Maintenance Practices and Costs of Rail-Trails

rails-to-trails conservancy

CONTENTS

Wallkill Valley Rail Trail, NY.

Rails-to-Trails Conservancy serves as the national voice for more than 160,000 members and supporters, 30,000 miles of rail-trails and multiuse trails, and more than 8,000 miles of potential trails waiting to be built, with a goal of creating more walkable, bikeable communities in America. Since 1986, we have worked from coast to coast, supporting the development of thousands of miles of rail-trails for millions to explore and enjoy.

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ACKNOWLEDGMENTS

Produced by Rails-to-Trails Conservancy

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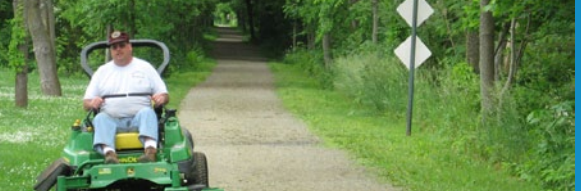
June 2015

The team wishes to recognize and thank RTC staff and others who contributed to the accuracy and utility of this report. Thanks to the trail managers and RTC staff who contributed photos for this report.

This study was made possible by the generous support of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation, Community and Conservation Partnership Program.

Allegheny River Trail, PA.



EXECUTIVE SUMMARY

For the past three decades of rail-trail development, maintenance costs have generally been seen as being expensive. These expenses, however, have remained largely untracked on a state or national basis. Further, a comprehensive breakdown and ranking of maintenance priorities did not exist.

To better understand this issue, RTC conducted a comprehensive survey of trail maintenance costs. Results of this study show that, contrary to popular belief, maintenance costs are not as high as many perceive them to be. In fact, when taking into account for volunteers, this study found that maintenance costs on average range from $500 to $1,000 per trail mile per year depending on surface.

St. John Valley Heritage Trail, ME.

In the 10 years that RTC's Northeast Regional Office has tracked technical inquiries, there has been a steady decline in the number of maintenance-related request. There are likely several reasons for this decline. Rail-trail managers and others share maintenance methods through a variety of networks, in addition to providing direct assistance to one another. Earlier documents on maintenance best management practices have also likely been helpful. In addition, many individual trails have been combined into larger systems, thus creating economies of scale. Volunteer programs also have grown in size and dependability and have taken on more responsibility.

Finally, it is evident that maintenance also has been deferred.

Therefore, it is possible that although maintenance costs have declined over time, perception of those costs has remained the same.

Trail managers and local stakeholders often cite the need for dedicated state or federal funding to help pay for trail maintenance. Up to this point, RTC has lacked sufficient data to make that case effectively to decision-makers at the state or federal level. This study was initiated to bring some clarity to this issue. Whether in a town hall meeting or a discussion with a member of Congress about the reauthorization of federal funding, more accuracy regarding rail-trail maintenance costs is required.

Because funding for rail-trails is difficult to secure, over-estimating maintenance costs can inadvertently give opponents easy leverage to speak against rail-trail development. In addition, funders often question if all aspects of any community development project should be funded by state and federal grants, particularly maintenance-related costs, which are often perceived as a "local issue."

This study presents a more comprehensive understanding of rail-trail maintenance, as has been done for other rail-trail issues such as construction costs, economic impact and rails-with-trails. Such an approach enables the rail-trail community to focus its limited resources more effectively on addressing the most critical issues.

This publication is the third in a series of similar works prepared by the RTC Northeast Regional Office. The first was released in 1996 in collaboration with a U.S. Department of Agriculture AmeriCorps staff member based in Fayette County, Pennsylvania. The second was released in 2005 and, as with this document, was made possible through a Growing Greener grant from the Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

Each successive study has grown in size and scope and, ideally, usefulness. The 1996 study contained 40 questions and received responses from 60 rail-trail managers. The 2005 study expanded to 70 questions and 100 respondents. This latest version asked 117 questions and drew answers from 200 respondents.

Of all the 2014 participants, 37 percent represented rural rail-trails, 14 percent urban, 13 percent suburban and 36 percent mixed. The mixed category contained primarily a rural/suburban combination.

In addition to identifying the types and frequency of maintenance tasks, this study sought for the first time to secure data on the cost of rail-trail maintenance. Almost 50 percent of the 200 trail managers provided a total maintenance cost, though far fewer had an actual budget. With the help of several veteran trail managers, RTC went a step further and prepared an additional 44-question survey that broke down the cost of each task. Only 25 managers completed this survey, and many of these required repeated follow-up by e-mail and phone.

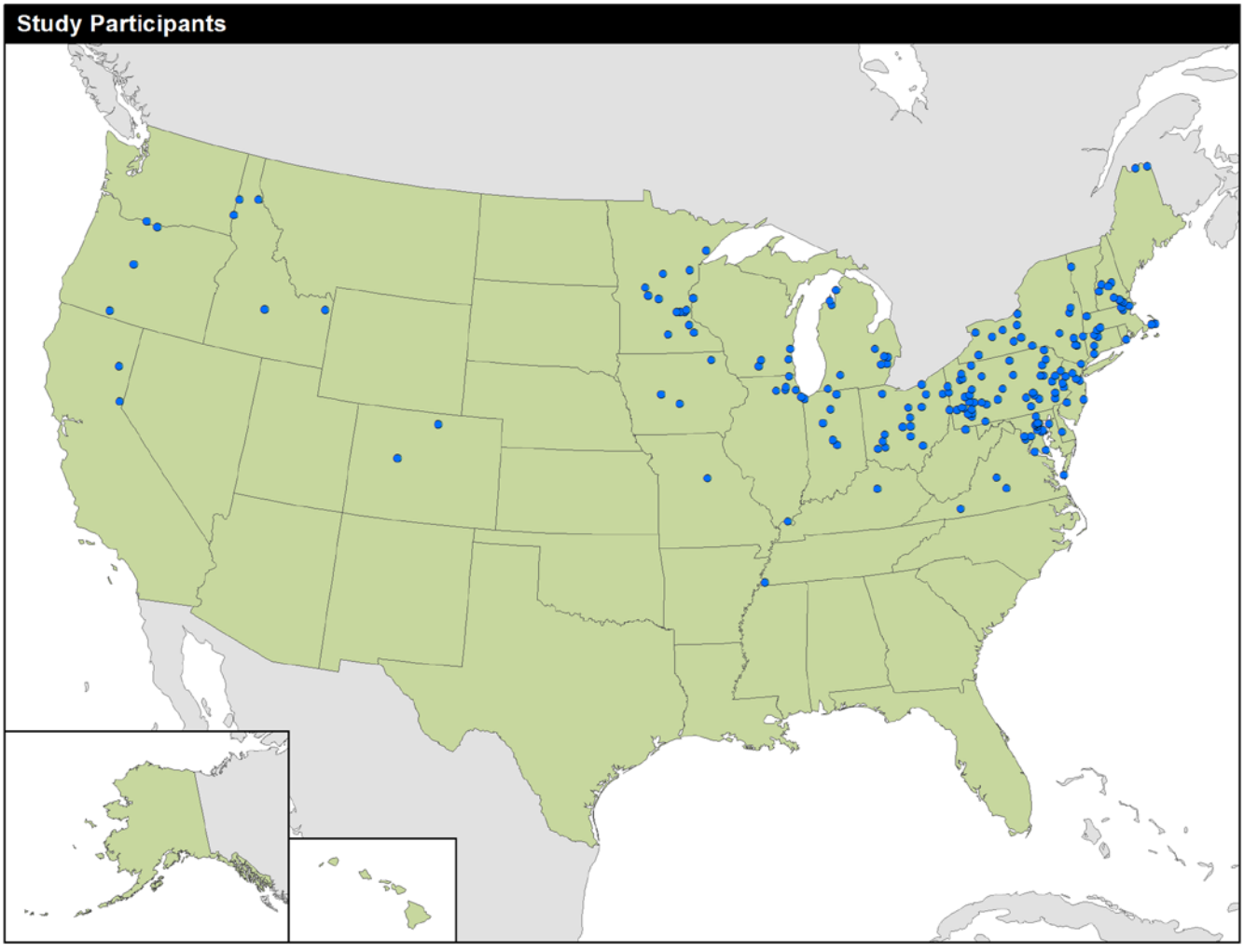


Figure 1. Map of Trail Groups Participating in Study

State and county managers said that it was too difficult to separate these costs from larger existing budgets. Small entities and private nonprofits said they simply did not have the capacity to track these figures.

If the need for maintenance funding is so critical, however, it would stand to reason that this data would be more available or that completion of the questionnaire would have greater value. This research indicates that the more likely explanation for why these costs are not tracked more rigorously is that rail-trails do not require as much maintenance as some fear or promote. This finding is critical in the ongoing case for funding support for rail-trails.

Snow covered bridge on the Piscataquog Trail in NH.

METHODOLOGY

The comparisons illustrated in this study are mostly between the 2005 and 2014 findings. The 1996 study contained too many "check all that apply" questions, which resulted in multiple answers and thus participation greater than 100 percent; comparison of the latter two studies was more reliable, as the answers in each added up to 100 percent. Further, not all the same trails were surveyed in the three studies. Unfortunately, only including those trails that participated in all three studies would have yielded too low a number to be significant.

The 2014 study began with a review of the earlier studies to determine which topics required updating. Our technical assistance team provided additional insights of the questions they typically are asked. We then did a review to determine what, if any, recent literature addressed the topics of trail maintenance activities and associated cost.

We then developed a survey instrument that would collect as much information as possible regarding the most important topics. During this process, we realized that there were different sets of questions for different trail surface types. This increased the number of questions in the survey to an overwhelming 195, which could prove prohibitive to trail managers.

This potential problem was solved by the decision to create the cost survey in Survey Monkey. Using this vehicle, we could provide trail managers with a link to the online survey, and they could take the survey at their convenience. This also enabled us reduce the number of questions by utilizing the skip logic in Survey Monkey, the manager of an asphalt-surfaced trail, for example, could "skip" all of the questions not applicable to their surface type.

To make comparisons across the trails, we limited our query to states with four seasons. We did not send invitations to trail managers in the southern tier of states.

Links to the online survey were sent to approximately 300 trail management organizations contained in RTC's national trails database as of January 6, 2014. Reminders to participate were sent to those organizations that did not immediately respond.

Of the responding trail management organizations, 95 indicated that they had a trail maintenance budget. A follow-up survey to gather more detailed maintenance cost information was sent to these 95 organizations. This was not an online survey but a Microsoft Excel spreadsheet, with 48 maintenance tasks as rows. Columns captured labor hours, hourly labor cost, volunteer hours, equipment costs, material costs, contracted services and total cost.

Many follow-up emails, phone calls and personal pleas were made over several months to encourage participation in this phase of the study.

Trail side mowing along the Perkiomen Tail in PA.

