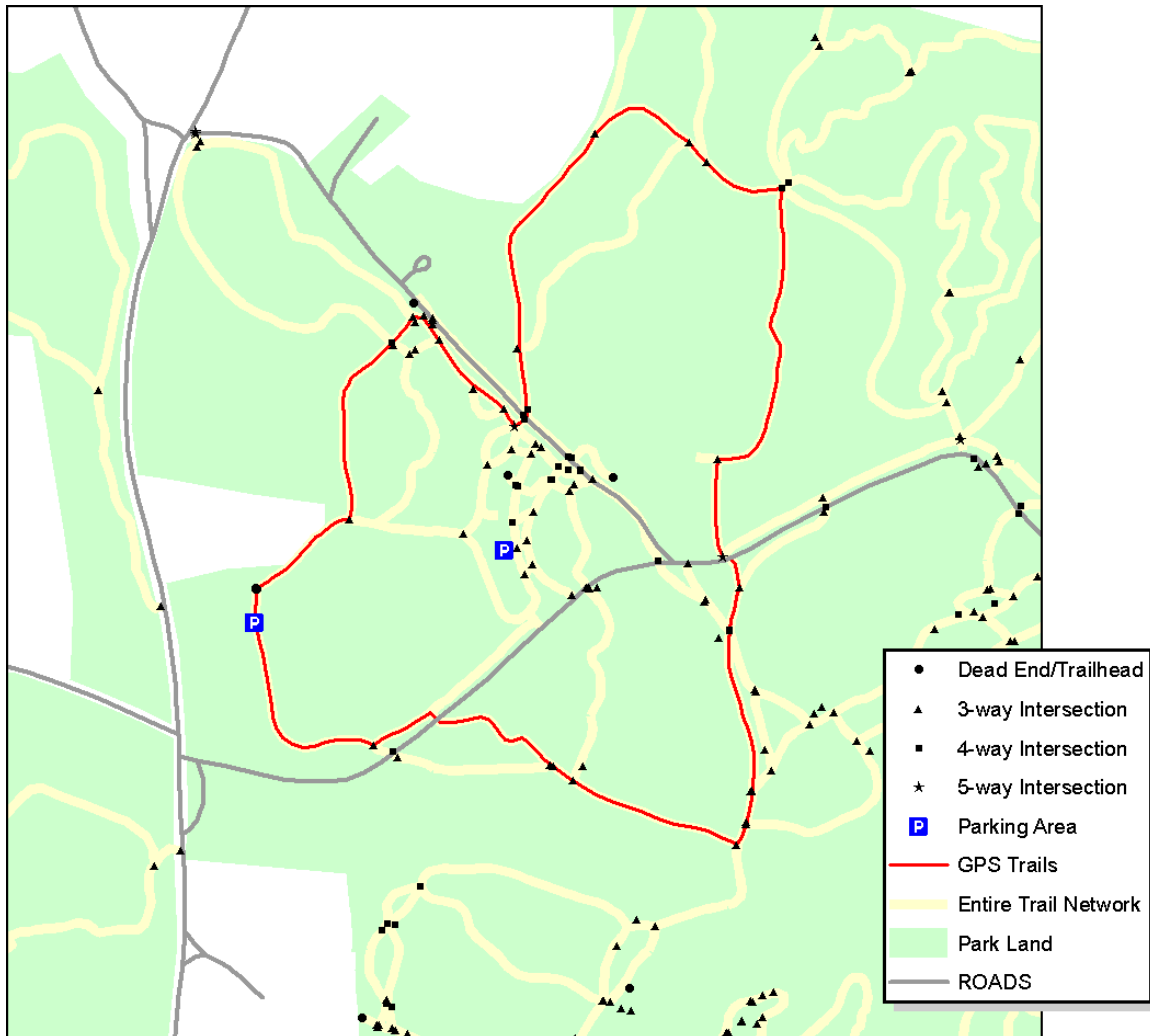


A one-way “intersection” is a dead end or trailhead or parking lot (there is only one way you can go)

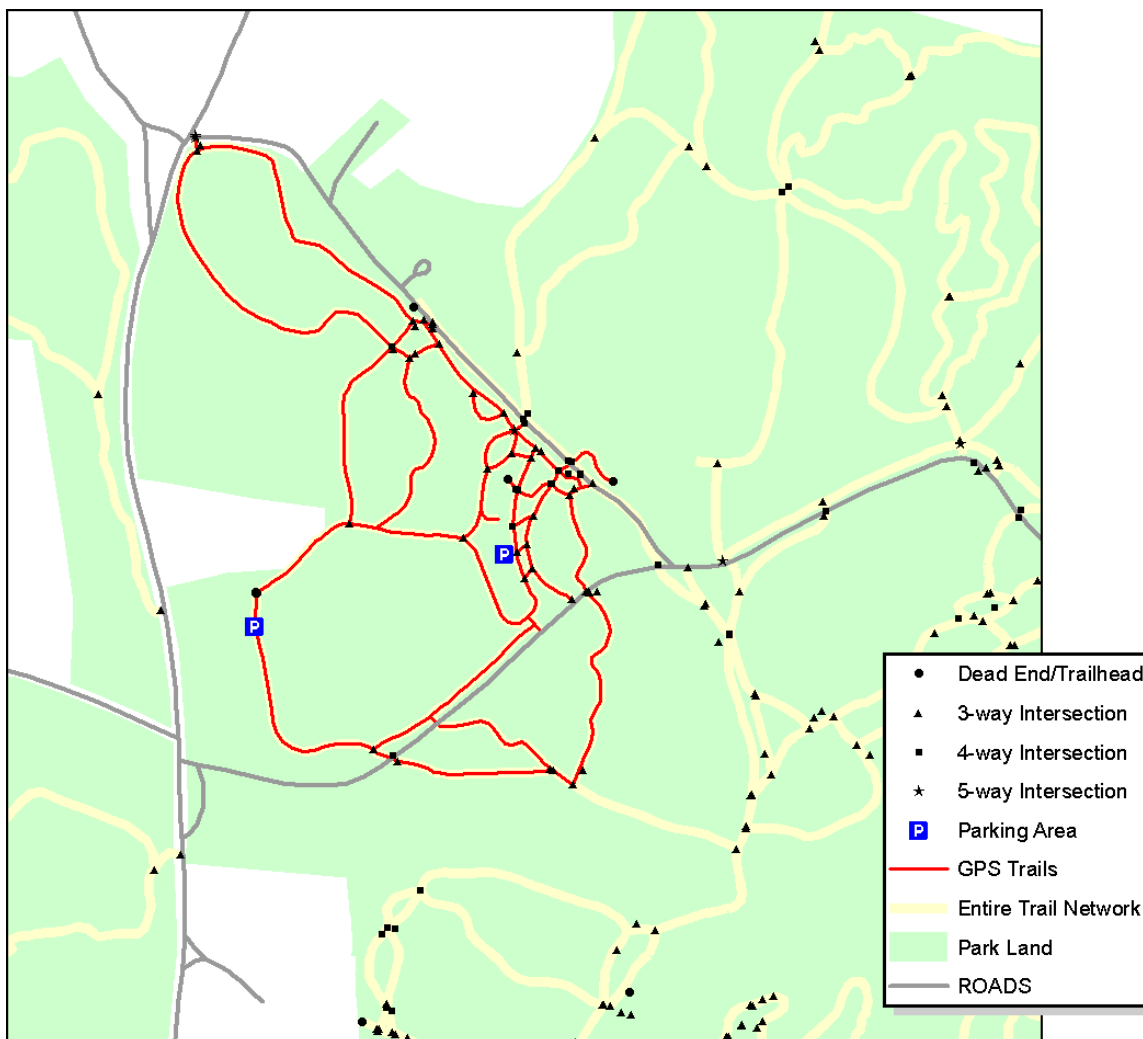


*Here’s an example of part of a trail map showing trail intersection points symbolized by the number of trails that meet at that intersection.*

Now you need to choose which way to go next. The way you walk when GPSing trails is very different from the way you walk when you're out for a pleasant walk in the woods. If you walk a long loop on a trail through the forest, you will miss all the side trails and you'll have to go back for them later. It is best to try to walk every side trail in a section of the park or forest before moving on to another section. This way you won't have to go back to get that one piece of trail you missed. Inevitably you will end up backtracking quite a bit to get to every trail section. Avoid the instinct to just keep walking on the main trail.



*This is a bad example of how to walk when GPSing trails. The user walked a large loop, but will have to go back and GPS all the side trails he missed. This was basically a complete waste of time, since he'll end up walking almost all these trails again to get to the missed trails.*



*This is a good example of how to walk. The user chose a small area of the park to concentrate on and GPSed every side trail in that area. Now that part of the park is done and the next day she can start on a new area.*

Continue walking trail sections and collecting intersection points (and other points like bridges, gates, stream crossings, etc.). Eventually you will build up a connected network of intersection points and trail sections that will fill the whole park. For all but the smallest parks, this will take more than one day. If you have time between fieldwork days, make a map of your progress, symbolizing the intersection points by how many trails are supposed to meet there. This will help you see which areas you need to return to (if you see a four-way intersection with only three trails sticking out of it, you'll need to return to get that missing trail). If the park is segmented by paved town roads (like in the image above), try not moving to a new section across a road until you are sure you have gotten every trail in the section you are in. Remember, you are collecting data, and if you only collect 90% of the trails in the park, your dataset is worse than useless: it is misleading.

Sometimes park users create their own trails that are not considered official by the park management. It is a good idea to GPS these trails anyway, even if they are clearly unofficial. This way the park managers can have a clear record of where the trails are so they can decide what to do about them (either block them off, ignore them, or make them into an official trail). They can be removed from the trail data later, but if you don't GPS them, no one will ever know about them. If you think a trail is unofficial, put a note in the Comments attribute field.

### **GPS techniques**

For points, the GPS unit should be set up to average several position readings to get a more accurate point. We have generally used 30 position readings, one per second. It is important not to move away from the point while taking these positions.

For lines we generally set the GPS unit to take a reading (vertex) every 4 seconds if on foot; if the user is riding a bike, car, or other vehicle, set it to take a reading more often. When walking a line it is important to be aware of the GPS status—if your GPS unit stops receiving positions you need to slow down or stop until it resumes collecting vertices. If you keep walking your line will have long straight segments that will not accurately reflect the trail shape. This is especially important if the trail has sharp turns; make sure you slow down and collect a position (vertex) at any sharp corner in the trail. Some GPS units beep with every vertex collected; some will make a sound if they stop getting readings, and some may indicate GPS status visually.

## Appendix H

### DCR – NHESP Biodiversity Conservation Initiative Conditions for Yellow Guidance Codes

1. The trail segment does not cross a stream, river, pondshore, lakeshore, or muddy bank. The trail work covers less than 100 meters of trail length.
2. The trail is not on a river bank.
3. No work is carried out within 25' of a stream.
4. No work is carried out within 50' of a stream.
5. All trail work must be done entirely with hand tools; if machinery is used, turtle sweeps must be done over the entire work area (including areas where vehicles are driven to the work area) prior to each day's work.
6. All trail work shall be carried out from October 1-April 15; during the rest of the year, if machinery is used, turtle sweeps must be done over the entire work area (including areas where vehicles are driven to the work area) prior to each day's work.
7. No work is carried out between April 15-August 10.
8. No work is carried out between May 1-July 20.
9. No work is carried out between April 1-July 15.
10. No work is carried out between April 1-August 31.
11. No work is carried out between May 20-August 1.
12. No work is carried out between March 15-May 15.
13. No work is carried out between March 15-August 1.
14. No work is carried out between January 1-August 15.
15. No work is carried out between May 20-July 20.
16. No work is carried out between April 15-July 20.
17. No work is carried out between April 15-August 31.
18. Before any work, surveys must be conducted as described in the definition below. If no vernal pools or breeding amphibians are found, then the work may proceed. If any vernal pools or breeding amphibians are found, then NHESP must review Site Specific Plans under MESA before work proceeds. A report of the survey results must be submitted to NHESP **before** work proceeds, regardless of whether vernal pools or breeding amphibians are found or not. Note that these surveys must be conducted at the appropriate time of year, as described in the survey definition.
19. Between April 15 and October 15, no mowers or brush-hogs can be used. If mowers or brush-hogs must be used, then either the vegetation must be less than 1 foot high, or the vegetation must be swept with a long stock immediately prior to mowing or brush-hogging. Between October 15 and April 15, mowers or brushhogs may be used with no additional conditions.
20. Rocks more than 20 feet from trail must not be moved.
21. Drainage must not be directed towards rock ledges, rock piles, or talus slopes.
22. Drainage must not be directed towards rock ledges, rock piles, or talus slopes; rocks more than 20 feet from trail must not be moved.



23. From May 1 to October 15, only woody plants may be cut or removed and only hand-held manual or mechanized tools may be used. From October 15 to May 1, mowing or weed-whacking is allowed. No vehicles or heavy machinery may be used unless the ground is frozen.
24. No soil is removed or disturbed (no digging or re-grading) outside of existing trail bed. (To be revised.)
25. No woody vegetation may be cut or removed, except small branches growing into the corridor of foot trails, or dead or dying stems and trunks leaning or fallen into the trail corridor, which may be removed with hand tools or chain saws. For this purpose, the foot trail corridor is defined as a rectangle 1 foot wider than the footprint of the existing trail and 8 feet high centered over the foot trail. No branches over 2 inches in diameter may be removed. No vehicle-mounted equipment may be used for trimming woody vegetation in the trail corridor.
26. No spruce trees may be cut or removed.
27. No herbaceous vegetation may be removed from rock walls, ledges, or outcrops.
28. Puncteons must be less than 20 feet long and represent less than 5% of the entire trail segment.
29. From June 1 to September 30, only woody plants may be cut or removed and only hand-held manual or mechanized tools may be used. From October 1 to May 31, mowing or weed-whacking is allowed. No vehicles or heavy machinery may be used unless the ground is frozen.
30. No aquatic plants may be removed by manual, mechanical, or chemical means; structures over water must be less than 4 feet wide.
31. From July 1 to March 15, only woody plants may be cut or removed and only hand-held manual or mechanized tools may be used. From March 16 to June 30, mowing or weed-whacking is allowed. No vehicles or heavy machinery may be used at any time.

