



UNIVERSITY
OF WOLLONGONG
AUSTRALIA

Hawkweed Community Based Social Marketing Project:

**A report on track users' boot cleaning
practices and attitudes in the Kosciuszko
National Park**

Nicholas Gill, Shaun McKiernan, Drauzio Annunciato

School of Geography and Sustainable Communities

University of Wollongong, NSW 2522, Australia

AUTHORS

Nicholas Gill, Shaun McKiernan, Drauzio Annunciato
School of Geography and Sustainable Communities and
Australian Centre for Culture, Environment, Society and Space Faculty of Social Sciences
University of Wollongong NSW 2522 Australia

For further correspondence contact: Nicholas Gill ngill@uow.edu.au

ACKNOWLEDGEMENTS

This research was funded by the NSW Office of Environment and Heritage. Mary Pilkington, Taneesha Amos-Hampson, Kath and John Anderson, Gary Caitcheon, and Marion Battishall assisted with surveying track users. Hillary Cherry from OEH and Wendy Gibney from the NSW Department of Primary Industry participated in survey design. Stephanie Martin and Jo Caldwell from OEH provided support for the fieldwork in Kosciuszko National Park.

Contents

List of Figures	iii
List of Tables	iv
Report Summary	1
Introduction.....	2
What are track users doing and how?	3
Before.....	3
After	4
What is the willingness of track users to change current practices?.....	6
Before.....	6
After	7
What are the barriers to track users cleaning their boots?	8
Before.....	9
After	11
What motivates track users to clean their boots?.....	13
Before.....	13
After	15
Interventions: benefits and difficulties of three boot cleaning methods	16
Barriers.....	16
Benefits	19
Knowledge of Weeds in National Parks and Willingness to Clean if Advised.....	21
Conclusion	23
Survey	24

List of Figures

Figure 1 Do you brush all vegetation and dirt off your boots/ footwear at the trailhead BEFORE a walk?.....	3
Figure 2 Do you brush all vegetation and dirt off your boots/ footwear at the trailhead AFTER a walk?.....	4
Figure 3 What is difficult or challenging about brushing all of the vegetation and dirt off your boots/ footwear at the trailhead BEFORE a walk?.....	10
Figure 4 What is difficult or challenging about brushing all of the vegetation and dirt off your boots/ footwear at the trailhead AFTER a walk?	12
Figure 5 What may be the benefits in brushing all of the vegetation and dirt off your boots at the trailhead BEFORE a walk?	14
Figure 6 What may be the benefits in brushing all of the vegetation and dirt off your boots/footwear at the trailhead AFTER a walk?.....	16
Figure 7 What may be difficult or challenging about carrying your own brush?.....	17
Figure 8 What may be difficult or challenging about using a brush provided at the trailhead?	18
Figure 9 What may be difficult or challenging about using a fixed boot brushing station?...	19
Figure 10 What may the benefits in using a brush provided at the trailhead?	20
Figure 11 What may the benefits in using a fixed boot brushing station?.....	21
Figure 12 Respondent self-rated knowledge of how weeds are affecting national parks (n=116).....	21

List of Tables

Table 1 Survey Locations in Kosciuszko National Park and Jindabyne.....	3
Table 2 Respondents at different locations and their cleaning practices before and after a walk (n=116).....	5
Table 3 Australian Residents and Visitors to Australia and their cleaning practice before and after a walk (n=114).....	6
Table 4 Likelihood of cleaning footwear before a walk by location (n=116)	7
Table 5 Non-cleaners: Q3 and Q8 If you were ADVISED to brush your boots/ footwear at the trailhead BEFORE/AFTER a walk, how likely would you be to do this all of the time? ...	8
Table 6 Likelihood of cleaning footwear after a walk by location (n=116)	8
Table 7 Barriers to footwear cleaning before a walk among cleaner and non-cleaners (n=116). *For these variables one cell had less than the expected count of five as required for the Chi Square test.	11
Table 8 Barriers to Cleaning Footwear Before a Walk For Non-Cleaners Who are Likely to Clean if Advised (n=100). Percent sums to more than one hundred as the questions were open-ended and respondents could provide more than one answer. Each row represents the number/percent who response was coded as ‘yes’ for that barrier.	12
Table 9 Barriers to Cleaning Footwear After a Walk For Non-Cleaners Who are Likely to Clean if Advised (n=85). Percent sums to more than one hundred as the questions were open-ended and respondents could provide more than one answer. Each row represents the number/percent who response was coded as ‘yes’ for that barrier.	13
Table 10 Benefits from footwear cleaning before a walk among cleaner and non-cleaners (n=116). *For these variables one cell had less than the expected count of five as required for the Chi Square test.	14
Table 11 Benefits of cleaning footwear before a walk by location.....	15
Table 12 Cleaning before a walk by knowledge of weed impacts in national parks (n=116)	22
Table 13 Likelihood of cleaning footwear before a walk by knowledge of weed impacts in national parks (n=116).....	22

Report Summary

116 track users participated in the survey on weed hygiene practices in the Kosciuszko National Park, over two visits in April 2018. The survey was conducted by researchers from the University of Wollongong in collaboration with the Office of Environment and Heritage. Survey locations included: Round Mountain; Charlotte Pass and the Jindabyne Visitor Centre.