MAJOR MAINTENANCE TASKS

The 2005 study indicated that trail group volunteers performed maintenance tasks on 46 percent of the survey trails. In the 2014 study, this percentage increased to 58 percent. Municipal government was the second most cited entity for performing maintenance tasks after trail-group volunteers, at 32 percent in 2005 and jumping to 43 percent in 2014. The percent of municipal governments owning trails remained nearly the same in the two studies, at 30 percent and 34 percent in 2005 and 2014, respectively.

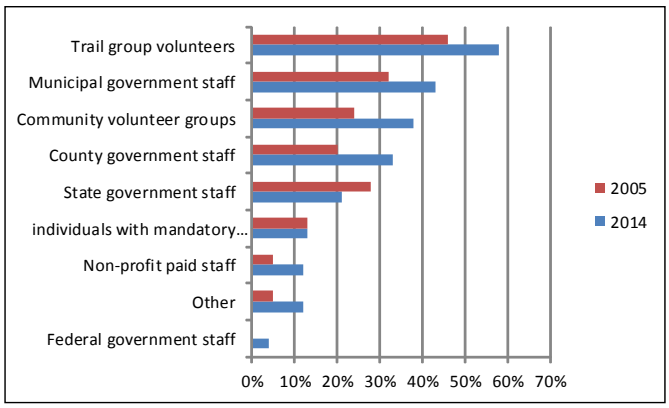


Figure 2. Who Performs Maintenance (2014 Survey)

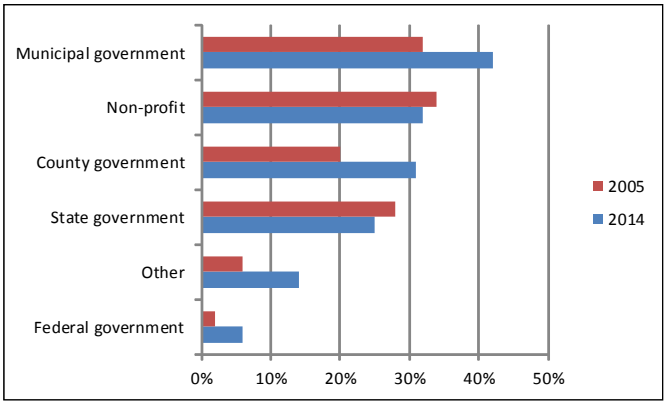


Figure 3. Trail Maintenance Funders (2014 Survey)

Administration

Written trail maintenance plan

We were surprised that 60 percent of the responding trail managers indicated they do not have a written trail maintenance plan. A written maintenance plan will save time and money and contribute to a better experience for trail users.

Funding trail maintenance

In the 2014 survey, municipal government was the leading funder of trail maintenance, mentioned by 42 percent of respondents. This is a significant increase from the 2005 maintenance study, when 26 percent mentioned municipal government funding. Funding by a nonprofit fell slightly from 34 percent in 2005 to 32 percent in 2014.

Of the trail managers who indicated that they had a budget specifically for trail maintenance, the figures for that budget ranged from less than $500 to more than $700,000. This range is nearly identical to that reported in the 2005 study.

Tracking annual users

Although not strictly a maintenance issue, the number of annual users of a trail does affect maintenance needs. Fifty four percent of our respondents indicated that they do not currently track the number of trail users; another 23 percent indicated that they guess or estimate. Of those trail managers who do conduct user counts, 16 percent do a manual count, and 23 percent conduct the count using an automated counter of some type. The reported annul usage ranged from 2,000 to more than 2 million.

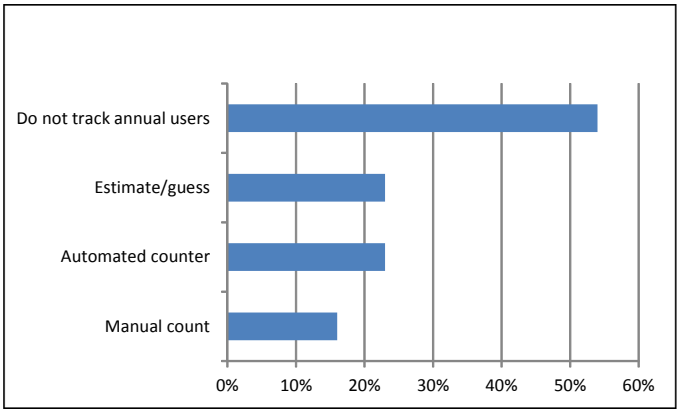


Figure 4. Tracking by Trail Managers (2014 Survey)

Hours of operation

Consistent with the 2005 trail maintenance and operations study, two-thirds of the trails surveyed in 2014 are open on a dawn-to-dusk schedule.

Perkiomen Rail Trail, PA.

Vegetation – Grass, Trees, Herbicides and Invasives!

Mowing

Sixty percent of detailed cost survey respondents reported that mowing was a labor-intensive maintenance activity and a significant component of the annual maintenance budget. We conducted a correlation analysis to determine if there was a relationship between labor hours and the length of trails. The graph below reveals that such a relationship does not exist.

Based on the data provided in the detailed cost analysis, it is apparent that the amount of time and expense associated with mowing is really a function of how the trail was designed. Some trails have a lot of grassy areas on the shoulders of the trail tread, while others have crushed stone or other shoulder materials that don't require periodic mowing.

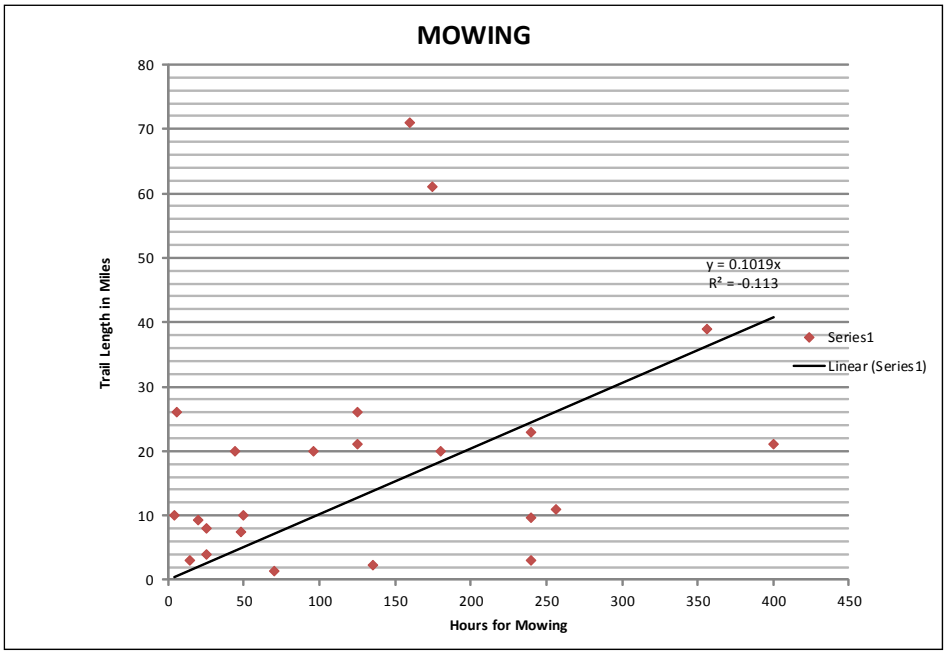
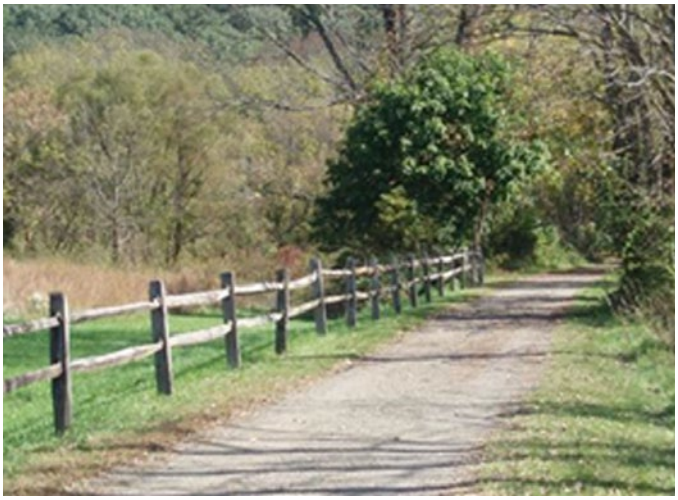


Figure 5. Correlation analysis shows no relationship between labor hours and length of trails.

MAJOR MAINTENANCE TASKS

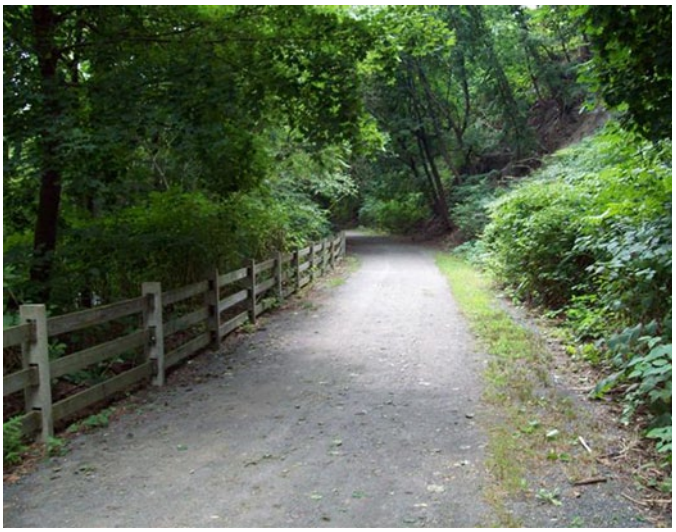


Perkiomen Rail Trail, PA
20 miles
Annual mowing costs $12,542

Rio Grande Rail Trail, CO
20 miles
Annual mowing costs $2,112

The Perkiomen Trail has a significant amount of grass along the shoulders of the trail and fencing that needs to be cut around manually. On the other hand, the Rio Grande Trail has more native vegetation or stone shoulders that do not require frequent mowing.

Heritage Rail Trail County Park, PA
21.1 miles
Annual mowing costs $6,000



Lackawanna River Heritage Trail, PA
19.9 miles
Annual mowing costs $7,367

The mowing cost for these two trails is fairly close on a per mile basis. The Heritage Rail Trail has a parallel rail bed along most of its length that requires herbicide treatment but no mowing. The Lackawanna Trail allows natural vegetation to grow along the shoulders or has placed stone shoulders.

MAJOR MAINTENANCE TASKS

Lititz-Warwick Trailway, PA
3 miles
Annual Hours mowing 240
Annual mowing costs $3,553

Oil Creek State Park Trail, PA
9.7 miles
Annual hours mowing 240
Annual mowing costs $3,739

The Lititz-Warwick Trailway has significant amounts of grassy areas that require mowing along trail edges in a primarily suburban setting. Oil Creek State Park Trail is more rural and relies on natural vegetation along the trail edges that does not require much maintenance. Surprisingly, however, both reported 240 hours was required for mowing each year. This example appears to indicate that there is no correlation between labor hours and costs.

