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An analysis of the breakdown of paper products (toilet paper, tissues and tampons) in natural environments, Tasmania, Australia

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Abstract

An examination of the relative breakdown rates of unused toilet paper, facial tissues and tampons was undertaken in nine different environments typical of Tasmanian natural areas. Bags of the paper products (toilet paper, facial tissues, tampons) were buried for periods of 6, 12 and 24 months at depths of 5 and 15 cm. A nutrient solution simulating human body wastes was added to half of the samples, to test the hypothesis that the addition of nutrients would enhance the breakdown of paper products buried in the soil. Mean annual rainfall was the most important measured variable determining mean breakdown in the nutrient addition treatment between sites, with high rainfall sites (mean annual rainfall of greater than 650 mm) recording less decayed products than the drier sites (mean annual rainfall of 500–650 mm). Temperature and soil organic content were important influences on the breakdown of the unfertilised products. Toilet paper and tissues decayed more readily than tampons. Nutrient addition enhanced decay for all products across all sites. Depth of burial was not important in determining the degree to which products decayed. In alpine environments, burial under rocks at the surface did not increase the speed of decay of any product. The Western Alpine site, typical of alpine sites in the Tasmanian Wilderness World Heritage Area, showed very little decay over the two-year period, even for nutrient enhanced products. Management prescriptions should be amended to dissuade people from depositing human toilet waste in the extreme (montane to alpine) environments in western Tasmania. Tampons should continue to be carried out as currently prescribed.

Keywords: Human toilet waste disposal; Toilet paper; Tampons; Tissues; Back-country; Urine; Breakdown rates

1. Introduction

Research into the impact of human faecal waste (faeces, urine and toilet paper) disposal on non-serviced wilderness areas appeared in the 1970s (Leonard and Plumley, 1979; Reeves, 1979) and in the 1980s (Temple et al., 1982). While recent studies have noted issues caused by inappropriate human faecal waste disposal in back-country areas (Cole et al., 1997; Leung and Marion, 2000a,b; Rochefort and Swinney, 2000; Cole, 2001), they have concentrated on other recreation impacts such as physical disturbances caused by camping and trampling, both in the US (Marion and Cole, 1996; Leung and Marion, 2000a,b) and Australia (Sun and Walsh, 1998). This gap in the knowledge of recreation impacts is recognised (Cilimburg et al., 2000) and is especially important in a context of increased visitor use of the back-country (Sun and Walsh, 1998; Lachapelle, 2000; Poll, 2002).

A Minimal Impact Bushwalking (MIB) Strategy was adopted by the Tasmanian Parks and Wildlife Service in an attempt to encourage bushwalkers to dispose of their waste in an environmentally safe manner (O'Loughlin, 1988). These guidelines advise campers to choose a toilet site that is at least 100 m away from any water source, where they should bury human waste (faeces and toilet paper) in a cat-hole approximately 15 cm deep. They are also advised to carry out used tampons. These guidelines were based on the Leave No Trace campaign in the USA. However, there are very few scientific data supporting the Australian guidelines. Recent surveys of campsites revealed the degree of non-compliance with MIB guidelines, with many cases of unburied toilet paper and/or faeces being recorded (von Platen, 2002; authors unpublished data).

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The persistence of toilet paper around campsites is primarily an aesthetic issue, the importance of which escalates if Tasmania's reputation as the 'clean, green State' is to be upheld, especially in the Tasmanian Wilderness World Heritage Area. There has been no published study that directly addresses the relative breakdown rates of toilet paper, tissues and tampons buried in the ground in natural environments. Limited information from North American research states that toilet paper is slow to breakdown (Hart, 1984), and may be dug up by animals (Land, 1995). The practice of burning toilet paper is neither desirable in environments dominated by soils high in organic matter (Reeves, 1979), nor is it a management option for the fire-free 'fuel-stove only' regions of western Tasmania. It has been suggested that recreationalists should carry out used toilet paper (Meyer, 1994; Drake, 1995). While this suggestion has been publicised on some Tasmanian walk maps (TASMAP, 2001), it is not a general recommendation of the current Tasmanian MIB guidelines.

The research reported in this paper was undertaken to determine: whether the environments frequented by bushwalkers in Tasmania differed in their ability to break down toilet paper, tissues and tampons; the periods required for breakdown; the impact of nutrient additions on the breakdown of paper products; and, the influence of depth of burial, climatic and edaphic attributes on breakdown rates. The management implications of the results are discussed.