### **Definitions**

\*Turtle sweep: the entire trail in question has been thoroughly searched for turtles on and within 5 feet of trail; if a turtle is found it should be moved approximately 20 feet (not >50 feet) away from work limits.

\*\*Surveys: Amphibian/Vernal Pool Surveys must include the following parameters:

- Surveys must be completed by personnel who are pre-approved ahead of time by NHESP to conduct vernal pool and/or rare salamander surveys. Rather than provide such approval on a project-specific basis, NHESP is willing to annually approve a list of qualified DCR staff and/or contractors, and update the list as needed.
- Surveys will include egg mass counts during the obligate amphibian breeding season (March - May); the specific timing of the surveys should be determined by documented amphibian movement phenology in a given region of Massachusetts in a given year (e.g., check Vernal Pool ListServ, a Yahoo Group List Serve monitored by the Vernal Pool Association). Sites should be surveyed for all vernal pool obligate species, including fairy shrimp, and also facultative amphibian species, if present at this time of the year.
- A minimum of two (2) surveys should be conducted with at least 1 week (i.e., 7 days) between surveys (since salamanders may take up to 6 weeks to lay all of their eggs) and should be conducted within all suitable breeding wetlands identified by the vernal pool expert within 100 feet of trails. Individual counts for each visit and a total count (or highest number observed) should be included with survey results.
- Results (regardless of outcome) must be reported to NHESP as a Site Specific Report with detailed trail maintenance information and surveys results, which should include: completed Vernal Pool Certification Forms (if applicable), maps (topographic and aerial maps), GPS coordinates of each site/pool surveyed, and photos of sites (i.e., vernal pool) and any obligate or facultative species found using the pool. Additionally, if a rare salamander is found in the vernal pool, a Rare Animal Observation Form must be included with the report.
- If a new or larger culvert is needed within a trail, there must be an evaluation conducted to determine if there are any hydrological effects on any pools in the vicinity of the trail (i.e., within 100 feet of the trail and culvert location). If vernal pool habitat hydrologically connected to the culvert replacement area is not identified, maintenance work may proceed; otherwise NHESP needs to review Site Specific Plans for maintenance work.

## Appendix I

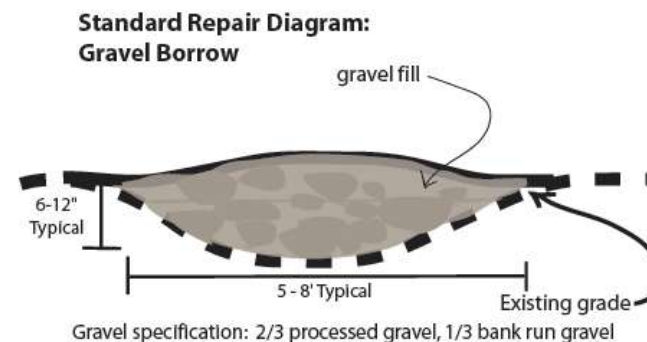
### Additional Trail Maintenance Specifications

# Mudholes/Protruding Rocks, Roots/Exposed Ledge

Causes:	Mudholes and ditches are depressed areas of notable deviation in grade from the surrounding area within the trail. Mudholes tend to be rounded depressional features whereas ditches are linear. After rain events, these depressional areas are often found to contain water and present an obstruction to some trail users. Mudholes in very tight soils (silts/clays) tend to pond water for longer periods of time and in some instances, where soil permeability is very low, ponding can impact the functionality of regulated wetlands.
Standard Repair:	The standard repair for mudholes and ditches is placement of a gravel/cobble mixture with compaction. Mudholes adjacent to wetlands should be flanked by erosion and sedimentation control structures such as hay bales or silt fencing during construction.
Regulatory Considerations:	Placement of fill within a wetland would require an Order of Conditions from the local Conservation Commission (Cons Com) and, possibly a permit from the U.S. Army Corps of Engineers and MA DEP. Fill placed within the "buffer zone" of the wetland may also require a permit from the Cons Com. The buffer zone will differ from town to town.
Other Repair Options:	Trails with frequent mudholes and ditches should be evaluated to determine if the standard repair would result in a sustainable trail. Large numbers of severe mudholes may be an indicator of a non-sustainable trail.



Photo of Problem Type: Mudholes



# Stream & Wetland Crossings - Narrow Trails

**Causes:** Trails often cross intermittent streams, perennial streams or wetlands and impacts to water quality can occur if the trail users cannot cross the resource without directly contacting the water and stream substrate.

**Standard Repair:** Along narrow streams used for non-motorized purposes, streams can be crossed in several ways depending on the size and type of the stream and the trail's geometric relationship to the water feature. For intermittent streams, placement of flat stone along the stream bed may be appropriate. Another option is the placement of a pipe or culvert to convey flow under the trail. For perennial streams, an anchored bridge is preferred, but culverts may also be used. For wetlands (marshes, swamps) the use of a bog bridge (aka puncheon) or a boardwalk can be used although boardwalks are preferred as they are elevated above the ground.

**Regulatory Considerations:** Placement of fill within a wetland would require an Order of Conditions from the local Conservation Commission (Cons Com) and, possibly a Section 404 Permit from the U.S. Army Corps of Engineers and a 401 Water Quality Certification from the DEP. Fill placed within the "buffer area" of the wetland may also require a permit from the Cons Com. The buffer area will differ from town to town. The crossing of perennial streams must conform to the MA DEP Stream Crossing Standards.

**Other Repair Options:** Bridge material options include steel or fiberglass pre-fab.

**Information Sources:** USFS, [http://www.ettechtonics.com/pedestrian\\_and\\_trail\\_bridges/](http://www.ettechtonics.com/pedestrian_and_trail_bridges/)

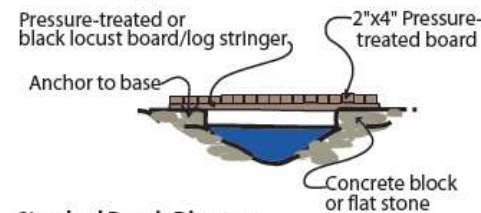
**Photo of Problem Type:  
Intermittent Stream Crossing**



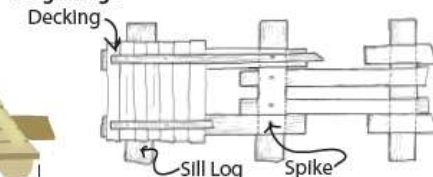
**Standard Repair Diagram:  
Bog Bridge**



**Standard Repair Diagram:  
Elevated Bridge**



**Standard Repair Diagram:  
Bog Bridge**



**Photo of Problem Type:  
Perennial Stream Crossing**



**Standard Repair Diagram:  
Elevated Bridge**



## Appendix J

### Erosion and Sedimentation Control Techniques

#### SEDIMENT BARRIERS

##### Definition

An erosion control device installed across and at the toe of a slope, usually consisting of hay, straw bales, or geo textile materials, to prevent sediment from entering wetlands or open water.

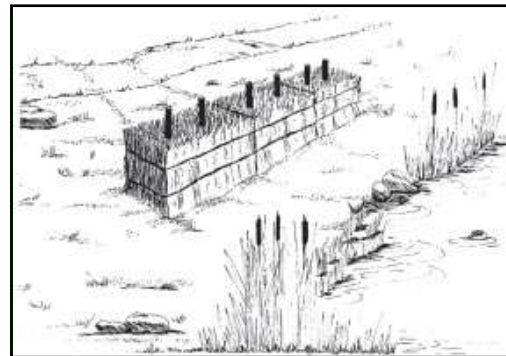
##### *Conditions where appropriate*

- When the erosion which would likely occur is in the form of sheet or rill erosion.
- Where temporary sediment retention is necessary until permanent vegetation is firmly established.

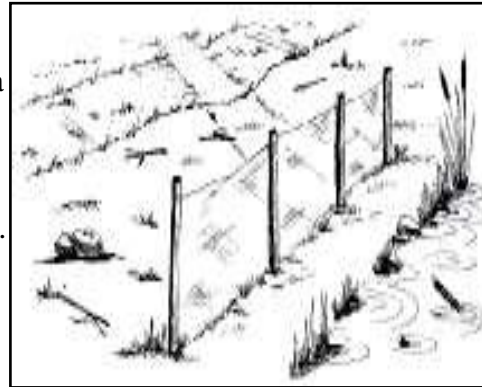
##### **Bales**

##### Guidelines for bale installation

- Bales shall be placed in a single row on the contour with the ends tightly adjoining, not to exceed 600 feet in length.  
Turn up the ends and begin a new row, if needed.
- The bales should be embedded into the ground at least 4" deep.
- After placing bales, they should be anchored in place with two stakes per bale driven through the bale and into the ground.
- Bales should be used where the area below the barrier has exposed soils and would be impacted by water flowing through a barrier.
- Inspections should be frequent. Repair or replacement should be done promptly, as needed.



**Silt Fencing:** A silt fence is a temporary sediment barrier consisting of filter fabric attached to supporting posts and entrenched in the soil. Silt fence is a sediment control practice, and is intended to be installed where sediment-laden water can pond, thus allowing the sediment to fall out of suspension and separate from the runoff. It is not intended to be an erosion control practice. Improperly applied or installed silt fence will increase erosion. A silt fence detains sediment by ponding water behind it and allowing sediment to settle out.



**Silt fence can be used where:**

- ❖ The slope is gentle, allowing temporary ponding and deposition of sediment;
- ❖ Sheet runoff would occur
- ❖ The size of the drainage area is no more than 1/4 acre per 100 linear feet of silt fence;
- ❖ The maximum flow path length above the barrier is 100 feet (30.5 m);

***Guidelines for silt fencing***

- If wooden stakes are utilized for silt fence construction, they must have a diameter of 2" when oak is used and 4" when pine is used.
- The filter fabric should be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter cloth should be spliced together only at a support post, with a minimum of a six-inch overlap, and sealed.
- When wire support is used, a standard-strength filter cloth maybe used. When wire support is not being used, extra-strength cloth should be used.
- The fabric should be stapled or wired to the fence and a minimum of 4" of the fabric should be extended into the trench.
- The trench should be backfilled and the soil compacted over the filter fabric.



### *Additional considerations*



**Inspect bales and barriers  
after heavy rains.**

- Sediment deposits should be removed when the level of deposits reaches one-half of the height of the bale or the silt fencing.
- Barriers should be removed when the area has revegetated and the barriers are no longer needed. The sediment should be removed or graded out before removal.
- Straw and hay bale barriers require more maintenance than geo textiles due to the permeability of the bales being less than that of silt fencing.
- Silt fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
- For specific information regarding the different types of geo textile materials and their construction and maintenance guidelines, contact the Department of Environmental Services, county conservation district, or a local industrial supplier.

United States  
Department of  
Agriculture

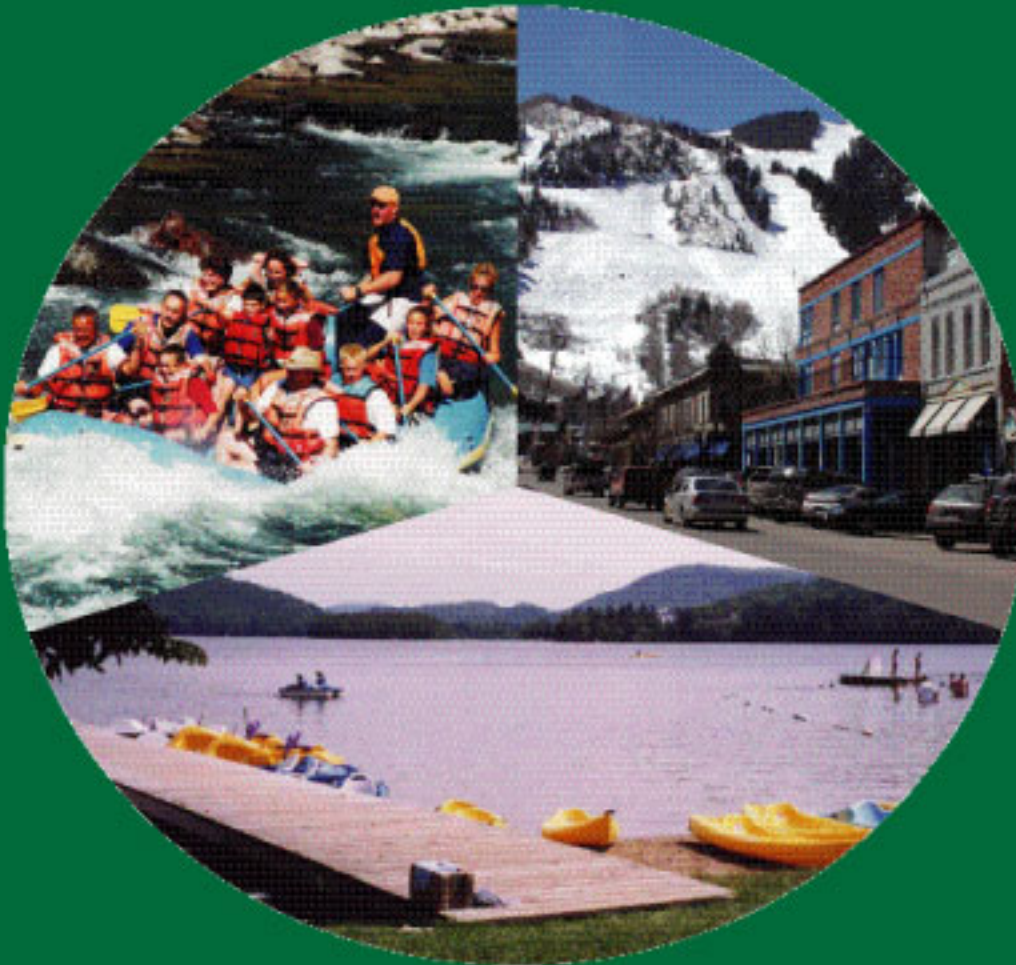


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Economic  
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# Recreation, Tourism, and Rural Well-Being

Richard J. Reeder  
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United States  
Department  
of Agriculture

Economic  
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Report  
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August 2005



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# Recreation, Tourism, and Rural Well-Being

**Richard J. Reeder and Dennis M. Brown**

## Abstract

The promotion of recreation and tourism has been both praised and criticized as a rural development strategy. This study uses regression analysis to assess the effect of recreation and tourism development on socioeconomic conditions in rural recreation counties. The findings imply that recreation and tourism development contributes to rural well-being, increasing local employment, wage levels, and income, reducing poverty, and improving education and health. But recreation and tourism development is not without drawbacks, including higher housing costs. Local effects also vary significantly, depending on the type of recreation area.