The survey focused on the boot cleaning practices of track users to assess their weed hygiene attitudes and practices. Some key findings from the research include:

- 79 individuals or 68% of respondents said that they cleaned their footwear *sometimes*, only occasionally, or never both before *and* after a walk.
- The potential to increase participation in boot cleaning was evidenced with 71.6% of all respondents indicating that if advised they would be 'very likely' to clean their boots *before* a walk. Another 20.7% of all respondents indicated they would be 'somewhat likely to' clean their footwear before a walk if advised to. Additionally, and similar to before the walk, all survey respondents indicated a high likelihood of cleaning their boots *after* a walk, if advised: 'Very likely to do this' (63.8%); 'somewhat likely to do this' (24.1%).
- Respondents' identified multiple barriers that prevent them from cleaning their boots at the trailhead before *and* after a walk. Lack of facilities/equipment; remembering/habit; and concern for the quality of clean were the most frequent responses. Additionally, respondents also noted fatigue (15.5%) as a barrier after a walk.
- The majority of survey respondents identified controlling the spread of noxious weed seeds and pathogens as the primary benefits in brushing boots at the trailhead before *and* after a walk. Specifically, this includes stopping weed/seed spread, preventing contamination, stopping pathogens, and general environmental protection. Additionally, survey respondents also noted having a clean car/house (31.9%) as a key motivator for brushing their boots after a walk.

Introduction

The following report provides a summary of track users' boot cleaning practices and attitudes in Kosciuszko National Park (KNP). In total, 116 track users were surveyed. We surveyed track users at two locations relevant to the distribution of Hawkweeds in KNP. The first location was Round Mountain, a common starting point for walkers undertaking overnight walks in KNP, and where we expected to survey general more experienced and independent walkers. The second location was Charlotte Pass and other sites along Kosciuszko Road. At these more popular and accessible locations we were able to survey largely day walkers. Round Mountain respondents were somewhat more likely to be 'frequent' bushwalkers but generally there was little meaningful (and no statistical) difference in bushwalking frequency across respondents at the different locations. Thirty-two percent of respondents rated their knowledge of weeds in national parks as high or very high. The remaining 68% rated their knowledge as 'very low', 'low', or neither 'high nor low'.

Our surveys at Charlotte Pass and other locations were cut short by weather and we conducted further surveys at the visitor centre in Jindabyne. The number of surveys in each location is provided in Table 1. To facilitate a comparison between track users at Round Mountain and at the other locations we recoded the other locations into one location category (see Table 2).

The report not only summarises the existing practices of survey respondents, but also identifies the existing barriers preventing track users cleaning their boots, as well as the perceived benefits that motivate track users to clean their boots before and after a walk. The survey has been uploaded and analysed in the software SPSS. The figures and data summaries below have been coded in two primary ways. First, for questions using a Likert scale (i.e. ranking people's attitudes or practices on a scale of 1-5), the data is presented as such. In comparison, the open response questions (i.e. survey respondents were not given a selection option), have been coded according to the key themes emerging across respondents. Moreover, each individual response was coded into an overall theme that was prevalent across a number of track users. In cases where multiple responses have been given, but numbers are not significant enough to create a variable, the category 'other' is provided. Where applicable, a more detailed summary of the methods used to create specific figures or tables have been provided below.

Location	Frequency	Percentage
Charlotte Pass	39	33.6
Sawpit Creek/Rainbow Lake/Rennix Gap	10	8.6
Jindabyne Visitor Centre	37	31.9
Round Mountain	30	25.9
Total	116	100.0

Table 1 Survey Locations in Kosciuszko National Park and Jindabyne

What are track users doing and how?

Before

The majority of survey respondents (59.5%) indicated they ‘never’ brush all vegetation and dirt off their boots/footwear at the trailhead before a walk. This response is significantly higher than the next two responses: ‘sometimes’ (16.4%) and ‘only occasionally’ (10.3%) (see Figure 1). Overall, 86.2% of respondents cleaned their footwear sometimes, only occasionally, or never, before a walk (we refer to these as ‘non-cleaners’).

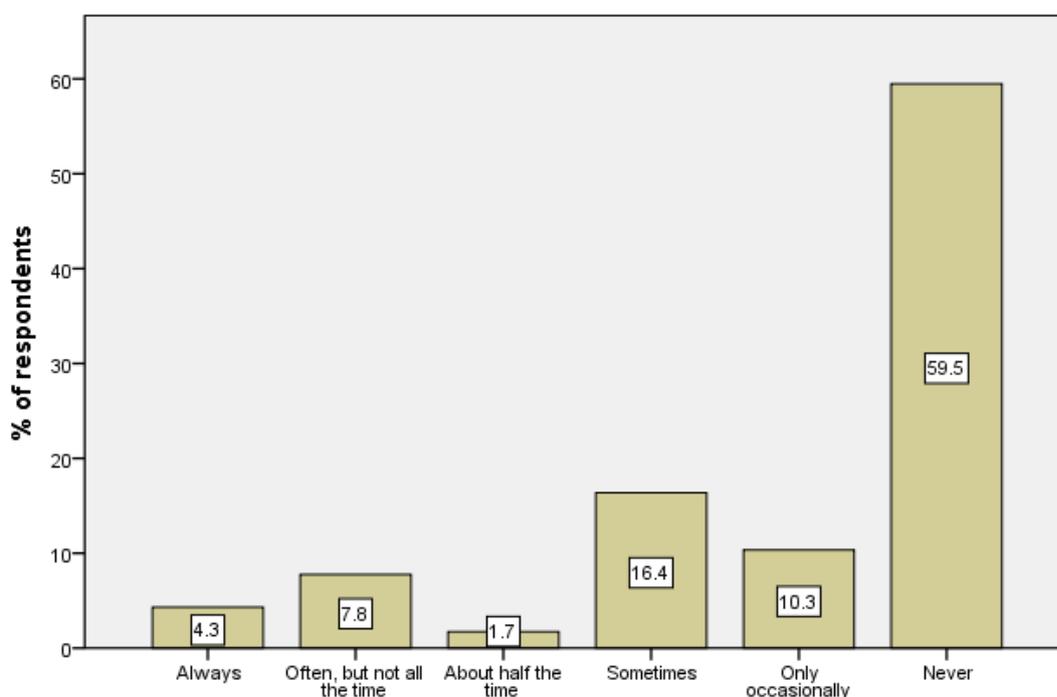


Figure 1 Do you brush all vegetation and dirt off your boots/ footwear BEFORE a walk?