Vegetation Management

We asked trail managers how much time they dedicate to vegetation management along the trail because this work is the second most labor-intensive, costly maintenance item reported by respondents to the detailed cost analysis survey. Of these respondents, 62 percent reported on this maintenance activity. The amount of time reported on a per-mile basis varied from as little as 0.25 hours per mile to 106 hours per mile (most of this work is carried out by volunteers).

We provided a list of 12 tasks to 2014 maintenance survey respondents when asking about their management of trail-side vegetation. More than 90 percent of our respondents reported that they do litter cleanup, tree pruning, fallen tree removal, tree removal as a safety issue, and mowing.

Removal of invasive tree species is becoming an increasingly necessary maintenance task. In the 2005 report, 36 percent of respondents reported invasive species removal as an important task; in 2014, almost 93 percent reported it as a major activity.

In the 2005 survey, about a third of the respondents indicated that they used a chemical herbicide to control vegetation. That percentage increased to 55 percent in the 2014 survey. Seventy-five percent of 2014 respondents reported that trail maintenance staff has responsibility for application of the herbicide. This activity was contracted out by only 14 percent of the respondents.

Tree down on Heritage Rail Trail County Park, PA.

Volunteers trimming brush, Three Rivers Heritage Trail, PA.

On average, respondents said they spent 13.5 hours per mile on vegetation management. The cost of vegetation management varied widely, from less than $100 for a four-mile trail to more than $55,000 for a 24-mile trail. Much of this work is carried out by trail management staff or volunteers, although some trail organizations do contract out this type of work. Volunteers should have some degree of training and supervision, especially when working with an herbicide.

Tree Removal

Tree removal was a significant maintenance task reported in our detailed maintenance cost analysis survey. Most of the reported costs were in excess of $1,000. Forty percent of the reporting trails indicated that they contracted out this activity. There are a number of reasons stated for removing trees. In some cases storms cause tress to block the trail. In others, a dead tree presents a potential hazard to trail users and is removed before limbs come crashing down on the trail.

Surface – Repair, Clearing, Snow

In the 2014 study we asked respondents to identify the predominant trail surface material based on six choices: asphalt, concrete, crushed stone, original railroad cinders, dirt/soil and boardwalk. The number of responses for concrete, railroad cinders, dirt and boardwalk were so small (seven or fewer) that analysis was not possible. Therefore, we concentrated our analysis on asphalt and crushed stone.

In the 2005 study, 45 percent of respondents indicated that their trails were composed of asphalt, and 41 percent said crushed stone. In 2014, asphalt increased to 52 percent, and crushed stone decreased to 34 percent. This increase in asphalt could either be because of increased use of asphalt surfaced trails or the samples included in the survey. In some cases, state policy dictates that trails must have an asphalt surface.

Beaver caused erosion damage, Ashuelot Rail-Trail, NH.

Maintenance of Non-asphalt Trails

The labor hours and resulting cost of repairs to non-asphalt trails varied widely among survey respondents. Labor hours reported for repairs ranged from 0.2 hours per mile for an 11-mile trail in Pennsylvania to 9.3 hours per mile for a three-mile trail in Massachusetts. The total cost of making repairs varied from a low of $31 to a high of nearly $13,000.

Not only did these costs vary widely across our sample, but they also varied widely from year to year. The major cause of damage to non-asphalt trails was because of water erosion, as reported by 55 percent of survey respondents.

The second biggest cause for repairs is because of vegetation, as reported by 25 percent of survey respondents. This can be caused by grass growing through non-asphalt trail surface, vegetation encroaching on trail edges or proliferation of invasive species. Controlling damage caused by vegetation encroachment is manageable with a program of regular, scheduled inspection and preventative maintenance.

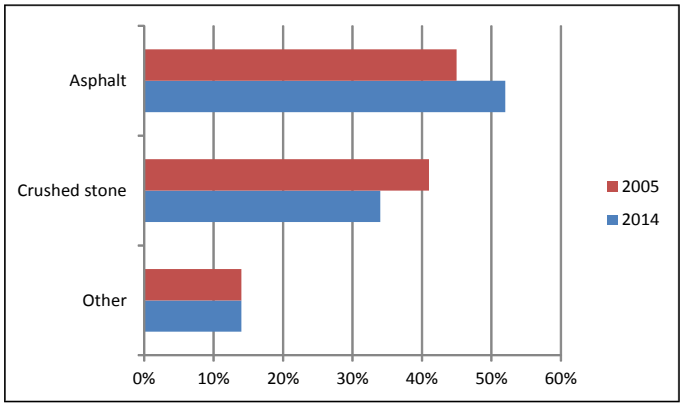


Figure 6. Predominant Trail Surfaces (2014 Survey)

Uncontrolled weed growth through trail surface.

Regrading of some or the entire surface is another requirement in non-asphalt trail maintenance. The amount of labor hours involved to perform this task varied widely, from 14 hours to regrade a three-mile trail to two hours to regrade a 10-mile trail. The nature of the re-grading process and the type of equipment used contribute to this variability. A good estimate of the average, based on those reporting this activity, is two hours per mile for re-grading a non-asphalt surface trail.

Maintenance of Asphalt Surfaced Trails

New to the 2014 were questions regarding causes of damage to asphalt trails. Survey respondents could list multiple causes of damage. As shown in Figure 7, tree roots are by far the leading cause of damage to an asphalt trail surface at 63 percent. The frost/freeze cycle and water erosion rank second and third, at 44 and 43 percent, respectively.

Respondents to the detailed maintenance cost survey submitted significant costs for repair of asphalt-surfaced trails. Examples include $9,600 for a 71-mile trail; $7,350 for a three-mile trail; and $7,200 for 39-mile trail. Only 30 percent of trail managers reported any asphalt repair. Only eight percent of managers of asphalt-surface trails reported that they seal-coated their trail. On a three-mile trail, the cost of the sealant material was $4,000 and the labor to apply it took 24 hours, or three work days.

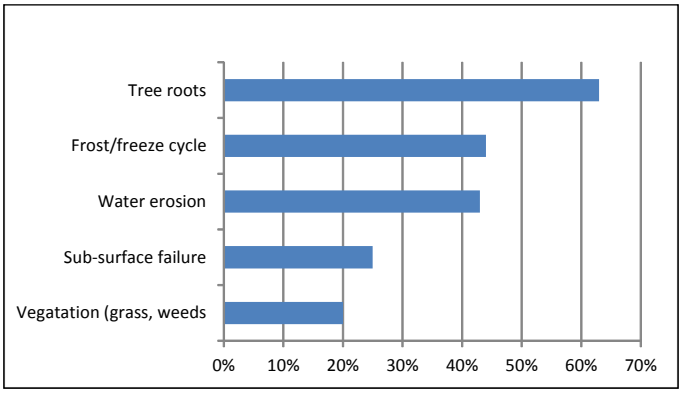


Figure 7. Sources of Surface Damage (2014 Survey)

Tree root damage Manhan Rail Trail, MA.

Another task required for maintenance of asphalt trails is crack sealing. The Willard Munger State Trail in Minnesota reported spending 240 hours sealing cracks on the 71-mile trail. That's $5,760 in labor costs and $2,500 in material costs. Similarly, the Oil Creek State Park Trail in Pennsylvania had labor costs of $935 and material costs of $1,500 to seal cracks along the 9.7-mile asphalt trail. Lack of a crack-sealing program can lead to vegetation growing up through the cracks, and this will contribute to deterioration of the asphalt surface.

MAJOR MAINTENANCE TASKS

Maintenance of crushed stone

More than one-half, or 56 percent, of 2014 respondents with a predominantly crushed stone surfaced trail reported that their trail had been resurfaced since original construction. This is a decrease from two-thirds in the 2005 study. In 2014, the most mentioned interval for resurfacing was 10 years or longer, compared with nine years in the 2005 study.

Consistent with the 2005 study, 71 percent of respondents indicated that crushed surface trails are primarily repaired manually, with a rakes, shovels and other hand tools. Light duty power equipment such as a Bobcat was used to repair damage by 42 percent of the respondents, and 32 percent responded that they utilized heavy equipment such as a grader. The type of equipment used is dictated by the severity of the damage to the crushed stone surfaced trail.

Forty-four percent of our survey respondents indicated that their crushed stone trail had been regraded since its original construction. This maintenance activity is carried out on an as-needed basis by 70 percent of the trail managers.

Water erosion is the most frequently mentioned cause of damage to a crushed stone surfaced trail, with 77 percent of respondents reporting it the 2014 study.

Water erosion is the most frequently mentioned cause of damage to a crushed stone surfaced trail.

Vegetation encroaching through the trail surface was the second most common cause of damage to a crushed stone trail, with one-third of respondents citing this cause. Less than 2 percent of respondents indicated tree roots as a cause of damage to a crushed stone surface trail.

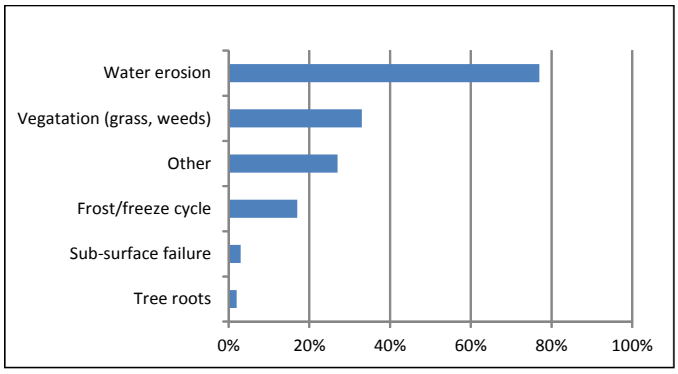


Figure 8. Sources of Damage to Crushed Stone Surface (2014 Survey)

Surface Clearing of Trail

For the purpose of the survey, trail clearing was defined as the removal of material such as leaves, sticks and stones from the trail surface. A third of the respondents to our detailed cost survey indicated that time was spent clearing the surface of the trail. This activity was mostly confined to asphalt surfaced trails. On average, surface clearing took 3.5 hours per mile, at an average cost of $22.25 per hour.

Erosion damage to stone dust trail.

Maintenance of Pavement Markings

Pavement markings are generally associated with asphalt-surfaced trails. This study found that a painted center line was the most common type of pavement marking. Other pavement markings are safety or instructional in nature. Some markings are painted on the trail surface, while others are applied thermally. The detailed cost analysis revealed that this activity, while not reported by many respondents, varied in cost from $19 per mile to $140 per mile.

Pavement markings, Hanover Trolley Trail, PA.

Snow Removal

Winter use of the Torrey C. Brown Trail, MD.

