Natural Capital Science Note

A Recreation Trail Scorecard for evaluating trails in northern New England

By Ethel Wilkerson and Andrew Whitman

Introduction

Outdoor recreation is a vital part of the social and economic fabric of many New England communities. In Maine alone, trail-based recreation adds over $500 million annually to the economy (Reiling 1999, Morris et al. 2005, Morris et al. 2006). Recreation trails in communities also improve public health (Sallis et al. 2006), increase citizen involvement in local organizations and activities (Savage et al. 2005), and increase property values (Asabere and Huffman 2009). Recreation activities also bolster support for conserving open space or "green" infrastructure that provides clean water, local food, wood fiber, and wildlife habitat.

Poorly managed recreation can threaten environmental, economic, and social benefits of recreation. Public recreation is one of the greatest threats to the health of forests in the U.S. (Bosworth 2007). Poorly maintained trails can lead to soil erosion (Leung and Marion 2000), degraded water quality (Rinella and Bogan 2003), biodiversity declines (Cole 1995), and loss of wildlife habitat (Marion and Leung 2001). In northern New England, over 95% of trails experienced significant soil erosion and over 40% of trails degraded water quality (Wilkerson and Whitman in press). Poorly maintained trails also greatly reduce the enjoyment and use of trails and create safety problems (Conrad 1997, Marion et al. 1993). For trails to continue to supply benefits to local communities, they must minimize impacts, maintain scenic beauty, and be safe for trail users.

Trail managers must balance the recreational experiences desired by users (Manfredo et al. 1983), environmental protection (Kuss and Grafe 1985, Hendee et al. 1990), safety, and scenic beauty with available resources. The maintenance of many trails on both public and private land relies on volunteers (Mann 2008). Moreover, trail managers have limited budgets and time with which to meet the increasing demand for recreation opportunities. To help trail managers and volunteers sustainably manage recreation trails, we developed a science-based, yet practical, rapid assessment tool (the Recreation Trail Stewardship Scorecard) to help assess trail conditions, and identify and prioritize trail segments in need of repair and maintenance. It is composed of five variables that indicate of the major environmental impacts, safety, and trash levels of trails. This report describes this tool and how to use it for evaluating recreation trails in northern New England.

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How we developed the Recreation Trail Stewardship Scorecard

The first step in the development of the Recreation Trail Stewardship Scorecard was an assessment of 200 miles of recreation trails in Maine and northern New Hampshire (Figure 1). Data on 55 parameters was collected on ATV, snowmobile, hiking, mountain biking, and multi-use trails. The second step was to reduce the long list of variables to a short list of indicators that are scientifically valid yet practical and affordable to monitor (see Wilkerson and Whitman [in press] for details on statistical analysis). Balancing scientific rigor with practicality and affordability resulted in some tradeoffs. For example, we excluded indicators for invasive species and wildlife from the scorecard because they require significant time and specialized skills to assess accurately. Including these indicators in the scorecard would make it less practical and affordable to implement. The Recreation Trail Stewardship Scorecard consists of 5 ecological and social indicators assessing:

(1) wet and muddy trail conditions,
(2) areas with soil erosion,
(3) water quality at trail and stream intersections,
(4) safety risks for trail users, and
(5) the presence of trash and litter along the trail.

The scorecard uses a problem assessment approach, which means the user identifies only areas that have undesirable or problematic conditions. Trails in good condition will have little recorded on the datasheet, but the final score will reflect the high quality of the trail. This approach makes data collection easier and faster than noting both good and bad conditions.

For each of the 5 indicators of trail quality in the scorecard there are 2 categories of problematic trail conditions: moderate and severe. The criteria for moderate and severe conditions were developed based on previous research (Marion 2007), experience gained by Manomet staff during data collection, and the need for a simple, standardized trail assessment procedure suitable for a wide group of users, both volunteer and professional. The use of two categories allows the trail scores to reflect the seriousness of the problem and allows managers to prioritize necessary management actions.