Of those respondents who do, or have cleaned their boots before a walk, the majority, 36.2%, indicated they use a fixed boot brushing station, 21.3% use a brush provided at the trail head, and 8.5% bring a brush with them. However, the second highest response was ‘Other’ (34%), indicating a high proportion track users do not use any of the suggested cleaning options. The cleaning methods associated with ‘other’ were largely ad hoc, including track users banging together their boots, or using their hands (50%). This involved using sticks, a towel, wiping on grass, and similar methods that were primarily carried out at the site. Cleaning boots at home using a water or brush was the second most common method in the ‘other’ category (31.3%). This often involved cleaning boots in a sink of soapy water, brushing off dirt and other foreign materials.

After

In comparison to before the trailhead, survey respondents were more likely to clean their boots after a walk (Always 11.2% as opposed to 4.3% before the walk; Often, but not all the time 9.5%, compared with 7.8% before). However, never (33.6%), sometimes (22.4%), and only occasionally (17.2%) were the most frequent responses (see Figure 2). Overall, 73.2% cleaned their footwear sometimes, only occasionally, or never after the walk (we refer to these as ‘non-cleaners’).

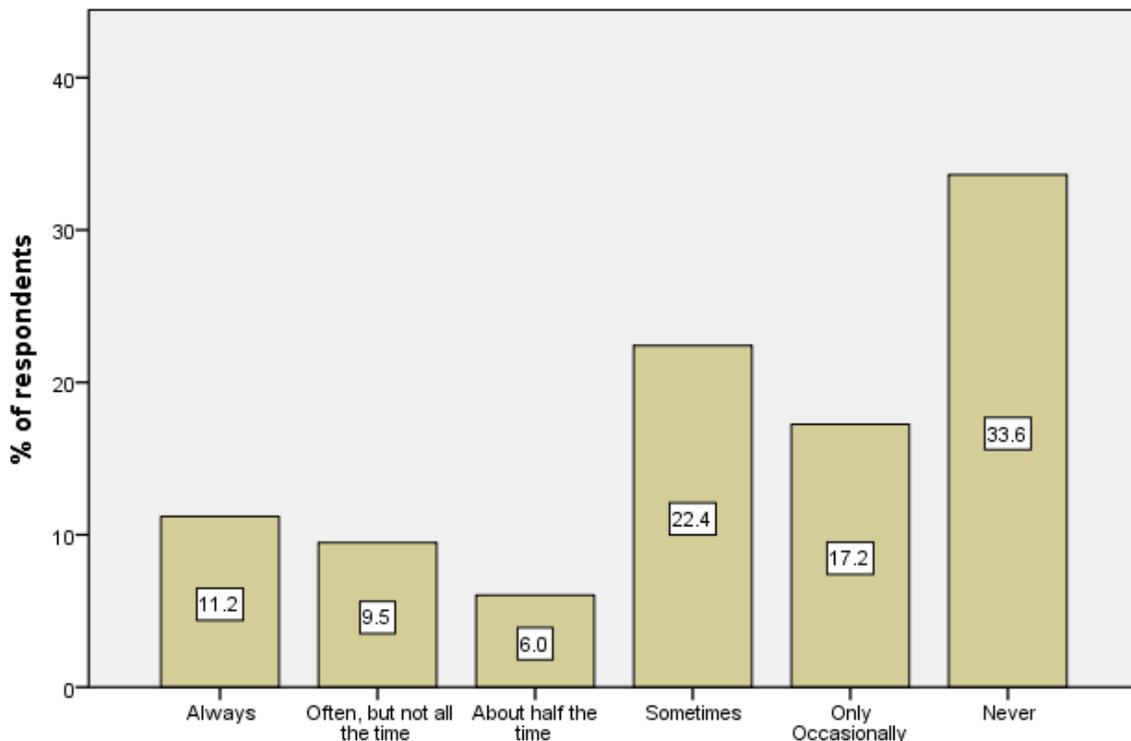


Figure 2 Do you brush all vegetation and dirt off your boots/ footwear at the trailhead AFTER a walk?

Of the respondents who do, or have cleaned their boots after a walk, only 3.9% brought a brush with them, 11.7% use a brush provided at the trailhead, and 22.1% use a fixed boot brushing station. Other (62.3%) was the highest response. Similar to before the walk, this included cleaning boots at home using a water and brush (30.4%), or using hands (sticks, wiping on grass, towel etc.) or banging boots together, most commonly in the car park (54.3%).

Overall, there is considerable overlap between the two groups; 79 individuals or 68% of respondents said that they cleaned their footwear sometimes, only occasionally, or never both before *and* after a walk. In contrast only five individuals said they always cleaned their footwear both before and after a walk. These results highlight the low penetration of footwear cleaning behaviour amongst track users in Kosciuszko National Park at the time of the survey in the first quarter of 2018.

When comparing the track users' responses in the different survey locations, there is only a partial difference in terms of the extent to which they clean their footwear before or after a walk and this difference is not statistically significant (Table 2).

	Clean before a walk		Fisher's Exact Test	Clean after a walk		Fisher's Exact Test
	Cleaners	Non-cleaners		Cleaners	Non-cleaners	
Charlotte Pass and other locations (n=86)	14%	86.0%	P=1.00	29.1%	70.9%	p=.473
Round Mountain (n=30)	13.3%	86.2%		20.0%	80.0%	

Table 2 Respondents at different locations and their cleaning practices before and after a walk (n=116)

Additionally, the bulk of our respondents were Australian residents, with only 11 respondents being visitors to Australia. No visitors cleaned their footwear before a walk and in this respect they were not substantially different from Australian residents, most of whom also do not clean their footwear (Table 3). However, the visitors do clean their footwear to a greater extent after a walk than Australian residents. With the caveat that while these numbers are

small, this difference is statistically significant (Table 3). It is difficult to explain this with the survey data. One possible explanation is provided for the benefits of cleaning footwear after a walk. The only benefit for which visitors substantially exceed Australian residents (and for which there is a statistically significant difference, Fisher’s Exact Test $p=.036$) is ‘clean car/house’. 63.6% of visitors indicated that this was a benefit of cleaning footwear after a walk as compared to 28.8% of Australian residents. This is possibly a function of using hire cars or of wanting to stay as clean as possible while travelling, using hotels, and having less access to cleaning equipment than they would at home. It may be related to norms in their home countries regarding cleaning or it may be due to recent exposure to biosecurity information while travelling; for example at international airports.