2. Methodology

2.1. Field methods

Nine sites were chosen that were representative of common plant communities found in a number of Tasmanian national parks (Fig. 1). These sites varied in altitudinal range, substrate, and climate conditions. Three sites were located in lowland vegetation on sand or dolerite in the south-eastern (warmer, drier) part of the State (coastal eucalypt forest, grassy eucalypt forest, heathy eucalypt forest), three sites were located on dolerite soils in alpine/subalpine vegetation (subalpine rainforest, montane eucalypt forest, eastern alpine heath), and three sites were located in the relatively low-nutrient quartzite country in western Tasmania (lowland rainforest, montane moorland, western alpine). More detailed site descriptions are presented in Bridle and Kirkpatrick (2003).

At each site two parallel transects, each approximately 20 m in length, were laid out along the contour. Within each transect 20 quadrats (50×50 cm) were located in areas that would be attractive as a toilet spot for bushwalkers, that is, the area was free from prickly shrubs, and the soil depth was a minimum of 15 cm. Quadrats were marked by steel roof spikes in each corner and the distance along the transect, and distance and direction of offset from the transect line was recorded. Quadrats were located at least 50 cm from each other in all directions to avoid overlap.

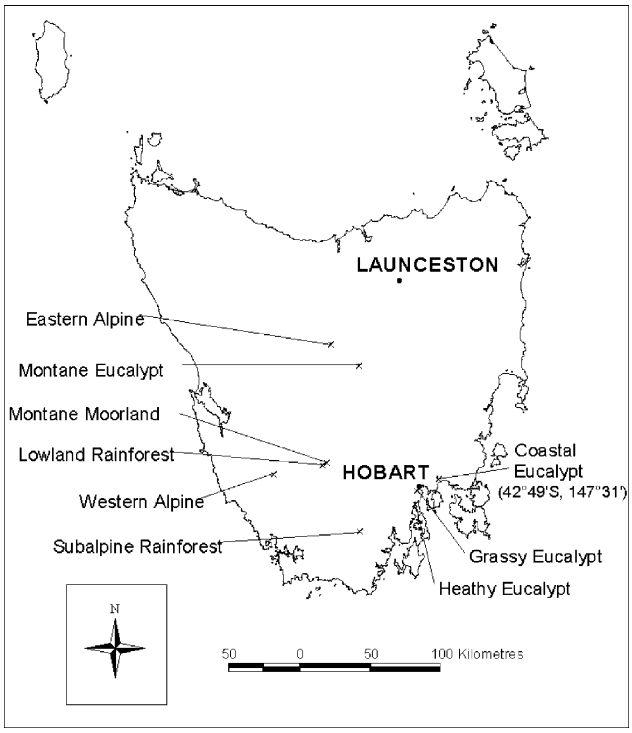

Fig. 1. Location of study sites.

Given that human waste is a major source of nutrient additions in natural environments, we decided to test the hypothesis that nutrient additions would enhance the decay of toilet paper and tampons in natural environments. We created an artificial solution to approximate the nutrients that would be added by defaecation and urination into the natural environment. Urine and faeces are made up of nitrogen, phosphorus, carbon, calcium and potassium, with roughly similar proportions of each (Gotaas, 1956). A formula was used to ensure that the solution was of consistent strength/dilution between quadrats and sites.

Two treatments were chosen to represent the process of digging holes (15 cm deep and approximately 10 cm in diameter) to bury human waste, one with a nutrient addition and one without.

Plastic mesh bags filled with known weights of bleached and unbleached toilet paper, facial tissues and tampons were sealed and then buried. It was difficult to maintain an even weight across all products in all bags. Each product weighed approximately 2 g, with tampons being the heaviest (2.7 g) and unbleached toilet paper being the lightest (1.7 g). Tissues had a mean weight of 2.5 g and bleached toilet paper weighed 2.1 g on average. All products had a carbon content of greater than 96%.

Bags were randomly allocated to treatments, with the same treatment being applied to bags in the same hole. Treatment 1 'dug' consisted of two bags that were buried at 15 and 5 cm in the same hole. Bags were wetted with 60 ml of distilled water before being covered by soil excavated