In the general maintenance study, 33 percent of respondents reported that they removed snow from portions of the trail, and 9 percent reported that they remove snow from the entire length of the trail. Generally, full or partial snow removal was more common on trails in urban or suburban areas.

According to respondents to the detailed cost study who reported snow removal (25 percent), the time and cost of snow removal varied widely. Time spent ranged from 500 hours on the 71-mile Traverse Area Recreation Trail in Michigan to 15 hours on the 24-mile Three Rivers Heritage Trail in Pittsburgh, Pennsylvania. This activity varied widely from year to year based on the frequency and amount of snowfall.

Some trail managers who did not report clearing snow from the trail surface did report that they cleared snow from trailhead parking lots. Trails can get a great deal of winter use if potential trail users have a place to park. Cross country skiing is a popular activity on many rail-trails in snow country. The Heritage Rail Trail County Park in Pennsylvania spent $600 clearing trailhead parking lots for skiers but does not clear the trail surface. In 2014, 63 percent of respondents reported doing trailhead snow removal, compared with half that number in 2005.

Drainage

Maintenance of drainage areas is critical to helping minimize the damage to both asphalt and crushed stone surfaced trails caused by water erosion. As we found in the 2005 survey, this activity is primarily carried out manually with the use of rakes and shovels. In both surveys, this manual activity was reported by 70 percent or more of the respondents.

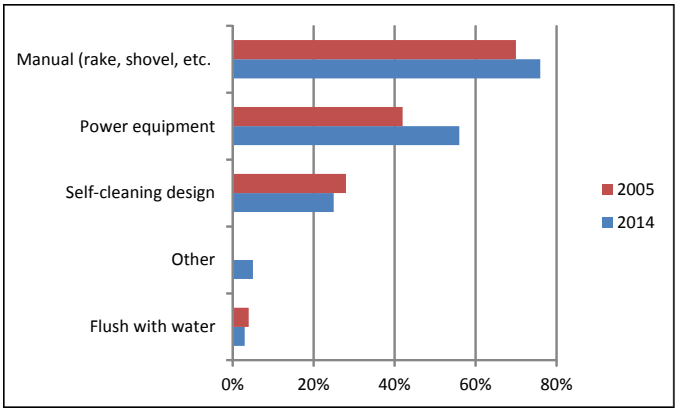


Figure 9. Drainage Activities (2014 Survey)

Culvert failure, Allegheny River Trail, PA.

Clearing of drainage swales and culverts

Periodically investing several hundred or even several thousand dollars in maintaining trail drainage systems and culverts can prevent catastrophic damage to a trail when a major water event occurs.

Culvert failure, Manhan Rail Trails, MA.

Forty-one percent of respondents to the detailed cost analysis survey reported spending staff and volunteer hours on this task. A quarter of those reporting indicated that this activity was carried out entirely by volunteers.

Volunteers on the four-mile Greater Hazelton Rails to Trails in Pennsylvania spent 60 hours on this task.

Of those trail management organizations that reported carrying out this this activity, the cost varied from $85 per mile to $350 per mile. Cost depended

on the type of drainage system used along the trail, the number of culverts that required cleaning and the method used to clean drainage swales and culverts.

The Montgomery County Pennsylvania Regional Trail maintenance schedule requires that drains, pipes, culverts and inlets are cleared out three times per year and must be checked after all heavy rainfalls. All leaf litter, branches and other debris are required to be removed at inlets and along drainage swales.

The West Penn trail maintenance plan calls for clearing drainage swales twice a year or as needed. Most of this work is done with rakes and shovels. Some larger ditches may require the use of a backhoe.

Drainage swale in need of cleaning.

Trailhead Amenities

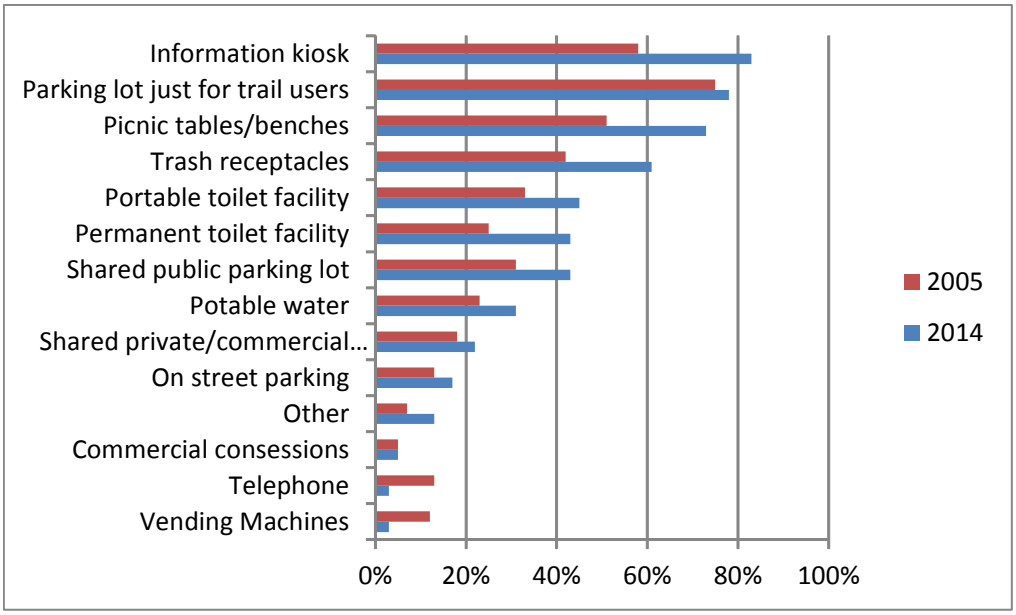
Between 2005 and 2014, dramatic changes were made in the types of facilities that trail managers provide at trailheads.

In 2005, only 58 percent of the survey respondents indicated that they provided an information kiosk at the trailheads. In the 2014 survey, however, 83 percent of respondents indicated that an information kiosk was part of the trailhead facility.

Availability of a permanent restroom facility increased from 25 percent in 2005 to 43 percent in 2014. Availability of portable toilet facilities at trailheads increased from 33 percent in 2005 to 45 percent in 2014, and the availability of trash receptacles increased from 42 percent to 61 percent over the decade between surveys.

Down East Sunrise Trail, ME.

MAJOR MAINTENANCE TASKS



Between 2005 and 2014, dramatic changes were made in the types of facilities that trail managers provide at trailheads.

Figure 10. Trailhead Features (2014 Survey)

In 2005, 51 percent of the respondents reported trailheads featuring picnic tables and benches; that number increased to 73 percent in 2014. Telephones at trailheads fell from 13 percent in 2005 to 3 percent in 2014, consistent with an overall decline in public phones in the United States.

In 2005 only 43 percent of survey respondents reported the availability of picnic tables and benches along the trail. Today, 76 percent of trail managers' report that picnic tables or benches are provided along their trails.

Trailheads

Respondents were asked to provide a detailed cost for several aspects of trailhead maintenance, including landscaping, toilet facilities and kiosks. For the majority of those reporting, landscaping at trailheads was carried out by volunteers. Volunteer hours annually ranged from as few as eight to as many as 500. The largest cost item at trailheads was maintenance of restroom facilities. The lowest cost item was maintenance of informational kiosks at the trailhead.

Amenities

The cost of maintaining amenities such as picnic tables and benches varied among trail managers reporting detailed cost information. It was most strongly correlated to the length of the trails, as longer trails required more benches and picnic tables to maintain. For example, the 71-mile Willard Munger State Trail in Minnesota spent $1,260 on maintenance of amenities, while the eight-mile section of the Ghost Town Trail in Pennsylvania spent only $25. This type of maintenance spending likely also varies on a year to year basis.

Trailhead signage, Youghiogheny Rive Trail, Great Allegheny Passage, PA.

Sanitation

Litter Clean-Up

More than half of the trail managers who responded to the detailed trail maintenance cost survey reported on the number of hours spent cleaning up litter. Although the amount of time spent on litter removal is greater along urban trails, rural trails also require this task. Friends of the Riverfront, which manages the 24-mile Three Rivers Heritage Trail system in Pittsburgh, spends 2,000 hours annually on litter control. The 56-mile Trail of the Coeur d' Alenes in Idaho spends 300 hours on litter cleanup.

Cub Scouts help with litter clean-up on the Heritage Rail Trail County Park, PA.

Restroom Maintenance

Maintenance of restroom facilities, whether at trailheads or along the trail, can be an ongoing annual expense. Respondents to the detailed cost analysis survey provided information about maintenance of both permanent facilities and portable toilets. Costs varied widely. The Heritage Rail Trail County Park in Pennsylvania has both permanent and portable toilets at trailheads along the 21- mile trail. Maintenance costs for these facilities were reported at more than $14,000 a year.

Permanent toilet facility along the Pine Creek Rail Trail, PA.

Earth Day trash pick up along the Capital Greenbelt, Harrisburg, PA.

Signage

The 2014 survey revealed that trail managers are increasing the number and types of signs along trails, which adds to the need for maintenance. Posted trail identification signs increased from 75 percent in 2005 to 91 percent in 2014. More trails have mileage markers as well, an increase from 55 percent in 2005 to 74 percent in 2014. The placement of interpretive signs has also grown substantially, from 31 percent in 2005 to 57 percent in 2014. All of this additional signage helps to provide a better trail experience. However, 76 percent of trail managers reported that their signs were subject to vandalism.

Welcome sign, Ashuelot Rail Trail, NH.

Repair and Maintenance of Signage

Another major maintenance task is the repair and maintenance of trail signage. More than 40 percent of respondents reported this as a significant maintenance activity. In this case, trail length is correlated with cost: typically, the longer the trail the more signs that need to be maintained and the more time and cost is involved.

The four-mile Path of the Flood Trail in Pennsylvania reported spending two hours on signage repair and maintenance, and the 26-mile Catskill Scenic Trail in New York reported spending 135 hours on this work.

More than 75 percent of the respondents to the general maintenance survey reported that vandalism was the major cause of damage requiring signage repair and maintenance.

Greenline Trail sign used for target practice.

Access Control

Maintenance of Gates and Bollards

Gates and bollards are used to keep automobiles and other motorized vehicles off of trails that are intended only for non-motorized use. While maintenance costs associated with gates and bollards were reported by only 15 percent of detailed cost analysis respondents, most indicated costs of between $2,300 and $5,000.

Bollard at intersection, Bruce Freeman Rail Trail, MA.

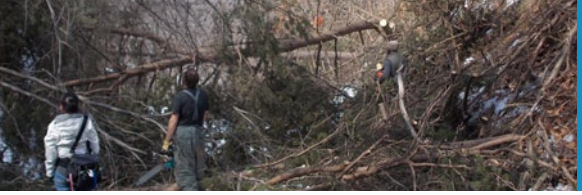
Fencing

A majority of the respondents to our survey, 51 percent, indicated that they had some type of fencing along their trail. Most common was split rail wooden fencing, which was mentioned by 45 percent of the respondents. Over time this becomes a maintenance issue, as posts and rails rot or become damaged in some way.