	Clean before a walk		Fisher’s Exact Test	Clean after a walk		Fisher’s Exact Test
	Cleaner	Non-cleaner				
Australian Resident (n=104)	15.4%	84.6%	P=.358	23.1%	76.9%	p=.034
Visitor (n=11)	0.0%	100.0%		54.5%	45.5%	

Table 3 Australian Residents and Visitors to Australia and their cleaning practice before and after a walk (n=114)

What is the willingness of track users to change current practices?

Those who do not clean their footwear to a great extent constitute the key target group for behaviour change. In this section we examine how likely these ‘non-cleaners’ are to clean their footwear if they were advised to. This data is limited to those who answered sometimes, only occasionally, or never to questions one and six which asked if they cleaned footwear before or after a walk. Additionally, we provide a summary on the willingness of all respondents to clean their boots before and after a walk, if advised.

Before

With respect to non-cleaners before a walk, there are 100 respondents in this group (i.e. those who answered sometimes, only occasionally or never to Question one, do you brush before a walk). Ninety-one of these are somewhat likely or very likely to clean their boots if advised and only five indicated that they probably wouldn’t do this even if advised (Table 5).

Additionally, 71.6% of all respondents (i.e. cleaners and non-cleaners) indicated that if advised they would be ‘very likely’ to do so. This was followed by 20.7% of all respondents indicating they would be ‘somewhat likely to’ clean their boots at the trailhead before a walk, if advised.

When comparing survey locations, there is only a slight difference between Round Mountain and the other locations in regards to the willingness of track users to clean boots before a walk, if advised. The Round Mountain walkers were more likely to be ‘somewhat likely’ to clean their footwear, but generally more inclined to be less likely to clean their footwear before a walk (Table 4).

	Not at all likely to do this	Somewhat unlikely to do this	Neither likely nor unlikely	Somewhat likely to do this	Very likely to do this
Other Locations	1.2%	2.3%	2.3%	19.8%	74.4%
Round Mountain	0.0%	6.7%	6.7%	23.3%	63.3%

Table 4 Likelihood of cleaning footwear before a walk by location (n=116)

After

For after a walk, of the 85 non-cleaners in this group (i.e. those who answered sometimes, only occasionally or never to question six, do you brush your boots after a walk), 75, or 88%, answered that they are somewhat likely or very likely to clean their boots if advised, and only 6 indicated that they probably wouldn’t do this even if advised (Table 5). Again, while these figures are likely to be inflated somewhat, it suggests that even non-cleaners will clean their boots if appropriate information and facilities are provided.

	Before a Walk: Frequency	Before a Walk: Percent	After a Walk: Frequency	After a Walk: Percent
Not at all likely to do this	1	1.0	1	1.2
Somewhat unlikely to do this	4	4.0	5	5.9
Neither likely nor unlikely	4	4.0	4	4.7
Somewhat likely to do this	24	24.0	20	23.5
Very likely to do this	67	67.0	55	64.7
Total	100	100.0	85	100.0

Table 5 Non-cleaners: Q3 and Q8 If you were ADVISED to brush your boots/ footwear at the trailhead BEFORE/AFTER a walk, how likely would you be to do this all of the time?

Additionally, and similar to before the walk, all survey respondents indicated a high likelihood of cleaning their boots after a walk, if advised: ‘Very likely to do this’ (63.8%); ‘somewhat likely to do this’ (24.1%). This is also evident when comparing the two study areas (**Table 6**). Although, Round Mountain walkers were slightly less inclined to be ‘somewhat’ or ‘very likely’ to clean footwear after a walk.

	Not at all likely to do this	Somewhat unlikely to do this	Neither likely nor unlikely	Somewhat likely to do this	Very likely to do this
Other Locations	1.2%	2.3%	3.5%	26.7%	66.3%
Round Mountain	0.0%	16.7%	10.0%	16.7%	56.7%

Table 6 Likelihood of cleaning footwear after a walk by location (n=116)

What are the barriers to track users cleaning their boots?

The following sections detail the perceived barriers and benefits of track users for cleaning their boots at the trailhead before and after a walk. The data below is presented in two ways. First, we summarise the responses of all respondents to Questions 4, 5, 9 and 10. Second, to provide insight into whether there are differences between those who clean their footwear and

those who don't with respect to benefits and barriers, we ran a cross-tabulation and chi square test (and Fisher's exact test) for question one (cleaning footwear before a walk). As the minimum cell count requirement for this test was violated, we then recoded the answers to question one into those who cleaned at least half the time (cleaners) and those who clean no more than 'sometimes' (non-cleaners). In interpreting these results, it should be noted that the numbers of cleaners is only sixteen. We also conducted the same test (i.e. the perceived barriers and benefits between cleaners and non-cleaners) for after the walk. However, the results were consistent with before the walk, and therefore have not been reproduced in the report.

Before

Respondents' identified multiple barriers that prevent them from cleaning their boots at the trailhead before a walk (see Figure 3). Of the open answers given by all respondents for this questions, lack of facilities/equipment (42.2%); remembering/habit (23.3%); quality of clean (16.4%); and nothing (16.4%) were the most frequent. Survey respondents' concern for the 'lack of facilities/equipment' refers to either the absence of equipment at the trailhead, or if existing equipment is in poor condition. 'Remembering/habit' refers to track users forgetting to clean their boots prior to the walk, or not having an established habit that prompts them to do so. 'Quality of the clean' denotes track users finding it difficult to remove mud, dirt or other contaminants due to the design of equipment or boot. However, 16.4% of all respondents indicate that there is 'nothing' difficult or challenging about brushing their boots at the trailhead before a walk.