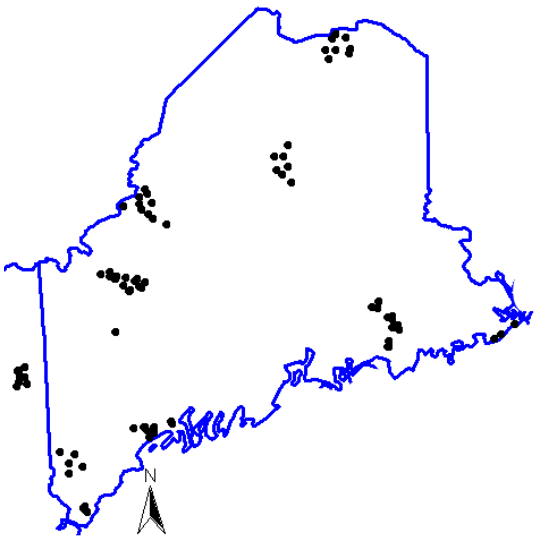

Figure 1. Locations of trails sampled.

How to apply the Recreation Trail Stewardship Scorecard

The scorecard is a standardized assessment and scoring tool that can be used to evaluate all types of recreation trails, including hiking, mountain biking, ATV, snowmobile, and multi-use. The entire scorecard can be applied from spring until late fall. Snow cover makes assessing the majority of indicators difficult. For snowmobile and other winter-use trails, safety must be assessed during the winter when the trails are in use. The remaining indicators can be assessed during trail work in the summer and fall.

Before heading out to the trail to complete the scorecard you will need to: 1) be familiar with the indicators and scoring criteria, 2) have a way to approximate the length of the trail or trail segment (you can use a GPS unit, an existing trail map, or mapping software), and 3) bring the scorecard user guide, a data sheet, clip board, trail map, and a pen or pencil. It is not required for the scorecard, but a digital camera may be helpful in documenting the conditions along the trail. Oftentimes a picture is a very effective way of communicating the need for trail improvements.

Remember to bring necessary equipment and supplies (e.g. water, snacks, first-aid kit) appropriate for the length and difficulty of the trail. Completing the

scorecard requires you to be aware of your surroundings, make decisions about the condition of the trail, and record data. Leave more time than required for simply walking or riding the trail. For the first few times you use the scorecard it may be helpful to complete the assessment with a partner.

A datasheet is provided to tally the frequency of moderate and severe observations of each indicator. The datasheet also provides space to record the approximate location of each moderate and severe observation. This is optional, but it can be helpful to record the location of these areas for future maintenance and improvement projects.

Indicator 1: Wet and muddy areas

Background: Wet and muddy areas on trails result in soil disturbance and compaction and are vulnerable to rutting and trail widening (Reisinger et al. 1990, Marion 1994). They can also reduce user enjoyment of the trail, result in unsafe conditions, and can make the trail unusable or undesirable for some user groups (e.g., inexperienced hikers or riders, older citizens, and families with young children). If uncorrected these areas often deteriorate over time and lead to further declines in environmental, safety, and aesthetic conditions.

Figure 2 A wet and muddy section of trail. Note the wet and muddy area is wider then nearby trail segments, has bare soil, and embedded footprints.

Instructions: As you walk along the trail segment, look for areas on the trail that are wet and muddy or clues that areas were wet and muddy in other seasons of the year or under other weather conditions. Clues can include: trail segments that are wider than nearby sections of trail, areas with bare soil that lack vegetation, and the presence of embedded footprints or tire tracks (Figure 2). Wet and muddy conditions are most common on flat and low-lying areas of trail (Olive and Marion 2009) where water pools and does not drain effectively.

In order for wet and muddy areas to be tallied, they must be at least **5 feet in length** and have new or existing footprints or tire tracks must be **at least 2 inches in depth** (Hint: Five feet is approximately 2 large steps for an adult. If you walk along a trail and both feet get wet or muddy, then the trail segment exceeds 5 feet). If the wet and muddy area is greater than 5 feet long but new or existing footprints or tire tracks are less than 2 inches deep, then the area is not tallied.If the trail segment is greater than **5 feet long**, and new or existing footprints or tire tracks are **greater than 2 inches but less than 6 inches deep**, then the segment is classified as moderate. If footprints or tire tracks **exceed 6 inches deep**, then the area is classified as severe. On the data sheet, tally the occurrence of moderate and severe areas and note the approximate location of each occurrence (optional).