Fencing generally is deployed along trails to protect trail users from a potential danger, such as a steep slope, or to prevent them from entering adjacent properties. In the detailed cost analysis, we looked at three types of typical trail side fencing: wooden, chain link and vinyl.

Of these three types, wooden fencing was reported to require the most maintenance. Thirty percent of the detailed cost survey respondents reported time repairing wooden fencing. This maintenance can take the form of replacing fencing that had rotted or fencing that had been damaged by accident or acts of vandalism. Only 8 percent of respondents reported repairs to chain link fence. No respondents reported repairs to vinyl fencing.

Damaged split rail fence along the Pine Creek Rail Trail, PA.



Split rail fencing, Pine Creek Rail Trail, PA.

Trail Features

Bridges

A full 88 percent of the trail managers indicated that they have at least one bridge along their trail. The most common — 61 percent — are original railroad bridges. The second most common type of bridge is new bike/pedestrian bridges with vehicle capacity. Surprisingly, 43 percent of respondents indicated that their bridges are not inspected on a regular basis by a certified inspectors or professional engineers. Fortunately, the number of trail managers reporting that their bridges are inspected increased from 33 percent in 2005 to 57 percent in 2014. The most frequent interval for bridge inspections reported in 2014 was two to three years, which is a shorter interval than that reported in 2005.

Scott Glen Bridge, Ghost Town Trail, PA.

Tunnels or Culverts

Tunnels are one of the most distinctive features of many rail-trails. In our 2014 survey, 41 percent of the surveyed trails reported that they had a tunnel on the trail, an increase of 14 percent from those reporting in 2005. Forty percent of the tunnels are illuminated, mostly on a dusk-to-dawn basis, with lighting triggered by a light sensor and powered by a municipal utility.

Other

Vandalism and Illegal Dumping

A third of the respondents to our detailed cost analysis survey reported that they spent time repairing trails due to acts of vandalism or dumping along the corridor. Managers of four trails between 21 and 26 miles long in predominantly suburban/rural environments spent between 40 and 150 hours repairing trails after acts of vandalism or illegal dumping.

Cleaning-up illegal dumping along the Hanover Trolley Trail, PA.

Average Labor Rate

Fifty nine percent of the respondents to the detailed maintenance cost survey reported labor rates for various trail maintenance activities. The rates ranged from a low of $10 per hour to a high of $75 per hour. Most labor rates were clustered around $25 per hour plus or minus $5. The average labor rate for all activities was $22.25.

Contracted Services

Many trail maintenance activities were carried out by trail management organizations and volunteers. Some, however, are better performed by outside contractors. In the survey, activities most commonly reported as being completed by contractors included tree removal, restroom maintenance, herbicide application, bridge inspections and clearing of drainage culverts and mowing.

Volunteers painting over graffiti.

Howard Tunnel, Heritage Rail Trail County Park, PA.

CONCLUSIONS

To better understand this issue, RTC conducted a comprehensive survey of trail maintenance costs. Results of this study show that, contrary to popular belief, maintenance costs are not as high as expected. Per mile yearly average costs for rail-trail maintenance assessed in this study ranged from $1,000 to $2,000, depending on whether the trail was asphalt or stone dust. This assessment supports the findings of the more detailed budgets that a few dozen trail managers provided, which averaged $2,026 per mile per year. This figure includes the value of volunteer service, which was assigned an equivalent hourly rate. When compared against the finding that 58 percent of trails reported using volunteers, both of the annual cost figures may decrease significantly.

Several additional significant findings from this study are summarized below.

Tree pruning even occurs in the dead of winter, Three Rivers Heritage Trail, PA.

Damage to asphalt trails from tree roots is significant and growing.

More than 60 percent of asphalt trail managers reported tree roots as the major source of trail damage. Clearly, as more asphalt trails are being built rather than stone dust trails (as required by some departments of transportation and metropolitan planning organizations); the true costs of these facilities needs to be better understood and shared. Replacing asphalt after several years is costly and frequently becomes a rebuild that is often funded by Transportation Enhancement (TE) programs or Transportation Alternatives Programs (TAP). This costly maintenance requirement might be prevented with better construction standards and possible use of root barriers in certain segments of a trail or periodic trenching to cut root growth. The removal of healthy trees several years after the trail is built is not the only option.

As an additional way to save money, several trail groups could work together to purchase materials or share equipment. State Departments of Natural Resources might use Recreation Trails Program funding to purchase equipment that can be used by any trail.

Invasive species concerns nearly tripled in importance from 2005 to 2014.

Some invasive species can be disproportionally destructive compared with native vegetation because natural control mechanisms do not exist in their new environment. This study found an increase in herbicide use, which is needed to control some invasive species. As a secondary issue, because trail groups rely heavily on volunteers and only contract out a small percent of herbicide application to professionals, it is logical to question if volunteers are adequately trained. Municipal workers, who would have adequate training, may be doing most of the herbicide application; however, this potential safety issue may warrant further examination.

CONCLUSIONS

Surprisingly, the survey found that 60 percent of rail-trails do not have maintenance plans.

This is surprising not only from a management perspective, but from a liability standpoint. All trail managers should have proof that they exercise a reasonable amount of due diligence to ensure that the trails are safe. Many government-owned and maintained rail-trails are included under larger park or civil works maintenance schedules. As a result, managers may believe that specific safety assurance for trails is not required. However, any trail that is owned, maintained or operated by a private, nonprofit organization should have a detailed safety management and maintenance plan with a schedule of tasks and inspections of related structures and facilities.

Estimating per-mile costs.

A total of 95 survey respondents provided an annual budget amount required to maintain their trail representing 40 percent of the trails included in the survey. Using the interquartile range (IQR) of those 95 trails gave us a total annual budget amount for maintenance. We determined that, of the sample group, annual maintenance cost per mile in 2013–2014 averaged $1,006 for a crushed stone trail and $1,971 for a paved asphalt trail. These figures do not include any extensive or exceptional repairs and are assumed to include only the most basic maintenance tasks needed to keep the trail usable.

Table 1. Estimated Costs Per Mile

Source	Asphalt Surface	Non-Asphalt Surface
RTC Maintenance & Operations Report - 2014	$1,971/mile	$1,006/mile
RTC Maintenance & Operations 2004 Report	$1,458/mile	$1,478/mile

Cost per activity.

Based upon the detailed cost analysis survey, we were able to determine the percentage that each activity represents in a typical trail maintenance budget. Data on asphalt and non-asphalt surfaces have been combined.

Table 2 Typical Maintenance Budget

Maintenance Activity	Percent of Budget
Surface clearing of trail	10.8%
Mowing	12.0%
Vegetation management (leaf clearing, pruning, etc.)	11.2%
Keep trail-side land clear of trash and debris	11.5%
Whole tree removal	5.4%
Application of herbicides or pesticides	2.3%
Clearing of drainage channels and culverts	5.4%
Surface maintenance of parking areas	2.7%
Litter clean up, trash cans	2.7%
Maintenance of toilets at trailheads	13.0%
Maintenance of toilets along the trail	1.2%
Trailhead parking snow removal	1.1%
Repair/maintenance of signs	6.3%
Recovery from illegal acts of vandalism/dumping	5.3%
Other trail maintenance activities	9.1%

Summary

Trail managers and local stakeholders often cite the need for dedicated state or federal funding to help pay for trail maintenance. Up to this point, RTC has lacked sufficient data to make that case effectively to decision-makers at the state or federal level. This study was initiated to bring some clarity to this issue. Because funding for rail-trails is difficult to secure, over-estimating maintenance costs can inadvertently give opponents easy leverage to speak against rail-trail development. In addition, funders often question if all aspects of any community development project should be funded by state and federal grants, particularly maintenance-related costs, which are often perceived as a "local issue."

This study presents a more comprehensive understanding of rail-trail maintenance, as has been done for other rail-trail issues such as construction costs, economic impact and rails-with-trails. Such an approach enables the rail-trail community to focus its limited resources more effectively on addressing the most critical issues.

Volunteers clear storm damage along trail in Heritage Rail Trail County Park, PA.

APPENDIX A 2014 SURVEY RESULTS

Please answer the following questions as completely and accurately as possible. If it is necessary to have more than one person in your organization answer different questions based on their personal areas of experience and expertise, please do so.

Please provide accurate information about the person to be contacted if any follow-up information is needed.

1. Please provide you name and contact information

Name
Title/Agency
Email
Phone

2. What is your Trail Name and state:

Trail name
State
Mileage

ADMINISTRATIVE

3. What is the trail surrounding Environment (check all that apply):

37%	Rural
12%	Urban
13%	Suburban
38%	Mixed

4. What are the permitted uses on your trail? (check all that apply)

3%	ATV
99%	Bike
79%	Cross Country Skiing
	Fishing
40%	Horseback Riding
56%	Inline skating
66%	Mountain Biking
16%	Snowmobile
100%	Walking
86%	Wheelchair Access

5. Who owns the land under the trail? If more than one, please indicate an approximate percentage.

23%	Federal government
43%	State government
34%	Municipal government
42%	County government
31%	Railroad
9.9%	Single private owner
46%	Non-profit entity
21%	Utility
12%	Multiple private owners

6. On a general basis, who PERFORMS maintenance of the trail? If more than one, please indicate an approximate percentage.