**Keywords:** recreation, tourism, recreation counties, rural development, economic indicators, social indicators, rural development policy.

## Acknowledgments

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## Contents

<b>Summary</b> .....	iii
<b>Introduction</b> .....	1
What Is a Recreation County? .....	3
General Characteristics of Recreation Counties .....	3
<b>Economic Impacts</b> .....	7
Employment .....	8
Earnings .....	9
Income .....	10
Housing Costs .....	12
<b>Social Impacts</b> .....	14
Population Growth .....	14
Travel Time to Work .....	14
Poverty Rate .....	16
Educational Attainment .....	16
Health Measures .....	17
Crime Rate .....	18
<b>Variations by Type of Recreation County</b> .....	19
<b>Conclusions</b> .....	24
<b>Ideas for Future Research</b> .....	26
<b>References</b> .....	27
<b>Appendix: Regression Analysis</b> .....	29

## Summary

With their high rates of growth, rural recreation counties represent one of the main rural success stories of recent years. During the 1990s, these places—whose amenities attract permanent residents as well as seasonal residents and tourists—averaged 20-percent population growth, about three times that of other nonmetropolitan counties, and 24-percent employment growth, more than double the rate of other nonmetro counties. However, tourism- and recreation-based development has been viewed as having negative as well as positive economic and social impacts, leading some local officials to question recreation development strategies.

### What Is the Issue?

Critics argue that the tourism industry—consisting mainly of hotels, restaurants, and other service-oriented businesses—offers seasonal, unskilled, low-wage jobs that depress local wages and income. As more of a county's workforce is employed in these jobs, tourism could increase local poverty and adversely affect the levels of education, health, and other aspects of community welfare. Meanwhile, the rapid growth associated with this development could strain the local infrastructure, leading to problems such as road congestion.

On the other hand, if tourism and recreational development attracts significant numbers of seasonal and permanent residents, it could change the community for the better. For example, the new residents could spark a housing boom and demand more goods and services, resulting in a more diversified economy with more high-paying jobs. Even low-paid recreation workers could benefit if better employment became available. Income levels could rise, along with levels of education, health, and other measures of community welfare, and poverty rates could be expected to decline.

This study quantifies the most important socioeconomic impacts of rural tourism and recreational development.

### What Did the Study Find?

Rural tourism and recreational development results in generally improved socioeconomic well-being, though significant variations were observed for different types of recreation counties.

Rural tourism and recreational development leads to higher employment growth rates and a higher percentage of working-age residents who are employed. Earnings and income levels are also positively affected. Although the cost of living is increased by higher housing costs, the increase offsets only part of the income advantage.

Rural tourism and recreational development results in lower local poverty rates and improvements in other social conditions, such as local educational attainment and health (measured by mortality rates). Although rates of serious crimes are elevated with this kind of development, this may be misleading because tourists and seasonal residents, while included as victims in the crime statistics, are not included in the base number of resi-

dents. Rapid growth brings its own challenges, particularly pressures on infrastructure. The one growth-strain measure examined in the study, commuting time to work, revealed little evidence of traffic congestion in rural recreation areas.

Rural recreation counties have not benefited equally. Rural counties with ski resorts were among the wealthiest, healthiest, and best educated places in the study, while those with reservoir lakes or those located in the southern Appalachian mountains were among the poorest and least educated. Rural casino counties had relatively high rates of employment growth and large increases in earnings during the 1990s.

### **How Was the Study Conducted?**

The study assessed the effect of recreation and tourism development on 311 rural U.S. counties identified by ERS as dependent on recreation and tourism. The findings here, showing largely positive effects, pertain mainly to places already dependent on recreational development. Counties just beginning to build a tourism- and recreation-based economy may not benefit to the same extent.

The authors used multiple regression analysis to determine the degree to which socioeconomic indicators in the 311 counties had been affected by recreational development. The key variable in the regression analysis was recreation dependency, a composite measure reflecting the percentage of local income, employment, and housing directly attributable to tourism and recreation. For each socioeconomic indicator in the study, two regressions were computed to explain intercounty variations—one for a single point in time (1999 or 2000) and one for variations in changes that occurred during the 1990s. A descriptive analysis, supplementing the regression analysis, compared recreation and other nonmetro county means for each of the socioeconomic indicators and trends, and then made socioeconomic comparisons among the different types of rural recreation counties.

## Introduction

While the economies of many rural areas in the United States have been sluggish in recent years, rural communities that have stressed recreation and tourism have experienced significant growth.<sup>1</sup> This has not gone unnoticed by local officials and development organizations, which have increasingly turned to recreation and tourism as a vehicle for development. However, not all observers are convinced that the benefits of this approach are worth the costs. There are concerns about the quality of the jobs created, rising housing costs, and potential adverse impacts on poverty, crime, and other social conditions.<sup>2</sup> This report assesses the validity of these concerns by analyzing recent data on a wide range of socioeconomic conditions and trends in U.S. rural recreation areas. The purpose is to gain a better understanding of how recreation and tourism development affects rural well-being.

Recreation and tourism development has potential advantages and disadvantages for rural communities. Among the advantages, recreation and tourism can add to business growth and profitability. Landowners can benefit from rising land values. Growth can create jobs for those who are unemployed or underemployed, and this can help raise some of them out of poverty. Recreation and tourism can help diversify an economy, making the economy less cyclical and less dependent on the ups and downs of one or two industries. It also gives underemployed manufacturing workers and farmers a way to supplement their incomes and remain in the community. Benefiting from growing tax revenues and growth-induced economies of scale, local governments may be able to improve public services. In addition, local residents may gain access to a broader array of private sector goods and services, such as medical care, shopping, and entertainment. While other types of growth can have similar benefits, rural recreation and tourism development may provide greater diversification, and, for many places, it may be easier to achieve than other kinds of development—such as high-tech development—because it does not require a highly educated workforce.

Many of the potential disadvantages of recreation-related development are associated with the rapid growth that these counties often experience; on average, “recreation counties” grew by 20 percent during the 1990s, nearly three times as fast as other rural counties. Rapid growth from any cause can erode local natural amenities, for example, by despoiling scenic views. Cultural amenities, such as historic sites, can also be threatened. Growth can lead to pollution and related health problems, higher housing costs, road congestion, and more crowded schools, and it may strain the capacity of public services. Small businesses can be threatened by growth-induced “big-box” commercial development, and farms can be burdened by increased property taxes. In addition, newcomers might have different values than existing residents, leading to conflicts over land use and public policies. Growth can also erode residents’ sense of place, which might reduce support for local institutions, schools, and public services.

Aside from these general growth-related issues, some specific problems have been linked to tourism and recreation industries. These include the potential for higher poverty rates associated with low-wage, unskilled workers who are attracted to the area to work in hotels, restaurants, and

<sup>1</sup>In this report, “tourism” and “recreation” refer to the development process in which tourists, seasonal residents, and permanent residents are attracted to the community to take part in recreation and leisure activities.

<sup>2</sup>For a good overall discussion of the benefits as well as the liabilities of recreation and tourism as a rural development strategy, see Gibson (1993), Galston and Baehler (1995), or Marcouiller and Green (2000).

recreation sites. Higher poverty rates could lead to various other social problems, including higher crime rates, lower levels of education, more health problems, and higher costs of providing public services.

With this mix of positive and negative impacts, it is understandable why experts on development policy may be uncertain about the value of rural tourism and recreation development strategies. Hence, it is important that policymakers have access to information about the nature and extent of the socioeconomic impacts of this type of development.

Past research has examined some of the impacts (Brown, 2002). Much of that research, however, is in the form of case studies, with only a few empirical studies examining nationwide rural impacts, such as the articles by English et al. (2000) and Deller et al. (2001). English et al. examined the impact of tourism on a variety of measures of local socioeconomic conditions (local income, employment, housing, economic structure, and demographic characteristics). Deller and his colleagues examined recreational amenities (including recreational infrastructure), local government finances, labor supply characteristics, and demographic demand characteristics, estimating their effects upon the growth of local population, employment, and income.

Our research used an approach similar to that of English and his colleagues, which identified a group of tourism-dependent counties and then used regression analysis to estimate the effect of tourism on various indicators of local rural conditions. Using the new ERS typology of rural recreation counties developed by Kenneth Johnson and Calvin Beale (2002), we identified differences between rural recreation counties and other nonmetro counties for various indicators of economic and social well-being.<sup>3</sup> We also examined socioeconomic variations by type of recreation county. We then used regression analysis to test statistically for the effect that dependence on recreation (including tourism and seasonal resident recreation) has on local socioeconomic conditions. Details about the regression analysis are provided in the appendix.

We hoped to shed light on several important questions about this development strategy. Among these are:

- How does rural recreation development affect residents' ability to find jobs?
- How are local wages and incomes affected?
- How does recreation development affect housing costs and local cost of living?
- What effect does recreation development have on local social problems such as crime, congestion, and poverty?
- How are education and health affected?
- How do various types of recreation areas differ in socioeconomic characteristics?

<sup>3</sup>We also examined fiscal and economic conditions in earlier research (Reeder and Brown, 2004), but our fiscal findings were not easy for us to interpret, so we excluded them from this report.

## What Is a Recreation County?

In 1998, Beale and Johnson identified 285 nonmetropolitan recreation counties based on empirical measures of recreation activity, including levels of employment and income in tourism-related industries and the presence of seasonal housing (Beale and Johnson, 1998). They modified and expanded their typology a few years later (Johnson and Beale, 2002). Their 2002 typology identified 329 recreation counties that fell into 11 categories, varying by geographic location, natural amenities, and form of recreation. It is this typology that ERS has adopted as its recreation county typology. We used the 2002 typology, which covered only nonmetropolitan counties. To simplify our analysis, we excluded Alaska and Hawaii.<sup>4</sup> This reduced the number of recreation counties in our study to 311.

One of the advantages of this typology is that it includes not only places with significant tourism-related activity but also those with a significant number of seasonal residents. (See box on next page, “How Were Recreation Counties Identified?”) Like tourists, most seasonal residents are attracted by opportunities for recreation, including some who come simply to relax in a scenic rural setting. In theory, seasonal residents should have a bigger economic impact on the local community than tourists because they stimulate the housing industry and their season-long presence significantly increases the demand for a wide range of local goods and services. In addition, seasonal residents often later become permanent residents. Because many seasonal residents first came to the area as tourists, it is difficult, if not impossible, to separate the long-term impact of tourists from seasonal residents. Our use of the ERS typology, which covers both tourism and seasonal recreational/residential development, thus seems ideal for estimating the long-term, overall impacts of tourism and recreation combined.

Another advantage of this typology is that it is derived from a continuous variable—a weighted average of tourism and seasonal housing dependence (see box on next page). In theory, this continuous variable may be used more effectively to estimate impacts than a simple recreation/other nonmetro dichotomous variable because it allows us to examine variations in the extent of recreation. Similarly, the different types of recreation counties in the Johnson/Beale typology can be used to further elucidate and estimate the impacts of recreational activity on local socioeconomic conditions.

## General Characteristics of Recreation Counties

The 311 recreation counties in our study are located in 43 States, but tend to be concentrated in the West, the Upper Great Lakes, and the Northeast (fig. 1). In the West, this reflects the ample opportunities for hiking, mountain climbing, fishing, and wintertime sports found in the many national parks and ski resorts there. By contrast, the high concentration of recreation counties in the Upper Great Lakes and Northeast—especially in New England and Upstate New York—is largely due to the popularity of long-established second homes in areas with lakes. Many of these areas also have significant wintertime recreation activities, including snowmobiling and skiing. Not surprisingly, recreation counties score higher (4.25) on ERS’ natural amenities index than other nonmetro counties (3.34).<sup>5</sup>

<sup>4</sup>We also excluded several counties that had been metropolitan in the 1980s but had lost their metropolitan status by 1993.

