

A brief assessment of trail impacts on the Witches trail Fort William as part of the UCI MTB World cup May 2006

What we did

As part of the 2006 world cup event at Fort William an opportunity was taken to measure the impact made on the trail by the riders competing on the cross country course.

This was undertaken to add further understanding and knowledge about the impact of bikes on different trail types and the relative differences noted due to surface type, cross slope and angle of trail tread and weather.

The weather prior to and during the race was wet, adding an extra dimension to the regular passage of the bikes themselves.

The race

A total of 221 riders started the race, 167 finished all laps, the men undertaking six laps and the women four. So in total an estimated minimum of 858 passes were made, but more probably 950 passes were made (out of a theoretical 1172 passes if all entered riders completed all laps).

The measurements

Simple linear quadrats were laid out across the trail, referenced to canes either side of the safety tapes. Measurements of trail profile were made at the centre of the ride line and at 10cm either side, additionally the angle of trail was recorded.

What we found

The exercise usefully revealed that trails are considerably fluid, with removal or deposition affected by angle of slope, speed of bike and clarity of sight lines.

Quadrat 1 showed low displacement, clear sight lines and moderate angle of trail, however immediately beyond the quadrat significant change was observed where the riders braked prior to a hidden drop turn to the left.

Quadrat 2 an engineered and relatively level old railway line was on a fast section of the course and showed minimal change.

Quadrat 3 a reused old stone dyke showed that even stone pitching changes, this quadrat on rough stonework also showed evidence of avoidance by riders

Quadrat 4 a wall ride with a very steep cross slope revealed the importance of sight lines in limiting the impact of braking, the ride line acted naturally to scrub the speed off the bikes despite the turn manoeuvre ahead.

Quadrat 5 revealed that unconsolidated "as dug" material moves a lot at these grades, a noticeable rock immediately below the quadrat (30cm) had been revealed, a distinct shift of ride line was observed.

Quadrat 6 very large scale erosion, a steep section immediately above the quadrat had lost a lot of material vertically and laterally, a previously clean boardwalk was now up to 88mm deep in displaced material, an obvious visible root above the quadrat (marked as a hazard by the marshal) had all but been covered and lost.

Conclusion

Trail design that uses slopes deviating beyond the accepted IMBA recommended maximums for sustainable angle (10% overall) of slope **do** erode more quickly than those staying within the recommended angles. Especially noticeable was the loss of material where excessive slope met unsuitable "as dug" material, even remedial measures such as rough stone pitching fail to control erosion if the solution poses a greater challenge to the riders than the original problem. But deviance from the grade recommendation is acceptable if sight lines prior to and exiting from features are clear and do not cause braking through the feature. The importance of sustainable trail design at inception is evident.



Boardwalk section prior to race



Carried on mud after 1000 bikes

Recommendations

The exercise revealed the need to gather more information on the dynamics of trail erosion, but some observations are clear:

- Install transacts in your new trails and monitor the impact of riders against the figures generated by your counters.
- Sustainable trails are hard to create or maintain once the basic IMBA guidance is put aside except in exceptional circumstances.
- Trail design is especially important to maximise the positive effects of trail flow and minimise the effects of riders actions and braking.
- Approximately 1000 bikes passed over the trail during the course of the race (roughly equivalent to a weekend day at Glentress), this reveals the importance of predicting the likely volume of traffic when specifying the quality of any new trail.
- Maintenance is inevitable once trails attract sufficient a volume of riders, this can be reduced by adhering to more sustainable angles of trail tread and avoiding excessive slopes, if excessive gradients are used by a trail designer or builder, get them to explain (and guarantee) to you why it won't fall apart, because it probably will!

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Methodology

A comparison of the detailed measurements prior to and post race.

The six sites

Were chosen to reflect the different trail types on the witches trail, they were also chosen to reflect the widely varying angle of trail found. The quadrats were established post training when the trail was officially close.

The result of the measured quadrats were as follows:-

QUADRAT 1	
Location and description – above “Nessie”; 15° slope ; brought in surfacing material; short sight line.	
BEFORE	AFTER
Dishing at centre of trail tread 52mm 10cm upslope 46mm 10cm downslope 46mm	Dishing at centre of trail tread 65mm 10cm upslope 45mm 10cm downslope 49mm loss at centre of trail 13mm
QUADRAT 2	
Location and description – “puggy line”; <5° slope ; old firm railway track, clear sight line.	
BEFORE	AFTER
Dishing at centre of trail tread 20mm 10cm upslope 22mm 10cm downslope 22mm	Dishing at centre of trail tread 21mm 10cm upslope 23mm 10cm downslope 18mm gain at centre of trail 1mm no visible sign of active erosion, some minor displacement laterally
QUADRAT 3	
Location and description – reused old stone wall(dyke); 0° slope , roughly pitched, clear sight line.	
BEFORE	AFTER
Dishing at centre of trail tread 22mm 10cm upslope 19mm 10cm downslope 25mm	Dishing at centre of trail tread 16mm 10cm upslope 21mm 10cm downslope 21mm loss at centre of trail 6mm

QUADRAT 4	
Location and description --"wall ride" natural alluvial mix of sand and rounded pebbles, clear sight line. (angle of slope across trail tread 33°)	
BEFORE	AFTER
Dishing at centre of trail tread 50mm 10cm upslope 50mm 10cm downslope 45mm	Dishing at centre of trail tread 49mm 10cm upslope 54mm 10cm downslope 50mm loss at centre of trail 1mm
QUADRAT 5	
Location and description - "Lazy K", Natural as dug climb, shallower below, steeper climb above 15/18° slope	
BEFORE	AFTER
Dishing at centre of trail tread 79mm 10cm upslope 85mm 10cm downslope 44mm	Dishing at centre of trail tread 45mm 10cm upslope 65mm 10cm downslope 31mm gain at centre of trail 34mm <i>(also significant changes to either side)</i>
QUADRAT 6	
Location and description - bottom of "blue crane" natural peat eroding to alluvial mineral beneath 12° slope	
BEFORE	AFTER
Dishing at centre of trail tread 21mm 10cm upslope 29mm 10cm downslope 11mm (30cm upslope 33mm 30cm downslope 3mm)	Dishing at centre of trail tread 0mm 10cm upslope 53mm 10cm downslope 0mm (30cm upslope 57mm 30cm downslope 49mm) gain at centre of trail 21mm <i>(also significant changes to either side)</i>

Photo records of trail changes over time



fig 1. "blue crane" 2006 showing further and continual erosion



fig 2. The same trail "blue crane" in 2004



fig 3. the same trail section looking up in 2003