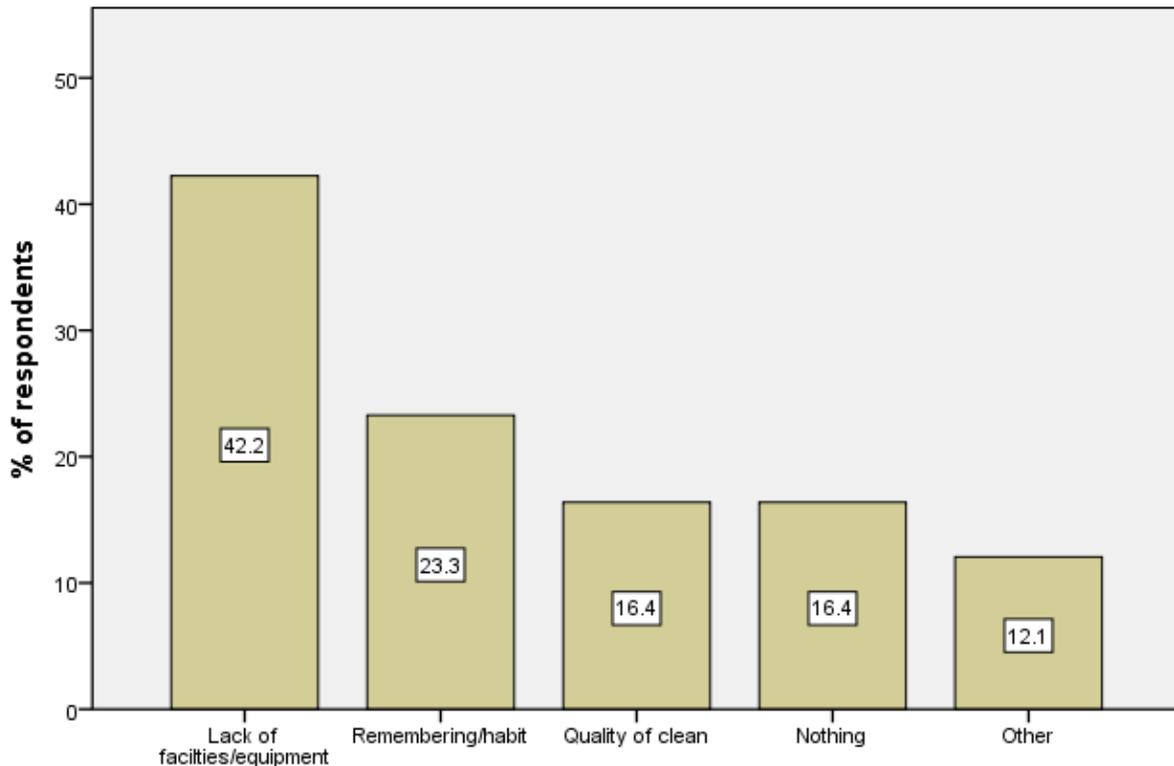


Figure 3 What is difficult or challenging about brushing all of the vegetation and dirt off your boots/ footwear at the trailhead BEFORE a walk?

While there is no statistically significant difference between cleaners and non-cleaners for ‘remembering/habit’ and ‘other’, non-cleaners are more likely to find a lack of facilities/equipment a barrier and this is statistically significant (Table 7). Presumably, cleaners are more likely to find some way to clean their boots regardless of facilities. Conversely, cleaners are more likely to find quality of clean a barrier. This is also statistically significant, although the number of cleaners is small (6 said this was a barrier). Moreover, non-cleaners were less likely than cleaners to nominate ‘nothing’ as a barrier. Notwithstanding the small number of cleaners in this analysis, it is noteworthy that they were more concerned about the quality of clean. It is possible that in being prepared to go to the effort to clean their footwear, they expect the result to be good. This may be a factor in retaining their willingness to clean footwear.

Barriers	Cleaners		Non-cleaners		χ^2 or Fisher's
	Yes	No	Yes	No	Exact test Output
Lack of facilities/equipment	18.8%	81.3%	46.0%	54.0%	$\chi^2(1)= 4.198$, $p=.040$
Remembering/habit	6.3%	93.8%	26%	74%	Fisher's exact test, $p=.113^*$
Quality of Clean	37.5%	62.5%	13.0%	87.0%	Fisher's exact test, $p=.137^*$
Nothing	31.3%	68.8%	16.4%	83.6%	Fisher's exact test, $p=.014^*$
Other	12.5%	87.5%	12.0%	88.0%	Fisher's exact test, $p=1.0^*$

Table 7 Barriers to footwear cleaning before a walk among cleaner and non-cleaners (n=116). *For these variables one cell had less than the expected count of five as required for the Chi Square test.

After

Similar to before the walk, all respondents indicated that a lack of facilities/equipment (51.7%); quality of the clean (13.8%); and remembering/habit (11.2%) are barriers to them cleaning their boots after a walk. However, respondents also noted fatigue (15.5%) as a barrier. Track users spoke of feeling too tired/exhausted after completing the walk and instead prefer to go straight home. Finally, and similar to before the walk, 12.9% of all respondents indicated that there was 'nothing' difficult or challenging about brushing their boots at the trailhead after a walk (see Figure 4).