58%	Trail Group Volunteers
39%	Other volunteer community groups (please specify)
13%	Individuals with mandatory community service
4%	Federal government
21%	State government
33%	County government
43%	Municipal government
12%	Non-profit entity (paid staff)
12%	Other (specify)

7. Do you have a written Trail Maintenance Plan?

40%	Yes
60%	No

8. Who FUNDS maintenance of the trail? If more than one, please indicate an approximate percentage.

6%	Federal government
31%	County government
32%	Non-profit entity
25%	State government
42%	Municipal government
14%	Other (specify)

Rail-Trail Maintenance and Operations

9. What is the annual maintenance budget for this trail? (Average for all respondents that provided a budget.)

$66,430

9.a. If known, please provide the dollar amounts for the following within your maintenance program. (Insufficient data)

Labor
Equipment
Supplies

10. How is the maintenance funded?

7%	Federally legislated (REC Trails funding)
24%	State Budget
49%	Municipal Budget
9%	Unique funding streams or fees collected through the community (e.g. hotel tax)?
39%	Local Fundraising activities (please describe)
29%	In-kind Donations

11. Is the trail covered by liability insurance?

77% Yes (If yes go to 12)
23% No (If no go to 15)

12. What is your coverage amount ?

Most indicated $1 - 2 Million

13. Who is your carrier?

Various

14. What is your annual cost?

Various

15. In what year was the trail first opened for public use?

Various

16. How do you track annual users:

54%	Do not currently track the number of annual users (Skip to 18)
23%	Estimate / guess
16%	Manual count
23%	Automated counter

17. How many users does your trail have on an annual basis?

Varied

18. What are the hours of operation of your trail?

63%	Dawn until dusk
30%	Open 24/7
7%	Other

SURFACE - GENERAL

19. What is the average width of your trail?

6%	6ft.
16%	8ft.
60%	10ft.
15%	12ft.
3%	Other (specify)

20. What surface material exists on any sections of your trail? (check all that apply)

76%	Asphalt
7%	Concrete
55%	Crushed Stone
9%	Cinders
21%	Dirt/ Soil
8%	Other (specify)

21. Please indicate any reused or recycled materials used in the surface of your trail?

69%	None
1%	Tires or other rubber
0%	Glassphalt
19%	Asphalt / pavement milling
2%	Coal ash (cinders)
8%	Quarry waste from stone/rock processing (tailings, etc.)
5%	Other (specify)

22. What is the predominant surface material on your trail?

52%	Asphalt	(Go to 23)
2%	Concrete	(Go to 35)
40%	Crushed Stone	(Go to 43)
4%	Original railroad cinders	(Go to 53)
4%	Dirt / Soil	(Go to 59)
0%	Boardwalk	(Go to 65)
5%	Other (specify)	(Go to 72)

SURFACE - ASPHALT

23. Has your trail been repaved or resurfaced since the original paving construction?

35%	Yes	(If yes go to 24)
65%	No	(If no go to 29)

24. At what frequency (in years)?

45%	Recurring
3%	3 to 5
7%	6 to 10
45%	10 plus

25. Has your trail been seal-coated since the original paving?

25% Yes	(If yes go to 26)
75% No	(If no go to 27)

26. At what frequency (in years)?

41%	Recurring
27%	3 to 5
23%	6 to 10
9%	10 plus

27. Do you have a crack sealing programing?

35% Yes	(If yes go to 28)
65% No	(If no go to 29)

28. At what frequency (in years)?

78%	Recurring
13%	3 to 5
9%	6 to 10
0%	10 plus

29. What are the major causes of damage to your asphalt surfaced trail?

43%	Water/erosion
63%	Tree roots
20%	Vegetation (grass, weeds)
25%	Sub surface failure
44%	Frost/freeze cycle

30. Is snow removed from your trail?

9%	Yes, fully
33%	Yes, partially
58%	No

31. How is the surface of your trail kept clear of trash and debris? (Check all that apply)

9%	Street sweeper
18%	Rotary brush
65%	Blower
58%	Manual (broom, rake, etc.)
7%	Other (specify)

32. Does your trail employ pavement markings? (Check all that apply.)

51% No (if no skip to 72)
49% Yes

33. Do you indicate a Center Line of the trail?

44% Yes
24% Painted
4% Thermal transfer
51% No

34. Do you employ other safety markings?

61% Yes:
35% Painted
14% Thermal transfer
35% No

SURFACE – CONCRETE

35. Have sections of your trail been re-poured or resurfaced since the original paving construction?

25% Yes (If yes go to 36)
75% No (If no go to 37)

36. At what frequency (in years)?

Recurring
3 to 5
6 to 10
10 plus

37. What are the major causes of damage to your concrete surfaced trail?

67% Water/erosion
33% Tree roots
0% Vegetation (grass, weeds)
0% Sub surface failure
33% Frost/freeze cycle
33% Other

38. Is snow removed from your trail?

33% Yes fully
0% Yes partially
67% No

39. How is the surface of your trail kept clear of trash and debris? (Check all that apply)

33% Street sweeper
33% Rotary brush
100% Blower
0% Manual (broom, rake, chainsaw, etc)
Other (specify)

40. Does your trail employ pavement markings? (Check all that apply.)

67% Yes (if yes go to 41)
33% No (If no go to 72)

41. Do you indicate a center line of the trail?

100% Yes
0% Painted
0% Thermal transfer
0% No

42. Do you employ other safety markings?

100% Yes:
0% Painted
0% Thermal transfer
0% No

SURFACE – CRUSHED/GRANULAR STONE

43. How was trail surface applied?

60% Paving machine
21% Box spreader
23% Tailgate from dump truck
11% Bucket spread from loader
0% Wheelbarrow or other manual
8% Other (specify)

44. Has your trail been re-surfaced since the original construction?

56%	Yes	(If yes go to 45)
48%	No	(If no go to 46)

45. At what frequency (in years)?

32%	Recurring
3%	3 to 5 years
21%	6 to 10 years
44%	10 years or longer

46. How is the surface material compacted?

14%	Not
38%	Steel drum roller (static)
47%	Steel drum roller (vibratory)
5%	Rubber tired roller
0%	Rammer
7%	Vibratory plates
10%	Other (specify)

47. If applicable, please indicate the size of aggregate used for your trail surface.

40%	Unknown
10%	1A
0%	1B 3% 2A
0%	2B 2% 2RC
30%	AASHTO #10
2%	DSA
18%	Other (specify)

48. Do you use any type of soil or aggregate binder?

97%	No
3%	Yes

49. What are the major causes of damage to your crushed stone surfaced trail:

77%	Water/erosion
2%	Tree roots
2%	Vegetation (grass, weeds)
3%	Sub surface failure
17%	Frost/freeze cycle
27%	Other (specify)

50. How are damages to your trail surface repaired:

32%	Grader or other heavy equipment
42%	Light duty power equipment
40%	Dragging
71%	Manual (rake, shovel, etc.)
13%	Other (specify)

51. Has your trail been re-graded since the original construction?

44%	Yes	(If yes go to 34a)
54%	No	(If no go to 36)

52. At what frequency (in years)?

74%	Recurring
4%	2 to 3 years
4%	4 to 5 years
19%	6 to 10 years

SURFACE – ORIGINAL RAILROAD CINDERS

53. How was the surface prepared after removal of the rails and ties

56%	Grader or other heavy equipment
11%	Light duty power equipment
33%	Dragging
11%	Manual (rake, shovel, etc.)
22%	Other (specify)

54. How was the surface material compacted ?

20%	Steel drum roller (static)
80%	Steel drum roller (vibratory)
0%	Rubber tired roller
0%	Rammer
0%	Vibratory plates
0%	Other (specify)

55. What are the major causes of damage to your cinder surfaced trail?

87%	Water/erosion
0%	Tree roots
25%	Vegetation (grass, weeds)
13%	Sub surface failure
50%	Frost/freeze cycle

56. How are damages to your trail surface repaired?

63%	Grader or other heavy equipment
63%	Light duty power equipment
25%	Dragging
50%	Manual (rake, shovel, etc)

Other (specify)

57. Has your trail been re-graded since the original construction?

71%	Yes	(If yes go to 58)
29%	No	(If no go to 65)

58. At what frequency (in years)?

100%	Recurring
0%	2 to 3 years
0%	4 to 5 years
0%	6 to 10 years

SURFACE – DIRT/SOIL

59. How was the surface prepared?

43%	Grader or other heavy equipment
43%	Light duty power equipment
15%	Dragging
29%	Manual (rake, shovel, etc)

Other (specify)

60. How was the surface material compacted?

20%	Steel drum roller (static)
20%	Steel drum roller (vibratory)
20%	Rubber tired roller
20%	Rammer
20%	Vibratory plates
40%	Other (specify)

61. What are the major causes of damage to your dirt/soil surfaced trail?

71%	Water/erosion
14%	Tree roots
14%	Vegetation (grass, weeds)
14%	Sub surface failure
29%	Frost/freeze cycle
43%	Other (specify)

62. How are damages to your trail surface repaired?

29%	Grader or other heavy equipment
71%	Light duty power equipment
0%	Dragging
71%	Manual (rake, shovel, etc)
0%	Other (specify)

63. Has your trail been re-graded since the original construction?

50%	Yes	(If yes go to 64)
50%	No	(If no go to 65)

64. At what age / frequency (in years)?

33%	Recurring
0%	2 to 3 years
33%	4 to 5 years
33%	6 to 10 years

SURFACE – BOARDWALK

65. Does you trail contain any segments of boardwalk?

18%	Yes	(If yes go to 66)
82%	No	(If no go to 53)

66. How long is the boardwalk segment of your trail?

0 %	10 feet or less
23%	10 to 50 feet
19%	51 to 100 feet
29%	101 to 500 feet
8%	501 to 1,000 feet
19%	1,001 feet or more

67. How wide is the boardwalk segment of your trail?

28%	5 to 7 feet
37%	8 to 10 feet
28%	11 to 12 feet
6%	Greater than 12 feet

68. What is the decking material of the boardwalk?

6%	Wood (pine, oak, et.) not pressure treated
0%	Wood (teak, red wood, etc.)
84%	Wood – pressure treated
3%	Synthetic wood (Trex, NewTechWood, ArmorGuard etc.)
0%	Concrete
7%	Other

69. How old is the boardwalk segment of your trail?

23%	1 to 3 years
42%	4 to 9 years
26%	10 to 20 years
10%	More than 20 years

70. Has your boardwalk been re-decked since its original construction?

33%	Yes	(If yes go to 71)
67%	No	(If no go to 72)

71. At what frequency has re-decking occurred?

11%	2 to 3 years
0%	4 to 5 years
22%	6 to 10 years
67%	More than 10 years

ADJACENT LAND AND VEGETATION

72. Does annual or perennial vegetation grow along your trail?

97%	Yes	(if yes go to 73)
3%	No	(if no go to 75)

73. Do you use any herbicides or pesticides in your trail maintenance?

45%	Yes	(If yes go to 73a)
54%	No	(If no go to 75)

If yes, please list:

74. Who is responsible for herbicide/pesticide application (check all that apply)

77%	Trail maintenance staff
20%	Volunteers
14%	Contractor

Rail-Trail Maintenance and Operations

75. Do trees grow along your trail?

100%	Yes
0%	No

76. If planting new trees, what is the distance between the trees and the edge of the trail?

15%	8
7%	10
6%	12
5%	20
7%	other?