<sup>5</sup>The ERS natural amenities index ranges from 1 to 7, encompassing six measures of natural amenities, covering climate (temperature and humidity), topographic variation (such as mountains), and water area. Data for this index are available at <http://www.ers.usda.gov/Data/NaturalAmenities>.

## How Were Recreation Counties Identified?

The 2002 Johnson/Beale typology covered only nonmetropolitan counties, using the 1993 Office of Management and Budget (OMB) definitions of metropolitan areas. Johnson and Beale began by examining a sample of well-known recreation areas to determine which economic indicators were most appropriate for identifying other such counties. They then computed the percentage share of wage and salary employment from the Census Bureau's 1999 County Business Patterns data and personal income from Bureau of Economic Analysis data as these data apply to recreation-related industries, i.e., entertainment and recreation, accommodations, eating and drinking places, and real estate. They also computed a third measure: the percentage share of housing units of seasonal or occasional use, from 2000 Census data. They then constructed a weighted average of the standardized Z-scores of these three main indicators (0.3 employment + 0.3 income + 0.4 seasonal homes). Counties scoring greater than 0.67 on this recreation dependency measure were considered recreation counties. Next, they added several large nonmetro counties that did not make the cut but had relatively high hotel and motel receipts from 1997 Census of Business data. Additional counties were accepted if the weighted average of the three combined indicators exceeded the mean and at least 25 percent of the county's housing was seasonal. Then Johnson and Beale deleted 14 counties that lacked any known recreational function but appeared to qualify "either because they were very small in population with inadequate and misleading County Business Patterns coverage or because they reflected high travel activity without recreational purpose, i.e., overnight motel and eating place clusters on major highways." These calculations produced their final set of 329 recreation counties. In 2004, ERS established these recreation counties as one of its county typologies (available at <http://www.ers.usda.gov/Briefing/Rurality/Typology/>). By 2004, some of these counties had changed their metropolitan status based on the new 2003 OMB definitions of metropolitan areas.

Data from the 2000 Census reveal that recreation and other nonmetro counties average similar population sizes (table 1).<sup>6</sup> However, during the last decade, the population of recreation counties has grown almost three times as fast (20 percent vs. 7 percent, on average). Recreation counties also have relatively low population densities, and more of their residents tend to live in rural parts of the county (those with less than 2,500 population).

Using the ERS 1993 county economic and policy typologies (Cook and Mizer, 1994), we found that the economies in recreational counties were generally more diverse than in other nonmetro counties. For example, only 30 percent of recreation counties were highly dependent on a single major industry (agriculture, mining, or manufacturing), while 58 percent of other nonmetro counties were highly dependent on just one of these industries. Recreation counties also were slightly less dependent on neighboring counties for employment; only 13 percent of recreation counties were identified as commuting counties (with a high percentage of their resident workforce commuting outside the county for employment), compared with 17 percent of other nonmetro counties.

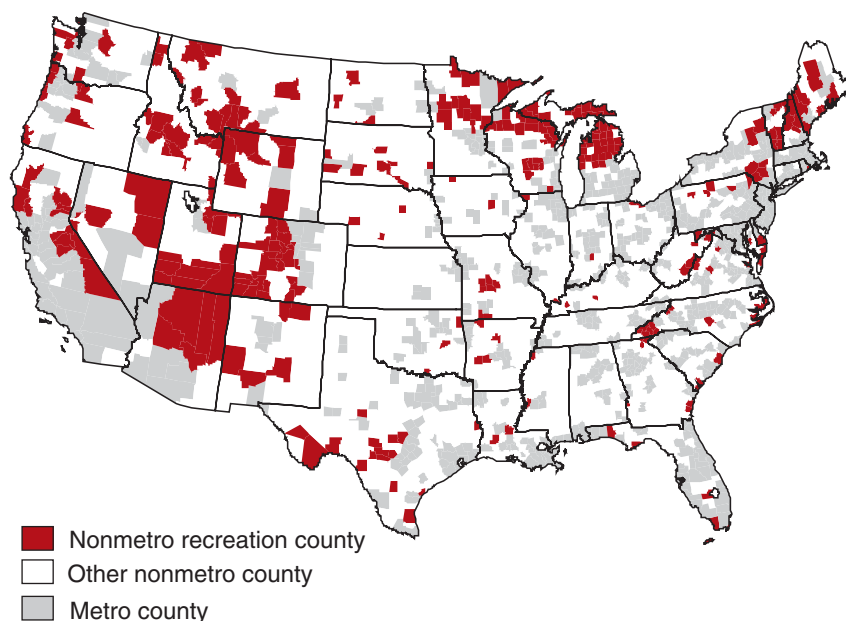
We also found that about a third (32 percent) of recreation counties were retirement-destination places vs. only 4 percent of other nonmetro counties.

<sup>6</sup>The averages shown in this report are "unweighted" averages (simple means). In most cases, these averages appear to represent fairly the typical county in the group being reported. In some cases, however, the average (mean) may be unrepresentative in that it differs significantly from the median. We will point out such instances in the text or in a footnote.

Figure 1

**Nonmetropolitan recreation counties, 2002**

Counties are concentrated in the West, Upper Midwest, and Northeast



Note: Excludes counties in Alaska and Hawaii.

Source: Adapted from Kenneth M. Johnson and Calvin L. Beale, 2002. "Nonmetro Recreation Counties: Their Identification and Rapid Growth," *Rural America*, Vol. 17, No. 4:12-19.

Table 1

**Demographic characteristics of recreation and other nonmetro counties**

Indicator	Type of county	
	Recreation	Other nonmetro
Nonmetro counties in our study	311	1,935
	<i>Number</i>	
	<i>Persons</i>	
Average county population in 2000	26,256	24,138
	<i>Percent</i>	
Population change 1990-2000	20.2	6.9
	<i>Persons per square mile</i>	
Population density in 2000	35.9	40.2
	<i>Percent</i>	
Rural share of county population in 1990	79.9	72.4

Note: These are county averages (simple means).

Source: ERS calculations using data from the U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce.



Many recreation counties (38 percent) were Federal land counties, meaning that at least 30 percent of the county's land was federally owned; only 7 percent of other nonmetro counties had that much Federal land. In addition, relatively few recreation counties (10 percent) had experienced persistently high levels of poverty (from 1950 to 1990), whereas about a fourth (26 percent) of other nonmetro counties fell into this category. Because recreation counties are not homogeneous with respect to these and other characteristics, the averages we present for all recreation counties mask considerable variation.

## Economic Impacts

The conventional wisdom among researchers in recent years has been that recreation and tourism have both positive and negative economic impacts for recreation areas.<sup>7</sup> On the positive side, recreation development helps to diversify the local economy (Gibson, 1993; Marcouiller and Green, 2000; English et al., 2000), and it generates economic growth (Gibson, 1993; Deller et al., 2001). It achieves this partly by acting as a kind of export industry, attracting money from the outside to spend on goods and services produced locally (Gibson, 1993). It also stimulates the local economy through other means. Infrastructure, such as airports and highways and water systems, often must be upgraded to meet the needs of tourists, and such improvements can help foster the growth of nonrecreation industries in the area by attracting entrepreneurs and labor and by providing direct inputs to these industries (Gibson, 1993).

Recreation development can involve significant economic leakages, however, in that many of the goods and services it requires come from outside the community—for example, temporary foreign workers often are drawn to the area to fill jobs in hotels, ski resorts, etc.—and many of the recreation-related establishments (restaurants, hotels, tour and travel companies) are owned by national or regional companies that export the profits (Gibson, 1993). Thus, part of the money from tourists and seasonal residents ends up leaving the locality. Another economic drawback involves the seasonality of recreation activities, which can create problems for workers and businesses during off-seasons (Gibson, 1993; Galston and Baehler, 1995), though this may actually be a plus for places where seasonal recreation jobs are timely, coming when farmers and other workers normally have an off-season.

The greatest economic concern is that recreation development may be less desirable than traditional forms of rural development because it increases the incidence of service employment with relatively low wages. According to Deller et al. (2001), “There is a perception that substituting traditional jobs in resource-extractive industries and manufacturing with more service-oriented jobs yields inferior earning power, benefits, and advancement potential” and that this may lead to “higher levels of local underemployment, lower income levels, and generally lower overall economic well-being.” In addition, many researchers are concerned that recreation may result in a less equitable distribution of income (Gibson, 1993; Marcouiller and Green, 2000). These problems may be compounded by the higher housing costs in some recreation areas (Galston and Baehler, 1995).

These concerns reflect findings from individual case studies. Only a few studies have attempted to estimate how rural recreation areas nationwide differ on economic measures. Deller et al. (2001) found that rural tourism and amenity-based development contributed to growth in per capita income and employment, and concluded that as a result of the positive impact on income “the concern expressed about the quality of jobs created ... appears to be misplaced.” English et al. (2000) also found that rural tourism was associated with higher per capita incomes, and with a higher percent increase in per capita income, although they found no significant relationship for household income. English and his colleagues also found housing

<sup>7</sup>Because most economic development strategies are adopted and implemented at the local level, our goal here is to provide better informed decisions at that level. Hence, the positives and negatives discussed here refer only to the situation facing the local county. Whether rural recreational development is good for the State or the Nation as a whole is also a worthwhile question, but beyond the scope of this report.

costs and the change in housing costs over time to be significantly related to rural tourism. On the other hand, they found no evidence that the distribution of income was less equal due to rural tourism.

To address these economic issues, we examined a variety of indicators reflecting employment, earnings, income, and housing costs.

## Employment

Two employment measures, the local employment growth rate (percent increase during the 1990s) and the local employment-population ratio (percentage of working-age resident population employed in 2000) are particularly illuminating. (See box “Data Sources” for each of the indicators used in this study.)

Recreation counties, on average, had more than double the rate of employment growth of other rural areas during the 1990s: 24 percent vs. 10 percent. The regression analysis, moreover, indicated that the extent to which a recreation county was dependent on recreation was positively and significantly related to the rate of local employment growth (see appendix for details on regression analysis). Employment growth generally offers residents more job opportunities, enabling some unemployed residents to find jobs and employed residents to find better jobs. However, job growth does not necessarily improve job conditions for current residents. If too many people come into the area seeking employment, and if those newcomers aggressively compete with locally unemployed (or underemployed) residents, the resident job seekers may end up having greater difficulty gaining employment. Thus, we need to look closely at employment data to determine how recreation affects the local ability to find jobs.

### Data Sources

The source for most of our data is the Decennial Census (Census Bureau, U.S. Department of Commerce). Other sources include:

- The Bureau of Economic Analysis, U.S. Department of Commerce, for data on earnings per job, and the Bureau of Labor Statistics, U.S. Department of Labor, Local Area Unemployment Statistics, for employment growth.
- The Uniform Crime Reporting Program (an unpublished data source available on an annual basis from the Federal Bureau of Investigation (FBI)), for data on serious crimes. Note: These data have not been adjusted by the FBI to reflect underreporting, which could affect comparability over time or among geographic areas.
- The Area Resource File (a county-specific health resources information system maintained by Quality Resource Systems, under contract to the Health Resources and Services Administration, U.S. Department of Health and Human Services), for the age-adjusted death rate, the number of physicians, and the area (in square miles) used to compute population densities for regression analysis.
- Kenneth Johnson and Calvin Beale for the recreation county types and the measure of recreation dependency used in their 2002 article.

To measure the ability of residents to find jobs, we examined the percentage of the working-age population that was employed.<sup>8</sup> For our study, we broke this into three separate rates covering three groups of the working-age population: ages 18-24, 25-64, and 65 and over. We hypothesized that recreation counties might be particularly advantageous for younger and older populations that may have a harder time competing in places with less job growth. In addition, younger and older groups may find it more convenient to work in recreation counties, which are thought to provide more part-time and seasonal jobs than most other places.

As expected, we found higher employment-population rates in recreation counties for both the younger and older age groups. However, the difference was less than 1 percentage point. The main working-age employment rate (ages 25-64) was roughly the same for both recreation and other nonmetro counties in 2000.<sup>9</sup> However, for each of these age groups, the upward trend in the employment-population rate during the 1990s favored recreation counties. Our regression analysis indicates that recreation had a positive and statistically significant impact on the employment rates for all three age categories in 2000. Recreation also had a positive and statistically significant impact on the increase in the employment rate during the 1990s, except for the older age group.<sup>10</sup>

## Earnings

Conventional wisdom suggests that a main drawback of tourism is that many of the jobs it creates are in restaurants, motels, and other businesses that tend to offer relatively low wages and few fringe benefits. But does this mean that rural recreation development generally leads to low-paying jobs? To address this question, we examined average annual earnings per job (which include wages and salaries and other labor and proprietor income, but exclude unearned income and fringe benefits). We found that average earnings per job were \$22,334 in 2000 for recreation counties—about \$450 less than in other rural counties (fig. 2, table 2).<sup>11</sup> The difference, though only about 2 percent, is consistent with the low-wage hypothesis. On the other hand, our finding that earnings per job increased faster in recreation counties than in other rural counties in the 1990s was not consistent with the conventional wisdom, but again, the difference was relatively small (\$200).

Our regression analysis, however, found no statistically significant relationship between earnings per job and recreation dependency, at least no simple linear relationship.<sup>12</sup> With regard to change in earnings per job during the 1990s, the regression analysis found that recreation had a positive and statistically significant impact on earnings per job. So these findings do not support the conventional wisdom that recreation results in generally low-paying jobs.