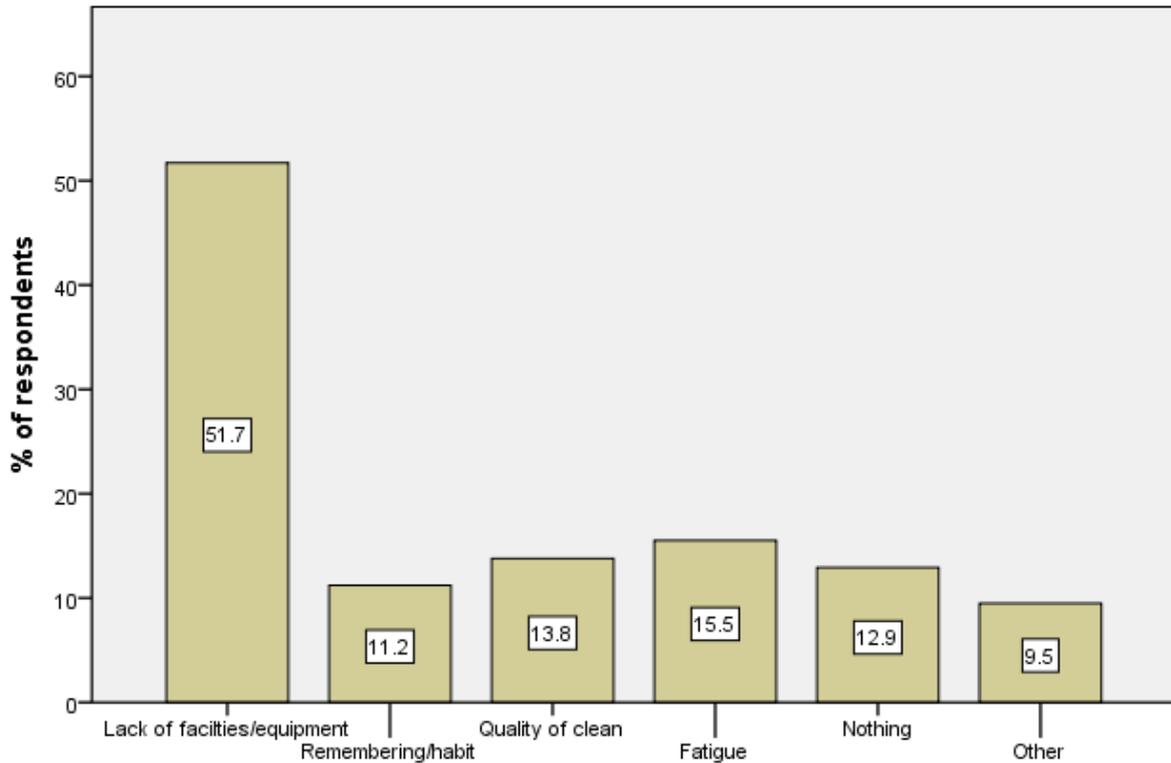


Figure 4 What is difficult or challenging about brushing all of the vegetation and dirt off your boots/ footwear at the trailhead AFTER a walk?

For those in the non-cleaner group, the barrier to cleaning boots are the same as for respondents overall (Figure 5 and Figure 11) and follow the same general distribution across the identified barriers. As for all respondents, approximately half of non-cleaners responded that lack of facilities/equipment was a barrier either before or after walk (see Table 8 and Table 9). For before a walk 26% of non-cleaners indicated that remembering/habit was a barrier; the figure for all respondents was 23.3%. Fatigue after walk was a barrier for 14.1% of non-cleaners and for 15.5% of all respondents.

Barriers	Frequency	Percent
Lack of facilities/equipment	46	46.0
Remembering/habit	26	26.0
Quality of Clean	13	13.0
Nothing	14	14.0
Other	12	12.0

Table 8 Barriers to Cleaning Footwear Before a Walk For Non-Cleaners Who are Likely to Clean if Advised (n=100). Percent sums to more than one hundred as the questions were open-ended and respondents could provide more than one answer. Each row represents the number/percent who response was coded as 'yes' for that barrier.

Barriers	Frequency	Percent
Lack of facilities/equipment	47	55.3
Remembering/habit	8	9.4
Quality of Clean	9	10.6
Fatigue	12	14.1
Nothing	12	14.1
Other	10	11.8

Table 9 Barriers to Cleaning Footwear After a Walk For Non-Cleaners Who are Likely to Clean if Advised (n=85). Percent sums to more than one hundred as the questions were open-ended and respondents could provide more than one answer. Each row represents the number/percent who response was coded as ‘yes’ for that barrier.

What motivates track users to clean their boots?

Before

This section details track users’ perceptions of the benefits in cleaning their boots before and after a walk. We infer the perceived benefits given by respondents to also constitute potential motivations for track users to clean their boots before and after a walk. The majority of survey respondents identified controlling the spread of noxious weed seeds and pathogens as the primary benefits in brushing boots at the trailhead before a walk (see Figure 5).

Specifically, this includes stopping weed/seed spread (53.4%), preventing contamination (27.6%), stopping pathogens (17.2%), and general environmental protection (9.5%). ‘Prevent contamination’ was separated from ‘weed/seed spread’ and ‘pathogens’, as it captures track users specifically stating ‘contamination’ in their answer. Additionally, stopping pathogens indicates survey respondents explicitly referring to either pathogens or disease.

Environmental protection (general) refers to instances when survey respondents mentioned preventing the spread of spores, foreign material, or non-natives as a benefit for cleaning their boots. Overall, these responses indicate that while track users seldom clean their boots at the trailhead before a walk, they are aware of reasons for cleaning their boots, and also demonstrate a strong willingness to clean their boots.