Indicator 2: Soil erosion

Background: Soil erosion alters soil structure and reduces nutrients available for plants and trees. Soil particles from the trail surface can be transported into streams, lakes, and wetlands, degrading water quality. Areas with high levels of soil erosion can create safety hazards (Leung and Marion 1996; Marion and Leung 2001) and make the trail unusable or undesirable for some user groups (e.g., inexperienced hikers or riders, older citizens, and families with young children). Severely eroded sections of trail often require costly management actions or trail improvements (Olive and Marion 2009).

Instructions: As you walk along the trail segment look for areas of trail with evidence of soil erosion, such as ruts or gullies within the trail boundaries, exposed tree roots and rocks, and trail surfaces that are entrenched or lower than the level of surrounding ground (Figure 3). Trail erosion is most common on moderate and steep slopes where concentrated flowing water can mobilize and transport soil

particles. Tally only eroded sections greater than **5 feet long** (approximately 2 large steps for an adult) with ruts, gullies, and/or difference between trail surface and surrounding ground **greater than 2 inches** anywhere within the eroded segment. If the eroded section does not meet both of these criteria then this area is not tallied. The eroded segment is classified as moderate if the depth of ruts or gullies or difference between trail and surrounding ground is **greater than 2 inches but less than 6 inches** anywhere within the eroded trail segment. If the depth of ruts or gullies or difference between trail and surrounding ground is **greater than 6 inches** anywhere within the eroded trail segment, then the area is classified as severe. Tally the occurrence of moderate and severe eroded areas on your data sheet and note the approximate location of each observation (optional).

Indicator 3: Water quality

Background: Stream crossings (bridges, fords, culverts) can result in inputs of soil, mud, sand, silt, and gravel to stream channels (Swank and Crossley 1988). Addition of these materials to water bodies can be harmful to aquatic organisms (Allan 1995). Sediment inputs are a major concern because the impacts to habitat and biota can be serious and extend for 100's of yards downstream of the trail. State laws in Maine generally prohibit any "unreasonable" erosion of soil or sediment into surface waters (Maine DEP 2008, LURC 2009.). Failure to comply with these laws can potentially result in penalties to the landowner and/or closure of the trail. In addition, visitors to natural areas find sediment inputs to stream channels undesirable (Noe et al. 1997) and crossings in poor condition are often unsafe and can create impassible barriers along the trail. Bridges and culverts can minimize degradation of water quality (Hammitt and Cole 1998); however, proper design, installation, and maintenance of crossing structures are required to protect water quality (Wilkerson and Whitman 2009).

The construction of bridges and culverts, and in some cases repair of existing structures, on recreation trails can require permits from a local municipality, the Maine Department of Environmental Protection, and/or Maine Land Use Regulation Commission. Be sure to check with local or regional authorities to determine what permits may be required for improvements to your trails. Construction of crossing structures should comply with established best management practices (motorized trails: MFS 2004, Maine ATV Program 2008; non-motorized trails: IMBA 2004, Birkby 2005, AMC 2008). Applying best management practices to trail design and stream crossings dramatically reduces water quality degradation (MFS 2006).

Figure 3. Examples of eroded trail segments. In the top picture note the ruts and gullies from concentrated water flow. In the bottom picture note the exposed tree roots and rocks and the trail surface is well below the level of ground on either side of the trail.

Instructions: At each stream crossing (where the trail crosses a stream channel) that is **at least 3 feet wide** (i.e., streams that can not be easily jumped over) carefully examine the stream bank and bottom at the location where the trail crosses the stream channel. Assess the crossing regardless of whether or not there is a crossing structure such as a bridge or culvert.