The data on earnings per job covered all jobs in the county, including those filled by nonresidents. A different picture emerges when we look only at earnings per resident worker. Aside from excluding nonresidents employed in the county (who, in theory, might be lowering the average earnings per job in recreation counties), this measure totals the income workers receive from all the jobs they have. This is important because recreation counties often provide numerous part-time and seasonal jobs, potentially allowing

<sup>8</sup>This may be viewed as a measure of both the availability of job opportunities to residents and of local economic efficiency.

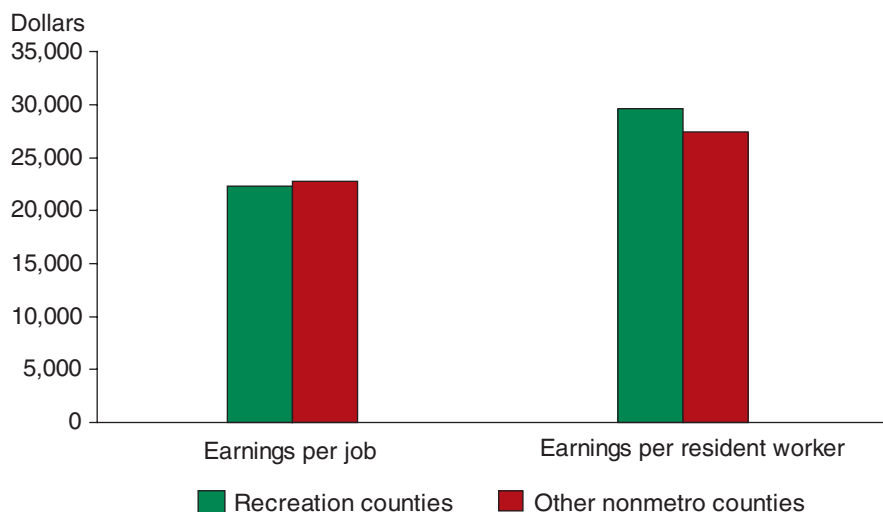
<sup>9</sup>Comparing medians instead of means, the difference between recreation and other nonmetro counties tends to be bigger in 2000 for all three age groups.

<sup>10</sup>Our regression explaining the change in employment rates for the elderly explained only 1 percent of the variation, which may have prevented the regression analysis from detecting the importance of recreation.

<sup>11</sup>Although the average earnings per job grew more in recreation counties than in other nonmetro counties, the reverse was true for the median earnings per job.

<sup>12</sup>When we ran a curvilinear regression, we found a significant negative coefficient for recreation dependency, and a significant positive coefficient for recreation dependency squared. This implies that among recreation counties, those with moderate degrees of recreation dependency had relatively lower earnings per job, compared with counties with lower or higher recreation dependencies. We do not have any explanation for this.

Figure 2

**Earnings in recreation and nonrecreation counties, 1999***Recreation counties have significantly higher levels of earnings per resident worker*

Source: Calculated by ERS using data from U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce.

more of their residents to have multiple jobs than the residents of other counties. The average worker's earnings from multiple jobs exceeded the average earnings per job. In recreation counties, earnings amounted to \$29,593 per resident worker (16 years or older) in 1999—about \$2,000 more than in other rural counties—an 8-percent difference.<sup>13</sup> Our regression analysis found recreation had a positive and statistically significant effect on earnings per resident worker. Thus, some residents may work more hours in recreation counties, but on average they end up earning more than residents of other nonmetro counties.

## Income

Earnings are only one source of income. Other sources include interest receipts, capital gains, and retirement benefits like social security. Because many recreation areas have attracted wealthy individuals—including retirees, whose earnings are only a small part of their incomes—we expected recreation county income levels to be higher than in other rural areas. Consistent with this expectation, we found average per capita income was 10 percent higher in recreation counties than in other nonmetro counties (fig. 3). Moreover, per capita income levels were growing more rapidly during the 1990s in recreation counties than in other nonmetro counties. These findings were reflected in our regression analysis, which found recreation had a positive and statistically significant effect on both the level of per capita income and the change in per capita income over time. This should also benefit the community as a whole, because higher incomes mean an increase in demand for local goods and services, as well as increased local government tax collections and contributions to local charities and other social organizations.

One problem in interpreting per capita incomes is that they average together the incomes of the wealthiest and the poorest individuals. Thus, a small number of extremely wealthy people could make the community seem much

<sup>13</sup>Census data also provided median earnings for two kinds of resident workers who were 16 years and older: full-time workers and other workers. For both types of workers, recreation counties surpassed other nonmetro counties in median earnings per worker in 2000.

Table 2

**Economic conditions in recreation and other nonmetro counties**

Indicator	Type of county	
	Recreation	Other nonmetro
Employment growth 1990-2000	23.7	9.8
Employment/population ratio in 2000		
Ages 16-24	67.4	66.7
Ages 25-64	70.3	70.3
Ages 65 and over	13.6	13.4
Change 1990-2000		
Ages 16-24	0.7	0.0
Ages 25-64	0.7	0.3
Ages 65 and over	1.5	1.4
Earnings per job in 2000	22,334	22,780
Change 1990-2000	5,340	5,140
Earnings per resident worker in 1999	29,593	27,445
Income per capita in 2000	22,810	20,727
Change 1990-2000	7,471	6,564
Median household income in 1999	35,001	31,812
Change 1989-1999	11,952	10,531
Median monthly rent in 2000	474	384
Change 1990-2000	134	104

Note: These are county averages (simple means).

Source: ERS calculations based on data from U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce, and Bureau of Labor Statistics, U.S. Department of Labor.

better off than with other measures, for instance, the income of the typical (or median) person in the county. If recreation counties had more wealthy individuals than other rural counties, the per capita measure might be a misleading indicator of how the average family or household in each of these counties differed in income.<sup>14</sup> For this reason, we include a second income measure: median household income in the county in 1999.

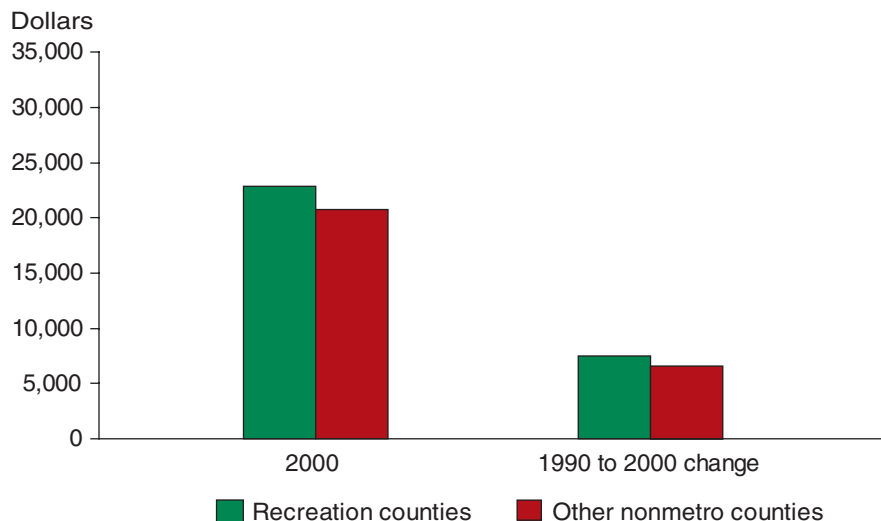
Using this measure, we found that median household income was 10 percent higher in recreation counties than in other rural counties. The recreation county advantage amounted to \$3,185 per year for the median household. The regression analysis reflected this finding, showing a positive and

<sup>14</sup>In other words, the mean (average) does not equal the median when income is not normally distributed.

Figure 3

### Per capita income in recreation and nonrecreation counties, 2000, and change during 1990s

*Recreation counties have significantly higher levels of income and had more income growth in the 1990s*



Source: Calculated by ERS using data from U.S. Census Bureau and Bureau of Economic Analysis, Department of Commerce.

statistically significant relationship between recreation and both the level and change in median family income.

## Housing Costs

One of the main complaints about recreation areas is that the cost of living in them is often higher, offsetting much of the advantage that residents might obtain from their higher incomes. Of particular concern is that high living costs could become a significant hardship for people struggling to raise families on minimum-wage jobs (Galston and Baehler, 1995). A high cost of living could force some lower paid workers (including some long-time residents) to look for housing outside the area.

The cost of housing is one of the most important contributors to the cost of living. According to Census data in 2000, median monthly rents for housing averaged \$474 in recreation counties, 23 percent higher than the \$384 median rent in other nonmetro counties (fig. 4). Our regression analysis also found a positive and statistically significant effect of recreation on median rent. Rents also increased faster during the 1990s in recreation counties, with the extent of recreation positively and significantly related to the extent of rent increase.

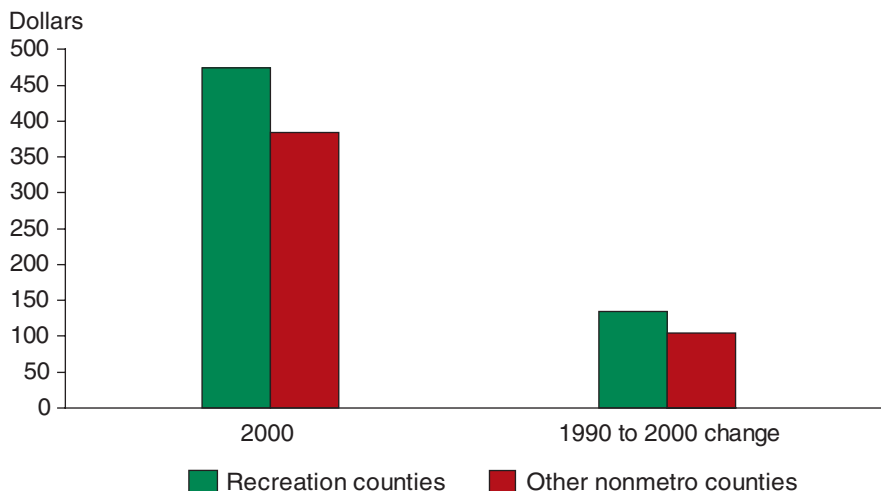
Though recreation counties had higher rents than other nonmetro counties, over the course of a year this amounted to a difference of only \$1,080 per household—about a third of the \$3,185 advantage we found in median household income in recreation counties. So after deducting for their higher rents, we found that households in recreation counties still had a significant income advantage over those in other rural counties.<sup>15</sup>

<sup>15</sup>Alternatively, we may compare regression coefficients for median rents and median household incomes. If we multiply the median (monthly) rent coefficient by 12 (months per year), we get a \$384 annual rent add-on associated with a 1-unit increase in recreation dependency. This compares with the \$1,474 add-on to median household income associated with the same 1-unit increase in recreation dependency. Thus, the regression analysis implies that higher rents claim only about a fourth (26 percent) of the added income related to recreation.

Figure 4

**Median monthly rents in recreation and nonrecreation counties, 2000, and change during 1990s**

*Recreation counties have significantly higher rents and had more growth in rents in the 1990s*



Source: Calculated by ERS using data from U.S. Census Bureau, Department of Commerce.

It is difficult to draw conclusions from this kind of information, for several reasons. First, rents show only part of the housing cost picture. Most housing units in the nonmetro counties we studied (in both recreation and other nonmetro counties) are owner-occupied rather than rented. Assuming that higher rents reflect higher home prices and greater equity in homes, higher home prices should increase the wealth of homeowners in recreation counties. In addition, higher rents and home prices may reflect better housing quality in recreation counties, rather than simply higher costs. This might be expected because more of the housing in these rapidly growing places is likely to be relatively new (and hence more valuable), and recreation county residents, having generally higher incomes, may demand better housing than residents of other nonmetro counties. Higher home values also increase the local tax base, which may lead to higher tax collections, enabling local governments to increase public services. Thus, on balance, it is unclear whether these higher housing costs are a plus or minus for the community.



## Social Impacts

Various researchers have examined the relationship between nonmetro recreation and social conditions in a community. Page et al. (2001) note that rapid population growth in nonmetro recreation counties has resulted in overcrowded conditions and traffic congestion. Recreation may also affect local poverty rates. Some authors have argued that recreation activity creates new sources of employment, helping to raise the poor from poverty (Gibson, 1993; Patton, 1985). Others have pointed to the low-wage, seasonal, and part-time nature of many tourism jobs, arguing that tourism may actually add to the number of poor in the community (Galston and Baehler, 1995; Smith, 1989). Recreation affects social conditions in other ways. For example, Page et al. argue that tourism and recreation activity may help to maintain or improve local services, such as health facilities, entertainment, banking, and public transportation, because of the increased demand that tourists generate for these activities. The relationship between recreation and crime has also been explored by a number of researchers (Rephann, 1999; Page et al., 2001; McPheters and Stronge, 1974), with a popular question being whether casinos increase criminal activity (Rephann et al., 1997; Hakim and Buck, 1989).

To address social impact concerns, we identified eight social indicators. Two involve conditions associated with rapid population growth; one identifies a population subgroup (persons in poverty) that may present special challenges; two relate to education; two deal with health-related concerns; and one measures crime.

## Population Growth

The first social variable we examined was the county population growth rate during the 1990s. Population growth can be beneficial for stagnant or declining rural areas looking for new sources of employment and income, but in some places it can bring problems. This is particularly true if growth occurs rapidly and haphazardly, contributing to sprawl, traffic congestion, environmental degradation, increased housing costs, school overcrowding, a decrease in open land, and loss of a “sense of place” for local residents.