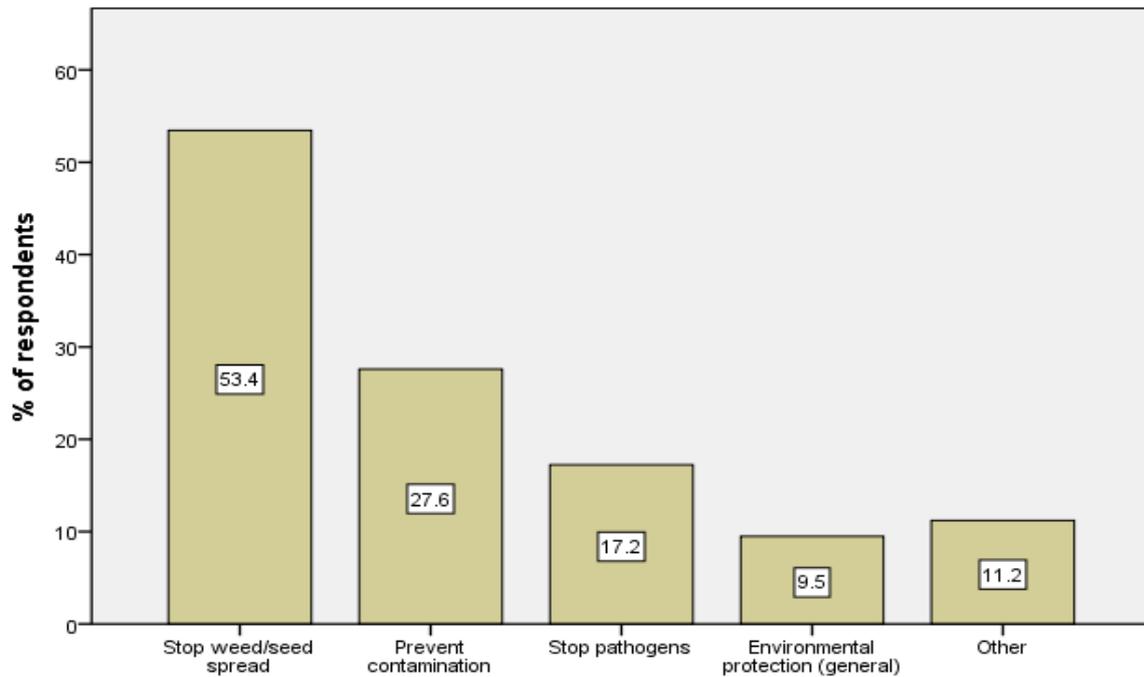


Figure 5 What may be the benefits in brushing all of the vegetation and dirt off your boots at the trailhead BEFORE a walk?

When comparing cleaners and non-cleaners, the results show that, while there is slightly greater awareness about the prevention of weed/seed spread being a benefit among cleaners than among non-cleaners, the differences across all benefits for cleaning footwear before a walk are not statistically significant (Table 10).

Benefits	Cleaners		Non-cleaners		χ^2 or Fisher's Exact test Output
	Yes	No	Yes	No	
Stop weed/seed spread	68.8%	31.3%	51%	49%	$\chi^2(1)= 1.747$, p=.186
Prevent Contamination	18.8%	81.3%	29.0%	71.0%	$\chi^2(1)= .725$, p=.394
Stop pathogens	25.0%	75.0%	16.0%	84.0%	$\chi^2(1)= .783$, p=.376
Environmental Protection	12.5%	87.5%	9.0%	91.0%	Fisher's exact test, p=.648*
Other	0.0%	100%	13.0%	87.0%	Fisher's exact text, p=.210*

Table 10 Benefits from footwear cleaning before a walk among cleaner and non-cleaners (n=116). *For these variables one cell had less than the expected count of five as required for the Chi Square test.

Additionally, with respect to the benefits of cleaning footwear, track users are generally not substantially different at the different locations. For example, Table 11 shows the only key difference is in the Round Mountain track users perceiving that preventing weed spread is a benefit of footwear cleaning to a significantly greater extent than track users at other location, although some other differences, such as ‘prevent contamination’ are worth noting.

Benefit	Other Locations		Round Mountain		χ^2 or Fisher's Exact test Output
	Yes	No	Yes	No	
Stop weed/seed spread	45.3%	54.7%	76.7%	23.3%	$\chi^2(1)= 8.767$, $p=.003$
Prevent contamination	31.4%	68.6%	16.7%	83.3%	$\chi^2(1)= 2.415$, $p=.120$
Stop pathogens	16.3%	83.7%	20.0%	80.0%	$\chi^2(1)= .216$, $p=.642$
Environmental Protection	10.5%	98.5%	6.7%	93.3%	Fisher's exact test, $p=.726^*$
Other	9.3%	90.7%	16.7%	83.3%	Fisher's exact test, $p=.316^*$

Table 11 Benefits of cleaning footwear before a walk by location

After

Similar to before a walk, track users indicated stopping weed/seed spread (43.1%), preventing contamination (17.2%), stopping pathogens (12.1%) as key benefits in brushing all of the vegetation and dirt off your boots at the trailhead after a walk. Additionally, survey respondents also noted having a clean car/house (31.9%) as a key motivator for brushing their boots after a walk (see Figure 6).