Figure 4: A) Erosion around bridge structure resulting in large inputs of sediment to stream; B) Decreased water clarity downstream of a crossing; C) Accumulation of sediment on the stream bottom downstream of a crossing; D) Disturbance of a stream bank (lack of vegetation, ruts, and tire tracks)

There are 3 clues to determine if the trail is negatively impacting water quality: (1) look for evidence of sediment (soil, sand, mud, gravel, wood chips, etc.) from the trail or crossing structures (bridge supports, fill around culverts, etc.) entering the stream channel (Figure 4a), (2) compare the clarity of the water (Figure 4b) and the amount of sediment on the stream bottom (Figure 4c) downstream of the crossing with upstream of the crossing (Hint: If downstream of the trail crossing has decreased water clarity and/or the stream bottom has a greater accumulation of sediment than upstream of the crossing then the trail is degrading water quality. If the water clarity and/or level of sediment is the same both upstream and downstream of the crossing then the stream crossing is not contributing sediment to the stream channel), and (3) look for disturbance on stream banks, including trampling of plants, embedded footprints or tire tracks, and soil slumping (Figure 4d).

If no evidence of sedimentation from the trail or crossing structure is observed then do not tally the crossing. The crossing is classified as moderate if one of two criteria is met: (1) accumulation of sediment downstream of crossing is approximately **2-6 cups greater** than sediment observed upstream of the crossing or (2) erosion channels, embedded footprints, scouring, or tire tracks on stream banks or within the stream channel are greater than **2 inches but do not exceed 6 inches in depth.** The criteria for severe are met if the accumulation of sediment downstream of crossings is approximately **6+ cups greater** or erosion channels or embedded footprints or tire tracks on stream banks or within the stream channel **exceed 6 inches in depth.**

Indicator 4: Trail safety

Background: The safety of trails is important to trail managers, land owners, and trail users (Birkby 1996, Andereck et al. 2001). Proactive assessment of trails can detect and address unsafe areas before minor and severe accidents occur. The definition of acceptable safe conditions will vary by trail depending on the primary user groups (e.g., advanced ATV riders or backpackers, families with young children, older citizens, those with limited mobility). For example, what may be considered safe conditions on a backcountry trail may not be considered safe for a trail that is frequented by families with young children. Safety standards must be made based on the goals for the trail and the goals and skill level of trail users.

Instructions: As you walk along the trail look for areas that **present a high risk of injury to trail users**. Unsafe areas can include (but are not limited to) bridges, steps, walkways, and ladders that are inadequate or in disrepair; steep slopes; slick areas without adequate traction; trail washouts; inadequate signage about obstacles or trail conditions; dangerous trail intersections; and trails in close proximity to busy roads, cliffs, or other potentially dangerous natural or man-made features. The definition of high risk will vary depending on the trail's primary user groups. Judge what is safe or unsafe based on your knowledge of the trail's primary users. An unsafe condition is classified as moderate if it is **likely** to cause injury or harm to users, either now or in the near future (<12 months). Severely unsafe conditions are defined as conditions that are **very likely** to cause injury or harm to users, either now or in the near future.

Indicator 5: Trash and litter

Background: Trash and litter includes bottles, cans, candy wrappers, paper products, as well as computer equipment, appliances, tires, and mattresses. The presence of trash and litter along recreation trails is not necessarily of high ecological concern; however, it has significant implications for user enjoyment of the trails and for maintaining positive relationships with landowners and easement holders. Trash makes trails unsightly and detract significantly from the experience of trails (Floyd et al. 1997; Shafer and Hammit 1995; Roggenbuck et al. 1993). Landowners (public and private) and easement holders are very sensitive to trash and dumping on their property (Maine DOC 2009). Users and managers who fail to respond to concerns about trash and litter are jeopardizing future recreational access to private lands.

Instructions: The amount of trash observed along the entire trail segment is classified into 1 of 3 categories (low, moderate, and severe) based on the size of trash bag necessary to dispose of trash along the trail. This differs from previous indicators because tallying each piece of trash along the trail is a time consuming process that can interfere with the assessment of other trail characteristics. Instead, focus on assessing trash near trail heads, picnic areas, and look-outs where trash often occurs at higher frequencies than at other locations along the trail. You may notice trash at other locations along the trail if it occurs at a level or in a location that detracts from overall enjoyment of the trail. As you walk along the trail, note on the datasheet the location of noticeable and high concentrations of trash (optional).