Perhaps because of their natural amenities and tourist attractions, recreation counties experienced a 20.2-percent rate of population growth between 1990-2000, nearly triple the 6.9-percent rate for other nonmetro counties during the same period (table 3). These results are consistent with our linear regression analysis, which found a positive and statistically significant relationship between recreation and the county population growth rate. Further analysis revealed an apparent curvilinear relationship, in which recreation counties with moderate recreation dependencies experienced higher growth rates than those with smaller and larger recreation dependencies.<sup>16</sup>

## Travel Time to Work

This variable was included to test the hypothesis that growth in recreation counties may lead to increasing traffic congestion (Page et al., 2001). We found that mean commute times for recreation and other rural counties were not significantly different in 2000. Moreover, during the 1990s, commute

<sup>16</sup>The recreation dependency variable had a statistically significant positive coefficient, while the recreation dependency squared variable had a statistically significant negative coefficient.

Table 3

**Social conditions in nonmetro recreation and other nonmetro counties**

Indicator	Type of county	
	Recreation	Other nonmetro
Population growth 1990-2000	20.2	6.9
	<i>Percent</i>	
Mean travel time to work in 2000	22.7	23.0
Change 1990-2000	4.4	4.3
	<i>Minutes</i>	
Poverty rate in 1999	13.2	15.7
	<i>Percent</i>	
Change 1989-1999	-2.6	-3.1
	<i>Percentage points</i>	
Residents without a high school diploma in 2000	18.4	25.0
	<i>Percent</i>	
Change 1990-2000	-7.4	-8.4
	<i>Percentage points</i>	
Residents with at least a bachelor's degree in 2000	19.2	13.6
	<i>Percent</i>	
Change 1990-2000	4.0	2.4
	<i>Percentage points</i>	
Physicians per 100,000 residents in 2003	123.0	83.4
	<i>Number</i>	
Age-adjusted deaths per 100,000 residents in 2003	817.3	898.3
	<i>Number</i>	
Rate of serious crime per 100 residents in 1999	2.8	2.4
	<i>Percent</i>	

Note: These are county averages (simple means).

Source: ERS calculations based on data from U.S. Bureau of the Census, U.S. Department of Commerce, Department of Health and Human Services, and the FBI.

times increased at roughly the same rate (4.4 percent for recreation counties vs. 4.3 percent for other rural counties). The regression analysis, however, revealed a significant negative relationship between recreation dependence and change in travel time to work during the 1990s. One explanation may be that expanded economic opportunities in recreation counties during the 1990s meant that residents had to travel shorter distances for jobs.

## Poverty Rate

Poverty poses a problem for communities by increasing the costs of providing public services and contributing to crime rates, health problems, and neighborhood blight. Previous research has found that an expanding tourist industry is linked with a decreasing rate of poverty (Rosenfeld et al., 1989; John et al., 1988). Given that many recreation counties have attracted well-off retirees and that average income levels have risen in recreation counties, the counties might, on average, be expected to have fewer individuals living in poverty than other nonmetro counties. However, as noted earlier, some have argued that tourism, by expanding the number of low-paying, part-time jobs, could increase the number of individuals living in poverty in these counties (Galston and Baehler, 1995; Smith, 1989).

We found that the poverty rate was substantially lower in recreation counties than in other rural counties. In 1999, 13.2 percent of all residents in recreation counties were living in poverty, compared with 15.7 percent in other nonmetro counties. Mirroring the national trend of declining poverty rates during the 1990s, the proportion of residents living in poverty during the decade declined (at approximately the same rate) in both recreation and other rural counties.<sup>17</sup> Our regression analysis also found a significantly negative relationship between recreation and the poverty rate.<sup>18</sup> In addition, the regression analysis found a statistically significant negative relationship between recreation and the change in the poverty rate.

## Educational Attainment

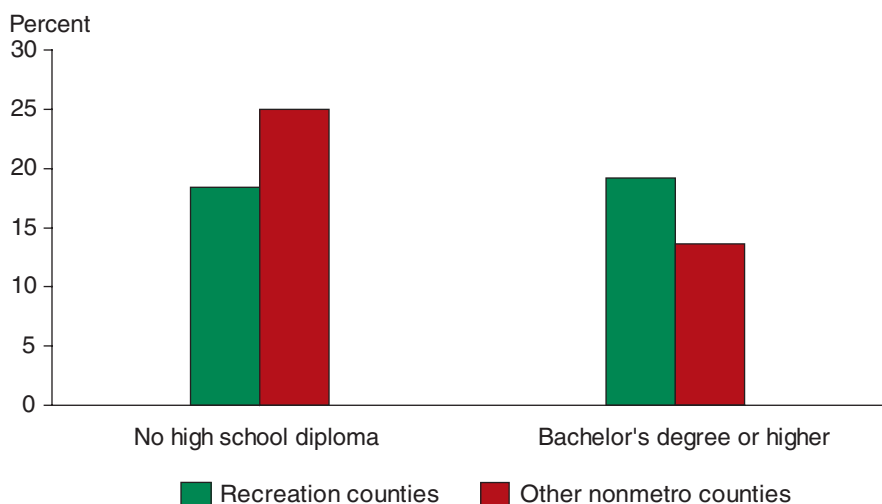
Previous research has identified the central role that education plays in rural poverty (McGranahan, 2000). Education is important, not only because it contributes to the economy, but also because it can affect the quality of life in rural communities and can help raise people out of poverty. Nonmetro areas with lower levels of education tend to be poorer and offer fewer economic opportunities for their residents. Migration (movement to another area) tends to increase with higher levels of education (Basker, 2002; Greenwood, 1993; Greenwood, 1975). Hence, recreation counties, which have had many in-migrants in recent years, may be expected to have higher levels of educational attainment than other nonmetro counties. English et al. (2000) found rural tourism to be associated with higher levels of educational attainment. We examined educational attainment at two levels: high school and college.

Our results show that residents in recreation counties have higher levels of education than other nonmetro residents (fig. 5). Recreation counties have both a smaller share of residents 25 years or older without a high school education, and a higher share of those with at least a bachelor's degree, than residents of other nonmetro counties. In 2000, 18.4 percent of residents age 25 or older in recreation counties did not have a high school diploma, compared with 25 percent in other nonmetro counties. For the same year, 19.2 percent of recreation county residents age 25 or older had a 4-year college degree or higher, compared with 13.6 percent in other nonmetro counties. During the 1990s, educational attainment on both measures improved in recreation as well as other nonmetro counties. These findings

<sup>17</sup>Both recreation and other rural counties had rates of poverty in 1999 higher than the 11.8 percent of metro counties.

<sup>18</sup>English et al. (2000) found no such relationship.

Figure 5

**Educational attainment in recreation and nonrecreation counties, 2000***Recreation counties have significantly higher levels of educational attainment*

Source: Calculated by ERS using data from U.S. Census Bureau, Department of Commerce.

are supported by our regression analysis, which found that recreation had a significant negative correlation with the share of residents without a high school diploma and a significant positive correlation with the share of residents with a bachelor's degree or higher. In addition, a statistically significant relationship was found between recreation and an increase in the share of college-educated residents during the 1990s. However, the change in the share of high school graduates during the 1990s, although positive, was not significantly related to recreation.

## Health Measures

Health is important for quality of life. In some recreation counties, many individuals moving in are retirees who demand more from health services than younger people; this could result in improved health services in these places. Many recreation counties are in pristine locations with clean air and water, which might also lead to better overall health. In addition, residents in recreation areas are probably more likely to be involved in outdoor activities than individuals in other nonmetro areas, which may also promote better overall health.

Our indicators of local health conditions—the number of physicians available and the age-adjusted mortality rate—support the view that recreation county residents have better health and health services than other nonmetro residents. In 2003, recreation counties had 123 physicians per 100,000 residents, compared with 83.4 per 100,000 residents in other nonmetro counties. The analysis also shows that the age-adjusted death rate (computed as a 3-year average) was almost 10 percent lower in recreation than in other nonmetro counties.

Our regression results show that recreation had a significantly negative correlation with the age-adjusted death rate. However, the relationship between recreation and the number of physicians, although positive, was statistically insignificant.

## **Crime Rate**

Many researchers have looked at the link between recreation activity and crime (Page et al., 2001; Rephann, 1999; McPheters and Stronge, 1974). Some types of recreation counties attract criminals who prey on tourists in-season and rob unoccupied houses during the off-season. Also, some low-income residents of these counties may commit crimes of opportunity, taking advantage of the influx of well-off outsiders. Some researchers have argued that crime may be particularly associated with casinos (Rephann et al., 1997; Hakim and Buck, 1989).

The results of our analysis indicate that recreation counties had nearly a 17-percent higher rate of serious crime (murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault) than other nonmetro counties. In 1999, the overall rate of serious crime in recreation counties was 2.8 incidents per 100 residents, compared with 2.4 incidents per 100 residents in other nonmetro counties, a statistically significant difference. These results are consistent with our regression analysis, which found that a significantly positive relationship exists between recreation and the crime rate.

However, the meaning of this finding is not clear because the crime rate is a biased measure in recreation areas, due to the fact that crimes committed against tourists and seasonal residents are included in the total number of crimes (the numerator of the crime rate), while tourists and seasonal residents are not included in the base number of residents (the denominator of the crime rate). So the crime rate is expected to be higher in recreation areas, even if residents of these areas are not more likely to be crime victims than residents of other rural areas.

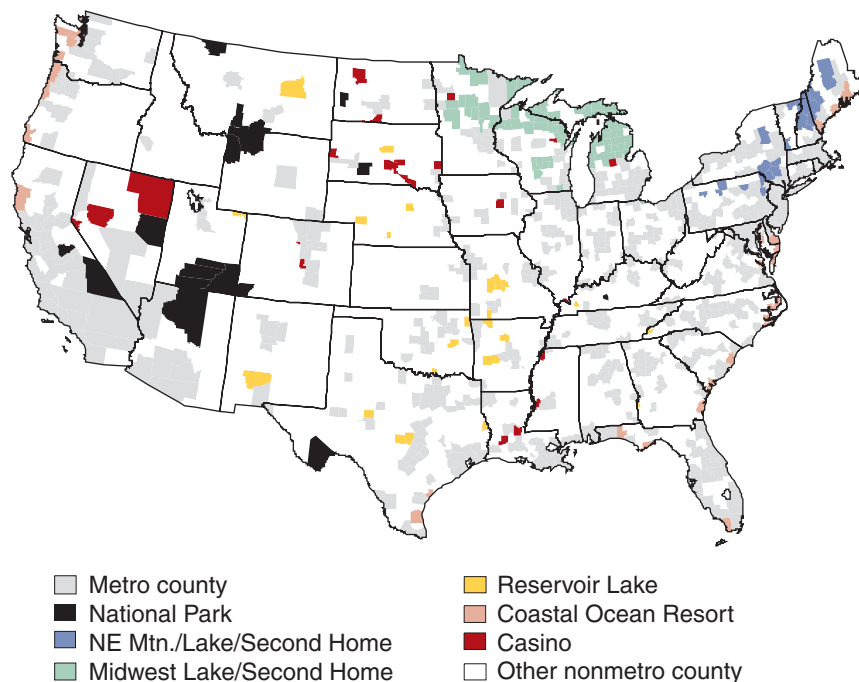
## Variations by Type of Recreation County

As noted, Johnson and Beale (2002) categorized each recreation county as belonging to 1 of 11 mutually exclusive recreational groupings, a classification that provides greater insight into the recreational component of each county (figs. 6 and 7). The single most common category is the Midwest Lake and Second Home, accounting for 70 counties and overwhelmingly concentrated in central and northern Michigan, Minnesota, and Wisconsin (table 4). The Northeast Mountain, Lake, and Second Home group, a closely related category, is mainly concentrated in northern New England (Maine, New Hampshire, and Vermont) and in portions of New York and Pennsylvania. Together, these two similar categories account for more than a quarter of all recreation counties. Both categories are relatively prosperous: Northeast counties had the highest level of earnings per job among all recreation types, and the Midwest category experienced sharp increases in household income during the 1990s (table 5). Both regions had rates of poverty among the lowest of all recreation categories (table 6).

Although almost every type of recreation county registered at least double-digit population growth during the 1990s (the exception being the Northeast Mountain, Lake, and Second Home), Ski Resort counties grew the fastest (increasing 38 percent), continuing a trend from the 1980s. Other recreation categories in the West (West Mountain and Other Mountain) also experienced rapid population growth. Ski Resort counties stand out in other ways,

Figure 6

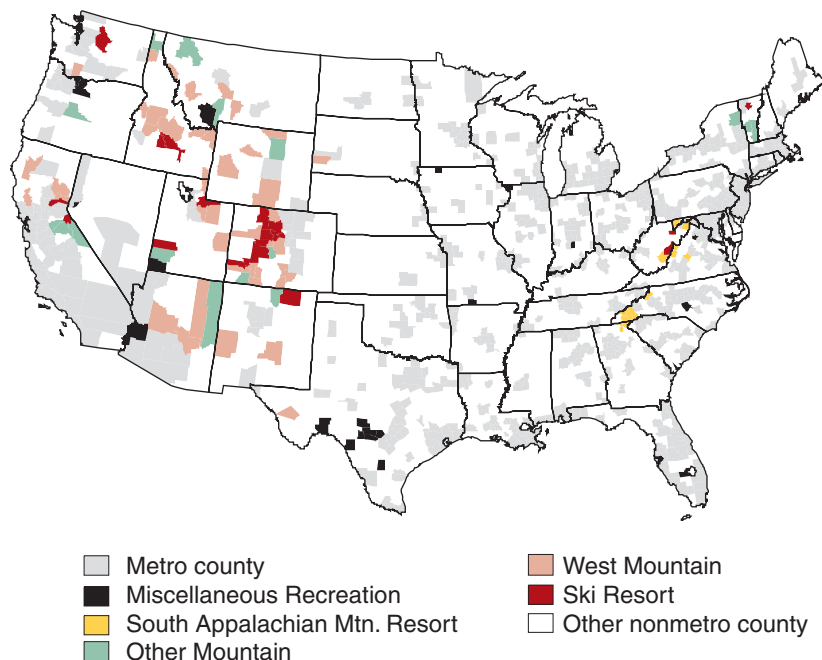
### Nonmetropolitan recreation categories by type (part 1), 2002



Note: Excludes counties in Alaska and Hawaii.