77. Please indicate any activities that are performed relative to trail side vegetation. (Check all that apply.)

93%	Litter clean-up
91%	Tree pruning
30%	Tree and shrub planting
90%	Tree removal - Safety
44%	Tree removal - Health
93%	Tree removal - Fallen
26%	Tree removal - Aesthetics (improve view shed)
92%	Mowing
40%	Leaf removal
62%	Invasive species removal
27%	Flower and ground cover planting
3%	Other (specify)

78. How is drainage accommodated? (Check all that apply.)

80%	Trail surface is crowned or sloped
76%	Trail-side drainage channels (ditches, gullies)
72%	Culverts
5%	Other (specify)

79. How are drainage areas kept clear? (Check all that apply.)

56%	Power equipment (backhoe, etc.)
76%	Manual (rake, shovel, etc.)
3%	Flush with water
25%	Self-cleaning design
5%	Other (specify)

PARKING, TRAILHEADS, and SANITATION

80. How many trailheads are there along your trail?

5%	None
26%	1-3
28%	3-5
26%	5-10
12%	10-15
4%	Other (please specify)

81. Please indicate the features of your trailheads. (Check all that apply.)

78%	Parking lot just for trail users
22%	Shared private/commercial parking lot
43%	Permanent toilet facility
83%	Information kiosk
31%	Potable water
5%	Any other commercial concession
3%	Telephone
43%	Shared public parking lot
45%	Portable toilet facility
17%	On-street parking
61%	Trash receptacles
3%	Vending machines
73%	Picnic tables/benches
13%	Other (specify)

82. What is the primary surface material for your trailhead parking area(s)?

53%	Asphalt
38%	Crushed Stone
0%	Cinders
6%	Dirt / Soil
3%	Other (specify)

83. Is snow removed from your trailhead parking lots?

63%	Yes
37%	No

84. Aside from trailheads, are any of these amenities provided along your trail. (Check all that apply.)

22%	Permanent toilet facility
52%	Informational kiosk
24%	Potable water
7%	Any other commercial concession
62%	Interpretive signage
22%	Portable toilet facility
43%	Trash receptacles
1%	Vending machines
76%	Picnic tables/benches
8%	Other (specify)

SIGNS, ACCESS CONTROL AND PUBLIC SAFETY

85. What types of signs do you use? (Check all that apply.)

91%	Trail identification sign ("welcome to ABC Trail")
74%	Mile marker
6%	Quarter miles
7%	1/10 mile
77%	Traffic control for trail users (stop, yield)
60%	Traffic control for cars at crossings
75%	Trail rules and regulations
25%	Property boundary sign (no trespassing)
57%	Interpretive signs
28%	Wayfinding on trail
20%	Wayfinding (off trail)
2%	No trail specific signage
12%	Other (specify)

86. Do you experience vandalism of your signs?

76%	Yes
24%	No

87. Please indicate any techniques you use to separate users by direction of travel or use? (e.g. pedestrian vs. bicycle) Check all that apply.

68%	None
13%	Pavement markings
23%	Signs
3%	Physical separation
3%	Different surface type
4%	Separate tread (Bridle or carriage path)
3%	Other (specify)

88. Is your trail patrolled by any professional policing authority?

65%	Yes	(If yes go to 89)
35%	No	(If no go to 90)

89. Police agency type:

5%	State police or state sheriff
42%	Municipal police
33%	Park or trail rangers
20%	Other (specify)

Rail-Trail Maintenance and Operations

90. Is your trail patrolled by a volunteer or a non-police group (e.g. crime watch)?

30%	Yes
70%	No

91. Do you have an on-going problem with any of the following activities on the trail? (Check all that apply.)

49%	Dumping
12%	Crimes against persons
28%	After hours use
17%	Trespass
71%	Vandalism
21%	Crimes against property
22%	Other (specify)

92. Are your trailheads lighted?

16%	Yes	(If yes go to 93)
84%	No	(If no go to 96)

93. During what times?

75%	Dusk until dawn
25%	Other

94. How are the lights controlled? (Check all that apply.)

13%	Always on
4%	Manual switch
25%	Clock / timer
75%	Light / dark sensor
4%	Motion sensor
18%	Other (specify)

95. How are the lights powered?

96%	Municipal power supply
4%	Solar panel
0%	Battery

96. Do you have emergency call boxes on along your trail or trailhead?

3%	Yes
97%	No

97. How is vehicular access to your trail controlled? (Check all that apply.)

22%	Vehicular access is not controlled
45%	Gates
26%	Fixed bollards
54%	Removable bollards
11%	Other (specify)

98. Do you use fencing along your trail?

64%	Yes	(if yes go to 99)
36%	No	(if no go to 101)

99. What types of fencing do you use?

18%	Chain link
45%	Split rail
7%	Woven Wire
3%	Stockade
27%	Other (specify)

100. What is the average height of the fence (in INCHES)?

48 “	most common

APPENDIX A 2014 SURVEY RESULTS

101. In what areas have you made accommodation for ADA standards or handicapped accessibility?

78%	Parking
50%	Restrooms
35%	Picnic tables
12%	Visitor's Center
15%	Interpretive areas
75%	Grade of trail
61%	Grade of access to trail
67%	Trail Surface
3%	Our trail has specific features for individuals with sight, hearing, or other impairments.
5%	Other (specify)

BRIDGES, TUNNELS and ROAD CROSSINGS

102. Do you have any bridges on your trail?

88%	Yes	(If yes go to 103)
12%	No	(If no go to 109)

103. What types of bridges do you have?

61%	Existing railroad bridge
33%	Pre-Fabricated
9%	New Bike/Ped (no vehicular capacity)
40%	New bike/ped (with vehicle capacity)
16%	Small foot bridge(less than 5' wide)
8%	Other (specify)

104. What is the deck material on your bridges? (Check all that apply.)

74%	Wood
9%	Synthetic lumber
1%	Rubber
11%	Metal
16%	Asphalt
36%	Concrete
11%	Stone/dirt/cinders
Other (specify)	

105. Do you have railings on your bridges?

97%	Yes	(If yes go to 106)
3%	No	(If no go to 109)

106. What is the height of the fence/railing (in INCHES)?

48"	most common

107. Are your bridges inspected on a regular basis by a certified inspector or professional engineer?

57%	Yes
43%	No

108. At what frequency (in years)?

0%	Recurring
66%	2 to 3 years
23%	4 to 5 years
11%	6 to 10 years

109. Do you have any tunnels or culverts for user passage under roads etc.

41%	Yes	(If yes go to 110)
59%	No	(If no go to 114)

Rail-Trail Maintenance and Operations

110. Are your tunnels lighted?

40%	Yes
60%	No

111. During what times?

31%	24/7
61%	Dusk to dawn
8%	Other (please specify time of day/ night)

112. How are lights controlled?

23%	Always on
0%	Manual switch
31%	Clock / timer
46%	Light / dark sensor
0%	Motion sensor

Other (specify)

113. How are the lights powered?

92%	Municipal power supply
8%	Solar
0%	Battery
0%	Generator

114 Do you paint/stain/treat bridge structures or decks, tunnel/underpass walls, etc?

45%	Yes	(If yes go to 115)
54%	No	(If no go to 116)

115. At what frequency (in years)?

68%	Recurring
0 %	2 to 3 years
10%	4 to 5 years
23%	6 to 10 years

116. How are at-grade crossings of roads controlled? (Check all that apply.)

89%	Stop sign for trail users
17%	Yield sign for trail users
17%	Traffic signal (red, yellow, green)
69%	Ped /bike crossing sign
17%	Stop sign for road users
20%	Yield sign for road users
30%	Pedestrian crossing signal (walk)
51%	Road striping

Other (specify)

APPENDIX B LIST OF PARTICIPANTS

Trail Name	State	Opened	Mileage	Surface
Tahoe City Public Utility District Multi-use trails	CA	1991	20	Asphalt
Bizz Johnson National Recreation Trail	CA	1983	25.4	Ballast, Gravel
Fort Collins City Trails	CO	1998	36	Concrete
Rio Grande Trail	CO	1987	42	Asphalt
Middlebury Greenway	CT	2008	5	Asphalt
Sue Grossman Still River Greenway	CT	1995	3	Asphalt
Trumbull Rails to Trails	CT	2006	7	Crushed Stone
Farmington Canal Heritage Trail	CT	2010	56	Asphalt
Metropolitan Branch Trail	DC	2000	3.5	Asphalt
Prairie Farmer Recreational Trail	IA	1999	22	Asphalt
Raccoon River Valley Trail	IA	1990	89	Asphalt, Concrete
Gay Lea Wilson Trail	IA	2000	17	Asphalt, Concrete
Ashton-Tetonia Rail Trail	ID	1913	30	Crushed Stone
Latah Trail	ID	1984	16	Asphalt
Trail of the Coeur d'Alenes Recreational Trailway	ID	2006	73	Asphalt
Wood River Trail	ID	1990	22	Asphalt
Route of the Hiawatha	ID &MT	1986	15	Ballast, Dirt, Gravel
George Rogers Clark Discovery Trail	IL	2010	9.2	Concrete
Forest Preserves of Cook County	IL	2009	100	Crushed Stone
Burnham Greenway	IL	2004	2.5	Asphalt
Millennium Trail and Greenway	IL	2003	8	Crushed Stone
Great Western Trail	IL	1990	12	Crushed Stone
Illinois Prairie Path	IL	1966	62	Crushed Stone
DeKalb Nature Trail	IL	1985	1.2	Asphalt
Oak Savannah Trail	IN	2010	8	Asphalt
Nickel Plate Trail	IN	2012	35	Crushed Stone
Pumpkinvine Nature Trails	IN	1996	20	Asphalt
Delphi Historic Trails	IN	2008	10	Crushed Stone
Zionsville Rail Trail	IN	1997	3.75	Asphalt
Monon Trail	IN	1997	9	Asphalt, Crushed Stone
Brighton East Rail Trail	KY	1998	2	Asphalt, Crushed Stone
Narrow Gauge Rail Trail	MA	2010	3	Crushed Stone
Bruce Freeman Rail Trail	MA	1992	6.8	Asphalt
Cape Cod Rail Trail	MA	2011	22	Asphalt
Methuen Rail Trail	MA	1995	2.4	Crushed Stone
Danvers Rail Trail	MA	1994	4.3	Crushed Stone
Old Colony Rail Trail	MA	1992	3	Asphalt
Southwick Rail Trail	MA	1994	6	Asphalt
Springfield Riverfront Bikeway/Walkway	MA	1994	3.7	Asphalt
Ashuwillticook Rail Trail	MA	2003	11	Asphalt
Gwynns Falls Trail	MD	2005	15	Asphalt