At the end of the trail segment estimate the total amount of trash you observed. If the amount of trash would fit within a disposable plastic grocery bag then the level of trash is low. If you estimate the trash along the trail would fill more than a **disposable plastic grocery bag** but could be completely collected using a **single tall kitchen size trash bag** (13 gallons) then the level of trash is moderate. If the level of trash along the trail **exceeds a single tall kitchen size trash bag** then the level of trash is severe. Instances of large household items, including tires, mattresses, and furniture, are categorized as severe.

How to Calculate the Trail Score

A sample datasheet in the 6-page Scorecard User's Guide illustrates how to calculate the score for a trail segment. Refer to the sample datasheet while reading these instructions.

There are six steps to calculating the score for a trail segment:
(1) Tally the number of observations in the moderate and severe categories for the first 4 indicators (wet and muddy trail segments, eroded areas, water quality, and user safety). Write these values in the row labeled Trail Totals; (2) multiply these trail totals by the appropriate category multiplier (moderate = 1, severe = 10); (3) for the 5th indicator, trash and litter, write the score that corresponds to level of trash observed along the trail: low =0, moderate=1, and severe=10; (4) sum the numbers calculated in steps 2 and 3; (5) multiply the approximate miles of trail surveyed by 2 (a constant used to adjust the range of the scoring system); (6) divide number calculated in step 5 by the sum calculated in step 4.

Table 1. The frequency of different trail scores on over 100 trail segments sampled in Maine and northern New Hampshire. Use this table to compare scores of trails in your area with other trails in the region. Find the category that most closely matches the final score of your trail and then determine the percentage of trails with lower (better condition) and higher (worse condition) scores.

Final Score	**% of trails with lower scores** (in better condition)	**% of trails with higher scores** (in worse condition)
1	6	94
5	12	88
10	30	70
20	50	50
30	67	33
40	72	28
50	78	22
60	83	17
70	90	10
80	94	6
90	98	2
100	100	0

Scores range for 0 (best condition) to >100 (worst condition). Scores of very highly degraded trails scores may exceed 100. Table 1 shows how often different trail scores occurred on over 100 trail segments sampled by Manomet in Maine and northern New Hampshire. You can use this table to determine how your trail segment compared to other trails in the region For example, if a trail segment scores 10, then this trail scored better than 30% of trails and worse than 70% of trails.

How Trail Mangers Can Use the Scorecard

The Recreation Trail Stewardship Scorecard can help managers make decisions that improve effectiveness of trail management, reduce trail impacts, and provide users with safe and enjoyable trails. Trail managers can use the scorecard to:

(1) **Assess the relative condition of a recreation trail**. Local scores can be compared with the scores of trails across northern New England;
(2) **Prioritize maintenance work on trails**. The scorecard can identify which trails or specific areas of trail are most in need of maintenance or improvement. Trail managers can then dedicate maintenance funds and staff/volunteer hours to target areas with the worst conditions;
(3) **Monitor and track changes in trail quality over time**. This allows managers to watch for trail deterioration due to use, abuse, or storm damage as well as evaluate the effectiveness of trail maintenance and improvements. This information can be used to justify the need for future maintenance and communicate the effectiveness of trail improvement projects;
(4) **Communicate trail condition to landowners, government agencies, forest certification auditors, and/or easement holders**. The scorecard can assure these groups that trails are being maintained, have minimal environmental impacts, are safe for users, and meet landowner and user expectations (i.e. lack of trash, user safety, natural resource protection). For example, a private landowner may agree to allow trail access to their land provided the trail exceeds a predetermined score;
(5) **Justify support funding to granting agencies, state and municipal staff, and the general public.** Competition for grant dollars and budget allocations are becoming increasingly competitive and the scorecard can objectively identify trails and trail segments that need improvements.

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