Source: Adapted from Kenneth M. Johnson and Calvin L. Beale, 2002. "Nonmetro Recreation Counties: Their Identification and Rapid Growth," *Rural America*, Vol. 17, No. 4:12-19.

Figure 7

**Nonmetropolitan recreation categories by type (part 2), 2002**

Note: Excludes counties in Alaska and Hawaii.

Source: Adapted from Kenneth M. Johnson and Calvin L. Beale, 2002. "Nonmetro Recreation Counties: Their Identification and Rapid Growth," *Rural America*, Vol. 17, No. 4:12-19.

measuring substantially higher than other recreation counties on a number of economic variables, including ratio of employment to population, earnings per job, earnings per worker, per capita income, and median household income. Ski Resorts also had the lowest poverty rate among all recreation categories, but had substantially higher housing costs—nearly 40 percent higher than the average for other nonmetro counties—which grew rapidly during the 1990s. Ski Resort counties also stand out in terms of social indicators, having the highest levels of educational attainment, the largest number of doctors, the lowest death rates, and the highest rate of crime among all recreation categories.

In contrast, Reservoir Lake counties and South Appalachian Mountain Resort counties are among the most economically challenged recreation county types. Reservoir Lake counties, which are mainly located in the Midwest and Great Plains regions, and South Appalachian Mountain Resort counties—in the upland areas of Georgia, North Carolina, Virginia, West Virginia, and Maryland—have among the lowest earnings per worker and lowest median household income levels. They also have among the lowest rents. Both of these regions have among the lowest levels of educational attainment. Further, they have higher-than-average age-adjusted death rates, but relatively low crime rates. The South Appalachian Mountain Resort category also has a significantly longer commute than other other nonmetro counties, possibly a reflection of its mountainous topography.

Table 4

**Recreation county categories**

Recreation category	Number of counties
Midwest Lake and Second Home	70
Northeast Mountain, Lake, and Second Home	19
Coastal Ocean Resort	35
Reservoir Lake	27
Ski Resort	20
Other Mountain (with Ski Resorts)	17
West Mountain (excluding Ski Resorts and National Parks)	46
South Appalachian Mountain Resort	17
Casino	21
National Park	18
Miscellaneous	21
Total	311

Source: Kenneth M. Johnson and Calvin L. Beale, "Nonmetro Recreation Counties: Their Identification and Rapid Growth," *Rural America*, Vol. 17, No. 4, 2002:12-19.

Casino counties also have relatively low levels of economic development, with the highest rate of poverty—over 40 percent higher than for all recreation counties—as well as below-average levels of per capita income, median household income, and earnings per worker. Still, during the 1990s, Casino counties, which are mainly located in the Upper Midwest, the Dakotas, the Mississippi Delta region, and Nevada, collectively had sharp employment growth (a third faster than the average for all recreation counties). Casino counties, which benefited from the establishment of gambling on Native American reservations during the 1990s, had a lower level of educational attainment, fewer physicians, a higher-than-average age-adjusted death rate, and a significantly higher rate of crime than most other recreation counties.



Table 5  
**Economic conditions and trends by type of recreation county**

Indicator	Casino	Ocean Resort	Reservoir Lake	MW Lake Home	NE MT/LK Home	Nat. Park	West MT	Ski Resort	Other MT	South AP MT Resort	Rec. Misc.	Rec. total	Non-rec. total	
														Percent
Employment growth 1990-2000	31.7*	19.2*	24.9*	23.3*	3.5	19.0*	25.0*	35.3*	26.0*	18.7*	29.2*	23.7*	9.8	
Employment/population ratio in 2000														
Ages 16-24	66.0	67.5	64.6	67.3	68.8	66.3	66.5	74.3*	67.2	66.1	68.1	67.4	66.7	
Ages 25-64	70.4	69.9	67.3	69.4	72.1	69.9	69.7	77.4*	70.6	69.4	71.0	70.3	70.3	
Ages 65 and over	16.0*	13.8	13.3	10.0*	11.6	15.3	15.5*	19.3*	13.5	11.1*	14.8	13.6	13.4	
Change 1990-2000						Percentage points								
Ages 16-24	1.0	-1.4*	0.2	2.7*	1.3	0.7	0.0	0.8	0.5	-0.1	-0.7	0.7*	0.0	
Ages 25-64	0.7	-1.4	0.6	2.8*	1.1	0.5	-0.0	0.4	0.6	-0.7	-0.4	0.7*	-0.3	
Ages 65 and over	2.2	1.6	1.2	2.0	0.8	0.9	0.5	3.0	0.8	1.3	0.9	1.5	1.4	
Earnings per job in 2000	24,372	23,698	19,630*	22,710	25,255*	21,233	20,058*	24,294	23,560	22,412	20,604	22,334	22,780	
Change 1990-2000	6,748	5,761	4,264	5,359	5,100	4,383	3,487*	7,394*	5,342	5,848	4,887	5,340	5,140	
Earnings per worker in 1999	28,249	31,905*	27,033	29,314*	28,968*	28,346	28,618*	34,992*	30,391*	28,596	30,089*	29,593*	27,445	
Income per capita in 2000	21,865	26,628*	20,002	21,485	23,718*	21,891	20,717	29,552*	22,898*	21,895	24,215*	22,810*	20,727	
Change 1990-2000	7,457	8,813*	5,802*	7,243*	7,566*	7,363	5,704	11,080*	7,323	7,834*	8,419*	7,471*	6,564	
Median household income in 1999	33,325	37,239*	29,635*	34,896*	34,447*	33,215	33,905*	44,521*	36,128*	32,843	36,396*	35,001*	31,812	
Change 1989-1999	11,477	11,475*	10,280	13,495*	9,411*	11,231	11,146	16,220*	11,630*	11,244	11,677*	11,952*	10,531	
Median monthly rent in 2000	440*	556*	384	421*	460*	445*	473*	660*	535*	431*	488*	474*	384	
Change 1990-2000	115	140*	110	111	85*	126	151*	228*	142*	129*	150*	134	104	

Note: These are county averages (simple means).

MW=Midwest; NE=Northeast; MT=Mountain; LK=Lake; Nat.=National; AP=Appalachian; Misc.=Miscellaneous; Rec.=Recreation.

\*Significantly different from nonrecreation county mean at 5-percent error level.

Source: ERS calculations based on data from U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce, and Bureau of Labor Statistics, U.S. Department of Labor. Recreation types from Johnson and Beale (2002), USDA, Economic Research Service.

Table 6  
**Social conditions and trends by type of recreation county**

Indicator	Casino	Ocean Resort	Reservoir Lake	MW Lake Home	NE MT/LK Home	Nat. Park	West MT	Ski Resort	Other MT	South AP MT Resort	Rec. Misc.	Rec. total	Non-rec. total
Population growth 1990-2000	16.7*	18.8*	20.4*	15.8*	5.8	13.3*	27.6*	38.0*	24.9*	18.4*	23.3*	20.2*	6.9
Mean travel time to work in 2000	21.7	22.3	24.3	22.3	23.3	20.3*	23.1	22.1	21.2	26.3*	23.5	22.7	23.0
Change 1990-2000	2.7*	3.8	4.8	4.8*	4.8	4.1	5.1*	4.6	3.9	5.3	3.6	4.4	4.3
Poverty rate in 1999	18.8*	12.4*	15.2	10.7*	12.0*	16.2	14.0*	10.2*	13.9	13.2*	13.3	13.2*	15.7
Change 1989-1999	-4.3	-1.6*	-2.9	-4.4*	0.0*	-4.4	-1.3*	-1.6*	-1.5*	-2.6	-2.1	-2.6	-3.1
Residents without high school diploma in 2000	21.2*	19.0*	23.6	18.0*	18.7*	17.7*	16.1*	11.8*	14.5*	24.7	19.8*	18.4*	25.0
Change 1990-2000	-7.3	-6.9*	-9.4*	-8.9	-6.3*	-6.8	-5.9*	-3.5*	-5.6*	-10.8*	-7.4	-7.4	-8.4
Residents with at least a B.A. degree in 2000	16.2*	22.5*	13.3	14.9*	17.7*	20.9*	20.5*	33.2*	24.3*	17.0*	19.6*	19.2*	13.6
Change 1990-2000	2.7	4.7*	2.8	3.4*	2.7	4.2*	4.5*	6.5*	4.8*	3.4*	4.2*	4.0	2.4
Physicians per 100,000 residents in 2003	78.0	166.6*	52.8*	97.5	181.9*	110.1	109.9*	192.0*	190.7*	149.7*	114.4	123.0*	83.4
Age-adjusted death rate per 100,000 residents in 2000-02	955.6	839.5*	858.8	829.7*	869.0	809.1*	766.3*	661.7*	759.3*	869.7	772.7*	817.3*	898.3
Rate of serious crime per 100 residents in 1999	3.2*	3.2*	2.0	2.6	2.6	2.5	2.6	3.8*	3.0	2.0	3.3*	2.8*	2.4

Note: These are county averages (simple means). MW=Midwest; NE=Northeast; MT=Mountain; LK=Lake; Nat.=National; AP=Appalachian; Misc.=Miscellaneous; Rec.=Recreation. \*Significantly different from non-recreation county mean at 5-percent error level.

Source: ERS calculations based on data from U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce, and Bureau of Labor Statistics, U.S. Department of Labor. Recreation types from Johnson and Beale (2002), USDA, Economic Research Service.

## Conclusions

This study provides quantitative information on how tourism and recreation development affects socioeconomic conditions in rural areas. Specifically, we wanted to address economic issues related to employment, income, earnings, and cost of living, and social issues such as poverty, education, health, and crime. A summary follows of our main findings on the socioeconomic impacts of rural recreation and tourism development.

- **Employment.** Our regression analysis found a positive and statistically significant association between recreation dependency and the percentage of working-age population with jobs. We also found that, with the exception of the older (65 and over) population, recreation dependency positively affected the change in this employment measure during the 1990s.
- **Earnings.** We examined earnings per job and earnings per resident to measure the value of the jobs associated with rural recreation development. We found that the average earnings per job in recreation counties were not significantly different than in other nonmetro counties, and we found no direct (linear) relationship between local dependency on recreation and local earnings per job in our recreation counties. However, our regression analysis found a positive relationship between recreation and growth in earnings per job during the 1990s. Thus, the trend seems to favor the pay levels for jobs in these recreation counties. These findings concern earnings of all who work in the county, including nonresidents. They report earnings per job, not per worker—an important distinction because workers may have more than one job, and the availability of second jobs (part-time and seasonal) may be greater in recreation counties than elsewhere. When we focused on total job earnings for residents of recreation counties, we found these earnings were significantly higher (\$2,000 more per worker) than for residents of other rural counties. The regression analysis also found a significant positive relationship between recreation and resident-worker earnings. So the earnings picture for recreation counties appears positive for the average resident.
- **Cost of living.** Our research suggests recreation development leads to higher living costs, at least with respect to housing. We found that the average rent was 23 percent higher in recreation counties, and it was positively and significantly associated with the degree of recreation dependency in our regression analysis. While this may reduce some of the economic advantages for residents of recreation counties, it does so only partially. Median household incomes, on average, were \$3,185 higher in recreation counties than in other rural counties. Annual costs associated with rent were \$1,080 higher in recreation counties, offsetting only about a third of the recreation county income advantage.
- **Growth strains.** We found recreation led to significantly higher rates of population growth. In theory, this can aggravate social problems, such as school crowding, housing shortages, pollution, and loss of identification with the community. The one growth-related social problem we addressed was road congestion. Examining the time it takes to commute to work, we found little evidence that congestion was pre-

senting undue problems for residents in recreation counties. Moreover, our regression analysis found that recreation was associated with smaller increases in average commute times in the 1990s than in other rural counties.

