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Genesis of Trails in Nature: Monitoring of Visitors' Effect on Nature

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Introduction

Off trail recreational behaviour in nature is a frequent event. In Denmark 60 % of visitors claim to have spent a proportion of their activities away from the established trails and roads (Jensen 1998). Sometimes, off trail activities give rise to generation of new trails. But how much does it take to make a trail? And how much time does it take before nature is again restored after the impact has stopped?

The effect of trampling is influenced by

- the type activity (bicycling, walking, running, riding etc.),
- the degree of impact (the number of passages) and
- the type of nature in which it is taking place (vegetation, soil type, climate etc.).

In classic experiments the effect of the trampling is investigated by application of the entire impact at once (Cole & Bayfield 1993). To assess the mutual effect of trampling impacts and nature's ability to restore itself, the present investigation has been set up as a series of impacts returning every 14 days over an entire year. It is expected that it will be possible to record less effect of trampling over time in fast growing nature types than in areas of less vigorous vegetation. Therefore the more vigorous the vegetation the more important it is to consider regeneration in trampling experiment designs.

Methods

The experiment is carried out in three locations of Northern Zealand, Denmark. The three locations were selected to represent different soil and nature types: Tisvilde Hegn (Pine on sandy soil – texture class 1), Gribskov/Kagerup (beech on clay – texture class 5) and Nødebo (open grass land on loamy sand– texture class 3). The three sites were selected to represent typical, but as different as possible Danish nature types. Nødebo, which was intermediate in terms of soil texture, was selected as a representative of an area exposed to sunlight all year round. At each location three experiments are set up for three activity types: Walking, running and mountain biking. At each location, for each activity type, test-trails were established according to

The setup means that after the first year, the maximum impact investigated will be (26 impacts of 105 passages) 2,730 which is a considerable number compared to the standard experiments carried out by Cole and Bayfield (1993) exploiting up to 500 passages.

After every campaign the characteristics of the trail are recorded. After the first year the impact is stopped, and then followed for up to two year

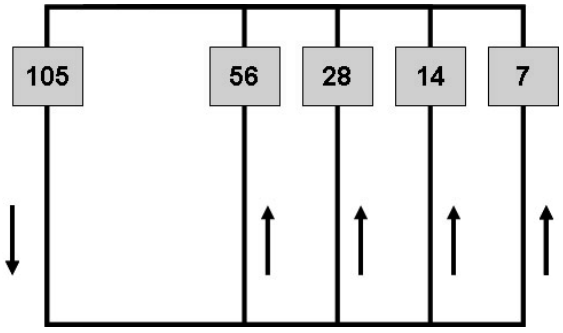

Figure 1: Experiment layout. For each activity (walking, running and bicycling) a trail was constructed. Every 14 days the trail was traversed the number of times indicated, in the direction shown by the arrows.

period where only the recording is continued. The recording includes a photograph of the trail at prescribed spot (see figure 2), registration of trail depth and width and a visual evaluation of the trail in the following categories:

1. No visible impact
2. Track visible
3. Soil in bottom of track visible
4. Soil in bottom of trail cut up
5. Sign of secondary erosion

Furthermore, every second month the soil compression is measured using a nuclear gauge (Randrup and Lichter 2001). At each trail, for each activity type, at each location the soil compression was measured in 10 and 30 cm depth and in triplicate.

The experiment was started in April 2005 and will continue onto 2007.

Results

The presentation will give results from the experiment including comparative studies of trampling effects on different soil/nature types given different activity types and degrees of impact. Results including pictures can be assessed via a web-page which will be demonstrated. The web-page enables comparison of 4 pictures at a time. Along with the pictures, measures and visual evaluation characters are displayed.

Conclusion

A clear management implication of the experiment is that if it is possible to document a correlation between impact and trampling effects (given activity and nature type), investigation in field of emerging trails would provide a rule of thumb for assessment of the number of people using the trail. Yet another possible application of the results will be for micro scale simulation of genesis of trails in the nature in the context of agent based modelling systems.

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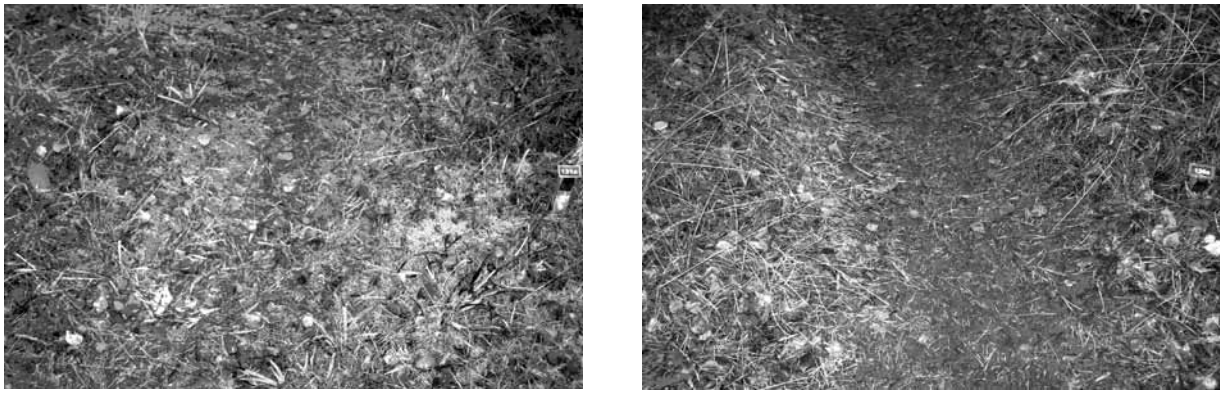

Figure 2: Example of pictures from the database. Both are from the site in Tisvilde Hegn (Sandy soil/pine forest). Both are taken on November 26 2005. Both are from the mountain bike tracks. To the left the track issued to 7 passages per 14 days (a total of 133 since the start of the experiment). To the right the track issued to 105 passages per 14 days (a total of 1995 passages).