Trail Maintenance Handbook
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**Purpose:**

Trail maintenance is necessary to:

- Repair damage and trail degradation due to erosion and general use
- Manage water flow off of the trail
- Reduce further erosion and subsequent trail damage
- Restore the character and trail experience for the user
- Address safety issues
**Trail Terminology:**

**Tread:** The tread is the actual travel surface of the trail. This width varies by trail.

**Trail Corridor:** The space that the trail travels through that needs to be maintained. This includes the tread, the backslope, the outslope and the width of the cleared vegetation.

**Backslope:** The uphill side of the trail.

**Outslope:** The downhill side off of the tread.

**Deberming:** Removing a raised lip, or berm, on the outer edge of the trail to allow water to flow off the trail. A process done to mend a cupped tread.

**Outsloping:** Angling the tread from the inside edge of the trail to the outside. In general, trails are outsloped by 5%.

**Insloping:** Angling the tread from the outside edge to the inside edge (outside edge is higher), such as banked turns, often referred to as berms.

**Sheetflow:** The ability of water to flow downhill in a consistent sheet which reduces soil erosion

**Flow Trails:** Mountain bike trails that incorporate banked turns, rollers, frequent grade reversals and often jumps. Examples in the SMT system are Solstice, Sol Train East and West, Rusty Lung, Burnpile, and sections of Chicken Dinner.
**Tools**

**Rakes:**

**Rock Rakes:** Rock rakes are just that - sturdy rakes that hold up to moving a lot of small and medium sized rocks.

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**Finish Rake:**
The finish rake is a poly garden rake that is used as the final step in maintaining a trail.

- Might be the only tool needed on a trail, depending on the amount of rocks in the soil as well as the frequency of maintenance.
- Very effective in reshaping the trail because it can grab lots of loose dirt.
- Important last step in smoothing the tread and making the maintenance last longer.
Tools

Grubbing and Digging Tools

There is often a need for heavier tools to be used during trail maintenance. These tools would be used before using the rakes.

McLeod

Pick Mattock

Tool Safety When Carrying

When carrying tools to the project site, wear gloves. When transporting tools, carry them at your side, not over your shoulder. This is for your safety, and others'.
Trail Maintenance Objectives

Maintaining a trail encompasses the trail corridor, not just the tread. This includes the backslope, tread, outslope and drainages. Below are some common trail maintenance issues.

Backslope: Rocks are constantly loosening from the backslope and falling onto the tread. Over time, these rocks can build up, along with dirt, on the inside edge of the trail. This pushes the trail users to the outside of the tread, causing tread creep and a loss of a safe trail width. This is mostly noticeable and more of a problem on narrow trails.

Tread: Loose rocks and weeds build up on the outside edge of the trail (called the critical edge). This creates a raised lip, called a berm. Because of this, the trail will become cupped or troughed over time. Deberming and re-establishing a 5% outslope of the tread allows for proper sheetflow. This is a common reason trails need maintenance.

Drainages: Water will find the lowest portion of the trail where it can drain off. Clogged drainages (from loose sediment, weeds, sticks and rocks) cause the water to collect on the trail creating puddles. In some cases, this can cause the water to flow down the length of the trail, creating ruts and excessive erosion. Drains routinely get clogged and need constant maintenance.
Techniques

The first step is an assessment of the area which helps determine what is needed and which tool to begin with.

**Start with the backslope:**
If addressing tread creep and/or the buildup of large rocks and soil, it is often helpful to use your hands first to remove the larger rocks. The rocks can then be placed where they can be useful and not just dangerously tossed off the trail. If chopping into and reshaping the backslope is needed, use a heavier tool, like a McLeod or Rouge Hoe.

Using the rake lightly, rake the backslope (sideways along the length it), instead of downwards to the tread. This allows the rocks to fall to the tread, at the same time moving loose dirt across to fill small holes and rills (small ruts) that have developed. This will create more of a mess for you to clean up on the tread, but is part of the process and best done first.

**Tread:**
Starting at a drain, sort the rock from the dirt with the rake while raking up the length of the trail. Rake the rocks up towards the high point of the trail, like a roller (if there is one) then completely off the trail. This technique avoids raking or casting the rocks/debris into the drain areas. By sorting the rocks from the dirt, there is dirt left on the tread for reshaping the tread.

**Reading the Trail Tread - Inslope and outslope**
Many trails, especially flow trails, incorporate insloping, such as banked turns. This insloping is designed to force water to the inside of the tread and then down and out to a drain. It is important to understand and be able to read the trail appropriately before performing maintenance. Not all sections of trails should be outsloped by 5%. When maintaining a banked turn, rake the dirt and rocks up and over the backside of the turn.
Drains:
The drains need to be lower than the tread surface in order for them to work. Large rocks, sticks and weeds can be removed by hand. Remove this debris completely from the drain (to the side) not just farther down the drainage. This is especially important in flatter terrain. The flatter the terrain, the more often the drains need to be maintained. In some cases, a drain may need to be dug out with a heavier tool than a rake.
These drains are full of deposition and fine material and need maintenance to function properly.