- **Poverty.** Another social problem that appeared to be reduced in recreation counties was poverty. Our regression analysis found recreation was associated with lower poverty rates and with larger declines in the poverty rate during the 1990s.
- **Crime.** There may be some cause for concern with regard to crime. We found crime rates (for serious crimes) were higher in recreation counties than in other rural counties, and our regression analysis also found a statistically significant positive relationship between crime rates and recreation dependency. However, crime statistics may be biased in recreation areas because crimes against tourists and seasonal residents are counted in the crime rate, while tourists and seasonal residents are not counted as part of the population base upon which the rate is calculated. Thus, even if people in recreation areas do not face a higher chance of becoming victims of crimes, the crime rates of these areas will appear higher than elsewhere. Nonetheless, one may still argue that recreation-related crime adds to the local cost of policing and incarcerating criminals, just as recreation-related traffic—even though it may not create congestion—adds to the cost of maintaining roads.
- **Education and health.** Our analysis found that recreation is associated with a more educated population, particularly with a higher percentage of college-educated people. We also found relatively good health conditions (measured by age-adjusted death rates) in recreation counties. This might be expected from the higher numbers of physicians per 100,000 residents that we found in recreation counties. However, our regression analysis did not find a statistically significant relationship between recreation dependence and the local supply of physicians. So some other explanation must be posited for the general good health in recreation counties, such as greater opportunities for physical exercise or residents who are more health-conscious.
- **Variations by county type.** Conditions vary significantly by recreation county type. For example, Ski Resort counties have among the wealthiest, best educated, and healthiest populations of all recreation county types. Ski Resort counties also have relatively high rates of crime. In contrast, Reservoir Lake counties and South Appalachian Mountain Resort counties have among the poorest and least educated residents of all recreation county types, along with relatively high age-adjusted death rates, but they have relatively low crime rates. Casino counties—which had among the highest rates of job growth and the largest absolute increases in earnings per job during the 1990s—also had among the highest rates of growth in employment per person for seniors, perhaps reflecting the greater need for jobs among those over age 65 in these relatively high-poverty communities.

## Ideas for Future Research

We focused mainly on conditions facing residents of mature rural recreation counties, that is, places that already have a substantial amount of recreation. Additional insights may come from expanding the analysis to include emerging recreation areas and neighboring places that may be affected by spillover impacts from recreation areas. Future research might also address issues related to specific population subgroups, such as low-paid workers, who may face more significant problems related to the high cost of housing in recreation areas. The analysis might also be expanded to examine recreation impacts on other aspects of community well-being, such as the environment, public services, institutions like churches and charitable foundations, and small business formation and entrepreneurial activity.

Our knowledge of rural recreation impacts might also benefit from different formulations of the regression model. For example, models could be fine-tuned to focus on individual indicators, or they could be estimated separately for individual regions and types of recreation areas. Feedback effects might be incorporated into the model—for example, recreation can lead to higher housing costs, which in turn can lead to reduced tourism and recreation development. More sophisticated models may be able to separate out these two effects. The models might also be examined over different time periods to test for cyclical effects and robustness over time.

Research might also measure the effects of specific State and local policies, along with other factors thought to affect the level of rural recreation and tourism (such as the availability of natural amenities and proximity and access to nonmetro areas). This might help State and local officials assess their potential for recreation and tourism development and identify strategies to further this development.

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## Appendix: Regression Analysis

Making inferences from simple comparisons of recreation and other nonmetro county means can be misleading because it is possible that much of the observed socioeconomic difference between the two groups could be coincidental and not directly related to the extent of recreation.

For example, during the 1990s, many recreation counties in the Rocky Mountains benefited from an unusual regional phenomenon associated with the outflow of population from metropolitan California. This raises a question: How much of the difference in growth that we observed between recreation and other nonmetro counties nationwide was region-specific, associated with this one-time outflow of population?

Similarly, the decade of the 1990s was one of rapid economic improvement, which may have particularly benefited places with high poverty rates, providing job opportunities to many who, under normal conditions, would have had a hard time finding jobs. Many of these high-poverty rural areas are in the South in other nonmetro counties. This largely regional phenomenon could have led to our finding that recreation counties nationwide benefited less from poverty rate reduction than did other nonmetro counties. But would we find the same thing if we looked at each region separately?

Other factors unrelated to recreation might also be expected to differentially affect recreation and other nonmetro areas and lead to a potential bias in the differences observed between the two types of counties. For example, counties that are more urban in nature may have had developmental advantages over more rural and isolated areas. While recreation is expected to add to the level of urbanization, recreation counties are still less urban than other nonmetro counties on average, so this potential bias could mask the beneficial impact of recreation in simple comparisons.

### Regression Methodology

In an attempt to overcome potential biases, we narrowed our analysis to recreation counties and conducted a regression analysis to see how a recreation county's extent of recreation dependency might affect the socioeconomic indicators examined in this report. Our measure of recreation dependency is the weighted average of a county's Z-scores covering tourism-related employment and income shares of the local economy and the recreational home share of total county homes, as developed by Johnson and Beale (2002): the larger the average, the more dependent a county is on recreation and tourism.<sup>19</sup> In addition, we included 10 dichotomous variables reflecting the Johnson and Beale recreation county types (for statistical reasons, we excluded the miscellaneous recreation county type). This allows for significant socioeconomic variations by type of recreation county (but it assumes that impacts associated with changes in recreation dependency do not vary with recreation type).

Following the approach of English et al. (2000), we also included several control variables that were not highly correlated with recreation dependency but that might be expected to affect local socioeconomic conditions. For example, we included eight dichotomous (0,1) variables identifying the

<sup>19</sup>Among the recreation counties we included in our analysis, recreation dependency ranged from a minimum of 0.12 to a maximum of 8.60, with a mean of 1.56 and a standard deviation of 1.23.



Census regional subdivisions. We did not include a dichotomous variable for one of the nine subdivisions—the Southeast—to avoid statistical problems.

We also included several demographic measures related to urbanization that are often included in empirical studies explaining regional socioeconomic variations. One was a dichotomous variable indicating whether the county was influenced by a nearby metropolitan area (based on adjacency as defined in the ERS 1993 Beale Codes, which requires both physical adjacency and significant commuting to the metro area). The other two demographic measures were county population density and percentage of county population residing in the rural portion of the county.

Ideally, an attempt to explain cross-county variations in socioeconomic indicators would involve separate models for each indicator, using theory to identify the explanatory variables and the form of the regression most relevant for a particular indicator. Given the large number of indicators in this study, we decided a simpler approach was expedient, so we followed English et al. in using just one set of explanatory variables for all of the indicators examined in our study. This results in some imprecision.

One of the ways our analysis differed from that of English and his colleagues was that our regressions only explained variations among our 311 recreation counties (rather than including all nonmetro counties as English did). In addition, we ran two ordinary least-squares regressions explaining intercounty variations rather than one. One of our regressions explained intercounty variations in the year 2000 (or the most recent year the data were available). The other regression explained intercounty variations in the change in the indicator over the previous 10 years. The change regression, which used the identical set of explanatory variables, may be viewed as a check on the year 2000 regression. In most cases, the regressions produced similar results: if recreation dependency was significant in the 2000 regression, it usually had the same sign and was significant in the change regression.

We also ran additional regressions for each indicator, adding a “squared” version of the recreation dependency variable to allow for a curvilinear relationship. We do not show the results of these additional regressions because in most cases they did not affect our results—the squared variable either explained little or no additional variation, or it only replaced the non-squared recreation dependency variable in significance with the same sign. In discussing our findings, however, we mention two cases where these curvilinear recreation factor regressions provided interesting results.

## Regression Findings

Space limitations prevent us from showing the complete regression results here, including estimated coefficients for the many control variables we used in our regressions.<sup>20</sup> However, we can summarize our findings by showing only the regression coefficients for the recreation dependency variable in the linear regressions we ran to explain variations for each of the socioeconomic variables of interest. For example, each horizontal row in table 7 summarizes the results of one or two regressions covering a particular socioeconomic variable. Results for the 2000 regression refer to regres-

<sup>20</sup>Detailed regression results are available from the authors upon request.

sions that explain socioeconomic variations in the year 2000 (or in the next-closest year available). Results for the 1990s change regression refer to regressions that explain variations in the change in socioeconomic variables during the 1990s. Thus, table 7 summarizes the results for 29 regressions. In addition, the regression statistics shown are unstandardized, and one should not attempt to draw inferences about their relative importance based on their magnitudes.

These regression coefficients are generally consistent with what we previously found when comparing simple means for recreation and other nonmetro counties (tables 2 and 3). Dependency on recreation was significantly related to most of our economic indicators, and the recreation dependency regression coefficients were also generally consistent with most of our prior findings with regard to social indicators.

In addition, we found statistically significant relationships that were not apparent from comparisons of means for recreation and other nonmetro

Table 7

### Linear regression analysis measuring the effect of recreation dependency on economic and social indicators

Dependent variables	2000 regression		1990s change regression	
	Recreation dependency B estimate	Regression's explanatory power <sup>1</sup>	Recreation dependency B estimate	Regression's explanatory power <sup>1</sup>
<b>Economic indicators:</b>				
Job growth rate	NA	NA	5.50**	0.184
Employment-population ratio:				
Ages 16-24	1.13**	0.209	0.56**	0.115
Ages 25-64	0.92**	0.211	0.48**	0.139
Ages 65 and over	1.04**	0.364	0.30	0.013
Earnings per job	-7.95	0.396	482.77**	0.265
Earnings per worker <sup>2</sup>	846.49**	0.317	NA	NA
Income per capita	1,044.52**	0.265	487.73**	0.207
Median household income <sup>2</sup>	1,474.40**	0.393	907.59**	0.339
Median rent	32.59**	0.516	10.74**	0.377
<b>Social indicators:</b>				
Population growth rate	4.59**	0.282	2.85**	0.245
Travel time to work	-0.25	0.327	-0.44**	0.157
Poverty rate <sup>2</sup>	-0.84**	0.249	-0.43**	0.242
Percent without HS diploma	-1.37**	0.468	0.22	0.341
Percent with bachelor's degree	2.24**	0.491	0.65**	0.211
Physicians per 100,000 population <sup>3</sup>	0.69	0.280	NA	NA
Age-adjusted death rate per 100,000 population <sup>4</sup>	-24.20**	0.290	NA	NA
Crime rate <sup>2</sup>	0.68**	0.264	NA	NA

NA=Not applicable.

\* The coefficient is statistically different from zero at the .05 level.

\*\* The coefficient is statistically different from zero at the .01 level.

<sup>1</sup>Adjusted R-square statistic (fraction of variation explained by regression).

<sup>2</sup>Data are reported for 1999

<sup>3</sup>Data are reported for 2003.

<sup>4</sup>Data are reported for 2000-02

Source: ERS calculations, based on data from U.S. Census Bureau and Bureau of Economic Analysis, U.S. Department of Commerce, and Bureau of Labor Statistics, U.S. Department of Labor.

counties. For example, the regression analysis showed significant positive relationships between recreation and the employment-population ratios for all three age groups studied, whereas there was little or no difference in the means for these ratios.

In some cases, the regression analysis raises questions about previously observed statistical differences. For example, we earlier found that recreation counties were statistically different from other nonmetro counties with respect to number of physicians per 100,000 residents, but the regression analysis found no statistically significant relationship between this indicator and recreation dependency.

For travel time to work, we had previously found no statistically significant difference between recreation and other nonmetro counties, either for the year 2000 or for the trend during the 1990s. However, the regression analysis revealed a statistically significant negative relationship between recreation dependence and change in travel time to work during the 1990s.

One of the more interesting findings was recreation dependency's negative and statistically significant relationship with the change in poverty rate. This means that the more recreation dependent a county is, the bigger its decline in poverty rate during the 1990s, controlling for other factors. The finding contrasts with our simple descriptive analysis, which found that recreation counties had, on average, a smaller decline in poverty than other nonmetro counties during the 1990s. This suggests that, as we suspected, the smaller average decline in poverty for recreation counties may have been simply a geographic coincidence, because when we controlled for regional differences and other factors in our regression analysis we found that the higher a county's recreation dependency, the more its poverty was reduced during this decade.

Another interesting finding involved earnings per job. We initially found that recreation dependency had a negative but statistically insignificant coefficient for earnings per job (in the 2000 model). When we ran the curvilinear version of the first regression (the 2000 model), we found a significant negative coefficient for recreation dependency and a significant positive coefficient for recreation dependency squared.<sup>21</sup> This implies that the recreation counties with moderate degrees of recreation dependency had relatively lower earnings per job, while those with higher or lower recreation dependency had higher earnings. Taken together, these findings present a somewhat muddled picture with respect to recreation impacts on earnings per job—there is no clear indication that recreation hurts a county in this regard. We got a clearer regression finding regarding the change in earnings per job during the 1990s, which revealed a positive and significant relationship between recreation dependency and the growth in earnings per job.

Two other indicators had different results for the 2000 regressions and the 1990s change regression: the employment population ratio for the elderly and the percent of adult (ages 25 and older) residents without high school diplomas. In both cases, the regressions explaining the change in the indicator produced insignificant coefficients for recreation dependency. For the employment-population ratio for ages 65 and up, the change regression performed very poorly, explaining less than 6 percent of the variation—less

<sup>21</sup>The nonlinear version of the change regression did not produce a similar significant relationship.

than any other regression in our analysis. This suggests that we might find a significant relationship if we were to improve the model to explain the behavior of the elderly. For the other indicator, the percentage without high school diplomas, we may need to find some other explanation, since the regression explaining change for this indicator performed better in terms of explaining variation than all of our other change-form regressions. Perhaps something unusual was going on in the 1990s that kept places with higher recreation dependencies from experiencing more significant declines in the percentage lacking high school degrees.<sup>22</sup>

We have already mentioned recreation's curvilinear relationship with earnings per job. The other case where we found a curvilinear relationship involved recreation's effects on population growth rates in the 1990s. The linear regression explaining population growth rate had a statistically significant positive coefficient for recreation dependency. The curvilinear regression had a statistically significant positive coefficient for recreation dependency and a statistically significant negative coefficient for recreation dependency squared. This implies that counties with moderate recreation dependencies have higher growth rates than counties with smaller or larger recreation dependencies.

<sup>22</sup>For example, it may be that during the 1990s, higher educated retirees began to move to a wider array of recreation areas, whereas before they may have concentrated in the most recreation-dependent areas.

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