Trail Name	State	Opened	Mileage	Surface
Jones Falls Trail	MD	2006	9.1	Asphalt
Herring Run Trail	MD	1978	2.5	Asphalt
Stony Run Trail	MD	2013	2.9	Asphalt
Three Notch Trail	MD	2013	7	Asphalt
Gilchrest Trail	MD	2011	1.2	Asphalt
Broadneck Trail	MD	2000	6.6	Asphalt
Washington, Baltimore & Annapolis Trail	MD	1983	10.25	Asphalt
Baltimore Washington International Airport Trail	MD	2013	12.5	Asphalt
Torrey C. Brown/Northern Central Railroad Trail	MD	1984	20	Crushed Stone
Baltimore & Annapolis Trail	MD	1991	14	Asphalt
Catonsville Short Line Trail	MD	2013	3.5	Dirt, Gravel
St. John Valley Heritage Trail	ME	1998	29	Crushed Stone
Bangor Aroostook Trail & Aroostook Valley Trail	ME	1999	61	Gravel, Dirt, Soil
Aroostook Valley Trail	ME	1991	28	Crushed Stone, Dirt
Polly Ann Trail	MI	1998	30	Asphalt, Crushed Stone
Riverfront Trail	MI	2005	2.25	Asphalt
Kalamazoo River Valley Trail	MI	1999	17	Asphalt
Clinton River Trail	MI	2004	1	Crushed Stone
Flint River Trail	MI	2009	20	Asphalt
Leelanau Trail	MI	1987	20	Asphalt
I-275 Metro Trail	MI	mid-1970's	30	Asphalt
Conner Creek Greenway	MI	2009	9.5	Asphalt
Traverse Area Recreation Trail	MI	1831	10.5	Asphalt
Little Traverse Wheelway	MI	1996	26	Asphalt
Dakota Rail Regional Trail	MN	2002	12.4	Asphalt
Rocori Trail	MN	2005	12.9	Asphalt
Paul Bunyan and Cuyuna State Trails	MN	2004	128	Asphalt
Kenilworth Regional Trail	MN	2005	0.15	Asphalt
Central Lakes State Trail	MN	1986	55	Asphalt
Willard Munger State Trail (Gateway Segment)	MN	1993	18	Asphalt, Crushed Stone
Bruce Vento Trail	MN	2010	23	Asphalt
Willard Munger State Trail (Matthew Lourey State Trail)	MN	1980	80	Asphalt, Crushed Stone
Cannon Valley Trail	MN	1986	20	Asphalt
Dairyland Trail	MN	1995	6.2	Crushed Stone
Lake Wobegon Trail	MN	1999	54	Asphalt
Sakatah Singing Hills State Trail	MN	1980	38	Asphalt
Duluth Winnipeg and Pacific Trail	MN	1985	8	Gravel
Douglas State Trail	MN	1974	26	Asphalt
MKT Nature and Fitness Trail	MO	1982	8.9	Concrete, Crushed Stone
Northern Rail Trail	NH	1995	23	Crushed Stone
Sugar River Trail	NH	1997	9	Dirt, Soil

APPENDIX B LIST OF PARTICIPANTS

Trail Name	State	Opened	Mileage	Surface
Goffstown Rail Trail	NH	2005	5.5	Crushed Stone
Windham Rail Trail	NH	2000	4	Asphalt
Winnipesaukee River Trail	NH	2005	7.9	Crushed Stone
WOW Trail	NH	1990	1.3	Asphalt
Derry Rail Trail	NH	2004	4.5	Asphalt
Gloucester Township Health & Fitness Trail	NJ	2001	2	Asphalt
Henry Hudson Trail	NJ	1995	24.5	Asphalt
Delaware and Raritan Canal State Park	NJ	1980	80	Crushed Stone
Barnegat Branch Trail	NJ	1971	15.6	rushed Stone
Middlesex Greenway	NJ	2006	3.1	Asphalt
Columbia Trail	NJ	1990	7.5	Crushed Stone
Paulinskill Valley Rail Trail	NJ	1992	27	Cinders, Dirt, Grass, Ballast
Traction Line Recreation Trail	NJ	1986	3	Asphalt
Dutchess Rail Trail	NY	1991	13.5	Asphalt
Oswego County Recreation Trail	NY	1979	24.35	Original railroad cinders
Joseph B. Clarke Rail Trail	NY	1998	2.5	Asphalt
Ontario Pathway	NY	1992	23.5	Cinders, Grass, Gravel
Town of Ballston Veterans Bike Path.	NY	1960	3.6	Asphalt
Auburn Trail	NY	1993	10	Crushed Stone
Clarence Bike Paths	NY	2004	10.2	Asphalt
Hudson Valley Rail Trail	NY	1824	3.6	Asphalt
Pat McGee Trail	NY	1987	13	Crushed Stone
South Hill Recreation Way	NY	1988	3.4	Crushed Stone
Wallkill Valley Rail Trail	NY	2000	24	Asphalt, Cinders, Gravel
Harlem Valley Rail Trail	NY	1978	17	Asphalt
Genesee Valley Greenway	NY	1992	90	Original railroad cinders
Catskill Scenic Trail	NY	1990	26	Original railroad cinders
Catharine Valley Trail State Park	NY	2002	10	Crushed Stone
Ballston Veterans Bike Path	NY	1994	20	Asphalt
Vestal Rail Trail	NY	2002	5	Asphalt
Heritage Trail	NY	1996	11	Asphalt, Crushed Stone
Hockhocking Adena Bikeway	OH	1990	21	Asphalt
Kokosing Gap Trail	OH	1982	13.5	Asphalt
4-C Bicentennial Trail and Peace Path	OH	1972	2.5	Asphalt
Fairfield Heritage Trail	OH	1999	9.3	Asphalt
Infirmary Mound Park trails	OH	1991	7	Asphalt, Dirt
Taft Reserve Trails	OH	1992	8	Asphalt, Dirt
Lobdell Reserve Trails	OH	1992	8	Asphalt, Dirt
Holmes County Trail	OH	1995	15	Asphalt
Richland B&O Trail	OH	1999	18.4	Asphalt
Lebanon - Countryside YMCA Trail	OH	2011	8	Asphalt

Trail Name	State	Opened	Mileage	Surface
Cleveland Metro Parks	OH	1990	250	Asphalt, Crushed Stone, Dirt
Heart of Ohio Trail	OH	1989	16	Asphalt
MetroParks Bikeway	OH	1990	11	Asphalt
Bike & Hike / Towpath / Freedom	OH	1966	60.4	Asphalt
Simon Kenton Trail	OH	2003	18	Asphalt
Alum Creek Trail	OH	2010	20	Asphalt
Hock-Hocking Adena Bikeway	OH	1992	22	Asphalt
Slippery Elm Trail	OH	1995	13.5	Asphalt
Creekside trail and others	OH	2005	62	Asphalt. Concrete
Deschutes River Railbed Trail	OR	2008	16	Dirt, Soil
Deschutes River Trail (some surfacing cut off)	OR	1989	24	Crushed Stone. Asphalt, Ballast, Cinders
OC&E and Woodsline State Trail	OR	1994	108	Woodchips
Panhandle Trail in Allegheny County	PA	1999	7.5	Crushed Stone
Chester Valley Trail	PA	2007	11.5	Asphalt
Capital Area Greenbelt	PA	1978	22	Asphalt
Five Star Trail	PA	1990	7.75	Crushed Stone
McClintock Trail	PA	1996	3.5	Asphalt
Trout Island Trail	PA	1980	2.5	Asphalt
Greater Hazleton Rails to Trails	PA	2011	6	Crushed Stone
Steel Valley Trail	PA	1988	19	Asphalt
Warren/North Warren Bike/Hike Trail	PA	2011	3	Asphalt
Allegheny River Trail	PA	1983	34.2	Asphalt
Sandy Creek Trail	PA	1998	12	Asphalt
Great Allegheny Passage (Yough River Trail)	PA	2000	185	Crushed Stone
Path of the Flood Trail	PA	2012	9	Asphalt, Ballast
Luzerne County National Recreation Trail	PA	1989	1.8	Crushed Stone
Ghost Town Trail	PA	1992	18	Crushed Stone
Stavich Bike Trail	PA	1983	7	Asphalt
Swatara Rail Trail	PA	1994	10	Crushed Stone
Roaring Run Trail	PA	2005	5	Crushed Stone
Clarion-Little Toby Trail	PA	1994	18	Crushed Stone
Lebanon Valley Rail-Trail	PA	1987	15.5	Crushed Stone
Lehigh Gorge Trail	PA	1994	26	Original railroad cinders
Queen City Trail	PA	2008	1	Asphalt
Montour Trail	PA	1985	47	Crushed Stone
Pine Creek Rail Trail - Tioga County	PA	2001	27	Crushed Stone
Great Allegheny Passage - Somerset County Segment	PA	2001	42	Crushed Stone
Butler Freeport Community Trail Council	PA	1997	20.4	Crushed Stone
Warwick Trial system	PA	1992	6	Asphalt
Perkiomen Trail	PA	2010	20	Crushed Stone

APPENDIX B LIST OF PARTICIPANTS

Trail Name	State	Opened	Mileage	Surface
Lackawanna River Heritage Trail	PA	1986	35	Crushed Stone
Oil Creek State Park Bike Trail	PA	1998	9.7	Asphalt
Great Allegheny Passage	PA	1996	150	Crushed Stone
Delaware Canal State Park	PA	2003	60	Crushed Stone
West Penn Trail	PA	1991	15	Crushed Stone
Three Rivers Heritage Trail	PA	1986	24	Asphalt
D&H Rail-Trail	PA	1997	38	Original railroad cinders
York County Heritage Rail Trail	PA	1999	23.5	Crushed Stone
The Lower Trail	PA	1998	17	Crushed Stone
Redbank Valley Trail	PA	1999	51	Crushed Stone
Armstrong Trail	PA	1992	36	Crushed Stone
Plainfield Township Trail	PA	1991	6.7	Crushed Stone
Pine Creek Rail Trail - Lycoming County	PA	1992	38	Crushed Stone
Blue and White Trails	PA	2002	2	Asphalt
Delaware Canal State Park Towpath	PA	1940	60	Crushed Stone, Dirt
Coal and Coke Trail	PA	2007	5	Asphalt, Crushed Stone
Five Star Trail	PA	1997	7.5	Crushed Stone
Ironton Rail Trail	PA	1995	9.2	Asphalt
West Penn Trail	PA	2002	15	Crushed Stone
Panhandle Trail - Washington County	PA & WV	1999	17	Crushed Stone
William O'Neill/South County Bike Path	RI	2013	8	Asphalt
Shelby Farms Greenline Trail	TN	1966	6	Asphalt
High Bridge Trail State Park	VA	2007	30.9	Crushed Stone
Virginia Capital Trail	VA	2005	16	Asphalt, Boardwalk
Southern Tip Bike & Hike Trail	VA	2008	2.6	Asphalt
New River Trail State Park	VA	2007	57	Asphalt
Virginia Blue Ridge Railway Trail	VA	1987	7	Crushed Stone
Dahlgren Railroad Heritage Trail	VA	1998	15.7	Dirt, Soil
Washington & Old Dominion Trail	VA	2001	45	Asphalt
Burlington Bike Path	VT	1987	25	Asphalt
Klickitat Trail	WA	2002	31	Gravel, Dirt
Ozaukee Interurban Trail	WI	1963	29.5	Asphalt
Hank Aaron State Trail	WI	2006	14	Asphalt
Gandy Dancer Trail	WI	2001	20.3	Crushed Stone
Badger and Glacial Drumlin State Trails	WI	1984	60	Crushed Stone
Southwest Path	WI	2010	4.5	Asphalt
Mon River	WV	2008	6	Crushed Stone
Caperton Trail	WV	1999	6	Asphalt
Deckers Creek Trail	WV	1999	19	Asphalt, Crushed Stone

Pine Creek Trail, PA.

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