**Weeds**

Controlling the growth of weeds and grasses is an important part of trail maintenance.
- Allows the water to flow off of the trail and keeps drains open
- Maintains proper width and character of the trail

Weeds and grasses can be a problem for trails and for the trail users by:
- Trapping water on the trail; blocking drains
- Narrowing wider trails; hiding optional, fun technical trail features

It is best to pull the weeds before they seed. Place pulled weeds off of the trail, not blocking any drainages. A rock or log can be placed on top to prevent them from blowing back onto the trail.
Safety, Awareness and Being Prepared

Working On An Open Trail

Since the trails are open to users, it is important to be alert and aware of others while working. This includes being visible, especially to downhill riders. Be extra cautious when working in a blind turn. Be aware of another trail that may be below the trail segment that is being worked. Control loose rocks, especially large ones. Try to avoid working during busy times. Don’t wear headphones. Be friendly.

Tool Placement

When putting a tool down, place it completely off the trail to the uphill side. If there is a sharp edge to the tool, place it sharp-side down. Putting the tool on the downhill side of the trail or leaving it on the trail is dangerous to you and others.

Be Prepared and Safe

Prepare yourself for being outdoors and for some hard work. Wear sturdy shoes, like boots. Wear work gloves and protect your eyes with glasses or sunglasses. Protect yourself from the sun or cold and check the weather forecast before heading out. Bring the food and hydration needed for the duration. Let someone know where you will be working in case of an emergency.

Hazards

Be aware of the hazards in nature. In the SMT Trail System, you may encounter:
- Rattlesnakes
- Spiders (including black widows), scorpions, ants and other stinging bugs
- Mountain lions and bear
- Bighorn Sheep and deer (although not usually dangerous)
- Lightning
- Sudden change in weather

When Not To Work On Trails

- Dirt is too wet to work and sticks to the bottom of shoes
- Trail is closed for wildlife closure
- Trail is being used for an event
### IMBA Trail Difficulty Rating System

<table>
<thead>
<tr>
<th>Trail Width</th>
<th>Easiest White Circle</th>
<th>Easy Green Circle</th>
<th>More Difficult Blue Square</th>
<th>Very Difficult Black Diamond</th>
<th>Extremely Difficult DBL. Black Diamond</th>
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</thead>
<tbody>
<tr>
<td>72&quot; (1,800 mm) or more</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>36&quot; (900 mm) or more</td>
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<tr>
<td>24&quot; (600 mm) or more</td>
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<tr>
<td>12&quot; (300 mm) or more</td>
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<tr>
<td>6&quot; (150 mm) or more</td>
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<thead>
<tr>
<th>Tread Surface</th>
<th>Hardened or surfaced</th>
<th>Firm and stable</th>
<th>Mostly stable with some variability</th>
<th>Widely variable</th>
<th>Widely variable and unpredictable</th>
</tr>
</thead>
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<tr>
<th>Average Trail Grade</th>
<th>Less than 5%</th>
<th>5% or less</th>
<th>10% or less</th>
<th>15% or less</th>
<th>20% or more</th>
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<tr>
<th>Maximum Trail Grade</th>
<th>Max 10%</th>
<th>Max 15%</th>
<th>Max 15% or greater</th>
<th>Max 15% or greater</th>
<th>Max 15% or greater</th>
</tr>
</thead>
</table>

| Natural Obstacles and Technical Trail Features (TTF) | None | Unavoidable obstacles 2" (50 mm) tall or less | Unavoidable obstacles 8" (200 mm) tall or less | Unavoidable obstacles 15" (380 mm) tall or less | Unavoidable obstacles 15" (380 mm) tall or less | Avoidable obstacles may be present | May include loose rocks | Unavoidable bridges 24" (600 mm) or wider | Unavoidable bridges 24" (600 mm) or wider | Unavoidable bridges 24" (600 mm) or narrower | Unavoidable bridges 24" (600 mm) or narrower | Unavoidable bridges 24" (600 mm) or narrower | TTF’s 24" (600 mm) high or less, width of deck is greater than 1/2 the height | TTF’s 48" (1,200 mm) high or less, width of deck is less than 1/2 the height | TTF’s 48" (1,200 mm) high or less, width of deck is unpredictable | Many sections may exceed criteria |

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**Trail Rating**

Our bike trails are built and maintained to International Mountain Bike Association (IMBA) standards. Keep these standards in mind when working on each individual trail.