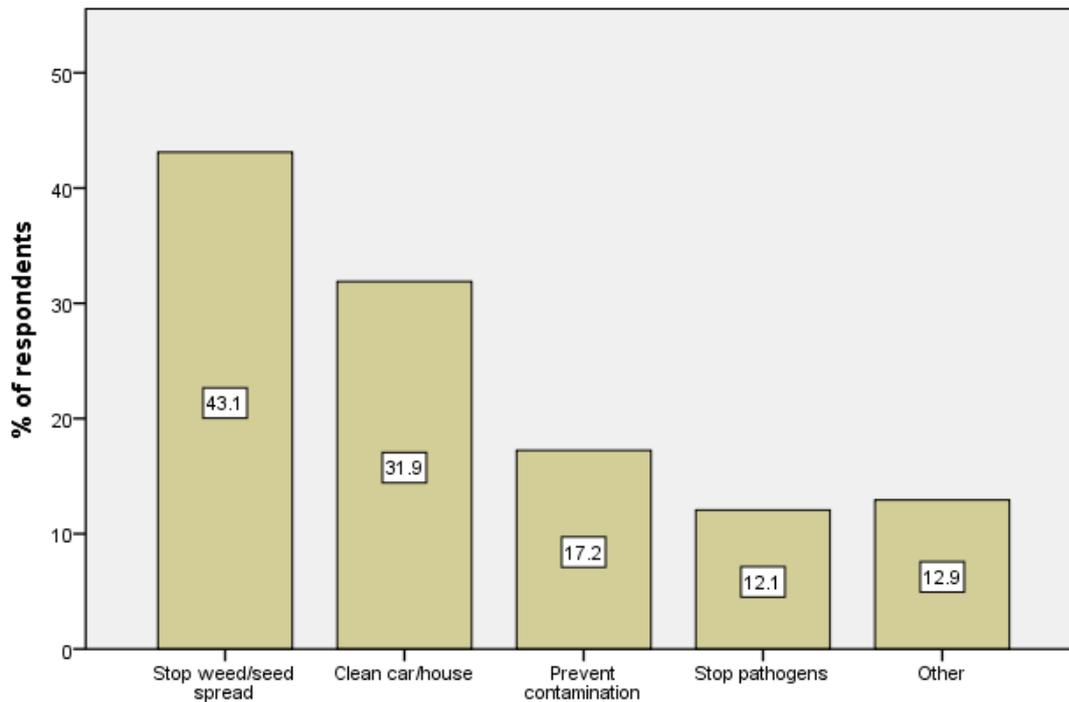


Figure 6 What may be the benefits in brushing all of the vegetation and dirt off your boots/footwear at the trailhead AFTER a walk?

Interventions: benefits and difficulties of three boot cleaning methods

Of the three cleaning strategies suggested to track users (i.e. bring their own brush, use a brush provided at the trailhead, or use a fixed boot brushing station), respondents indicated a stronger preference for the latter two. This is evidenced in the responses to the question on the difficulties and challenges of using each method. For example, 49.1% of track users stated there was ‘nothing’ difficult in using a brush provided at the trailhead, and 43.1% indicated there to be no difficulty in using a fixed boot brushing station. In comparison, only 7.8% of respondents stated there was nothing difficult or challenging in bringing their own brush.

Barriers

More specifically, survey respondents indicated three main difficulties or challenges in carrying their own brush: Weight (44.8%); Space (35.3%); and Remembering (32.8%) (Figure 7). In addition to these three main difficulties/challenges, cleanliness of brush (9.5%) and inconvenience (7.8%) were also cited by track users. ‘Cleanliness of brush’ refers to respondents’ concern of cross-contamination that may result from a dirty brush, while

‘inconvenience’ captures those responses where either space or weight were not explicitly mentioned.

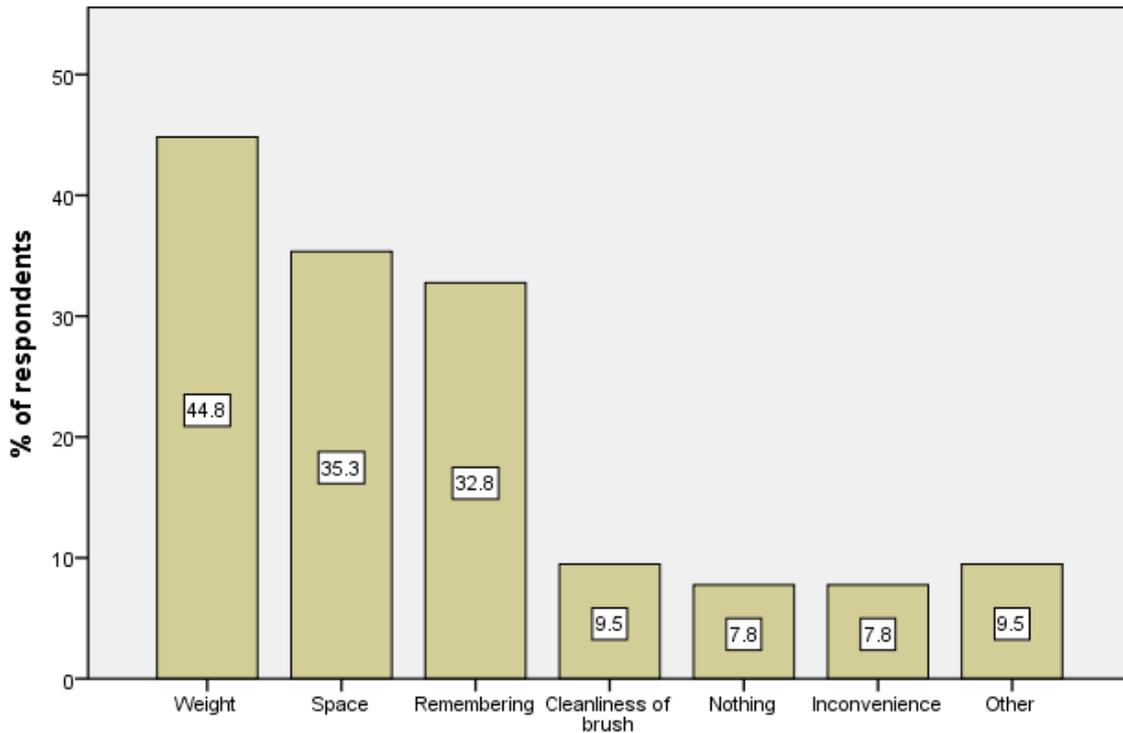


Figure 7 What may be difficult or challenging about carrying your own brush?

In contrast to carrying their own brush, survey respondents highlighted: poor condition/lack of maintenance (30.2%); queue (17.2%); and cross-contamination/dirty brush (12.9%) as the three main difficulties or challenges in using a brush provided at the trailhead. Survey respondents’ cited the potential for queues to be a difficulty due to wait-time, while ‘cross-contamination/dirty brush’ captures the more specific concerns of track users in sharing a brush, compared to general ‘poor condition/lack of maintenance’ (see Figure 8).

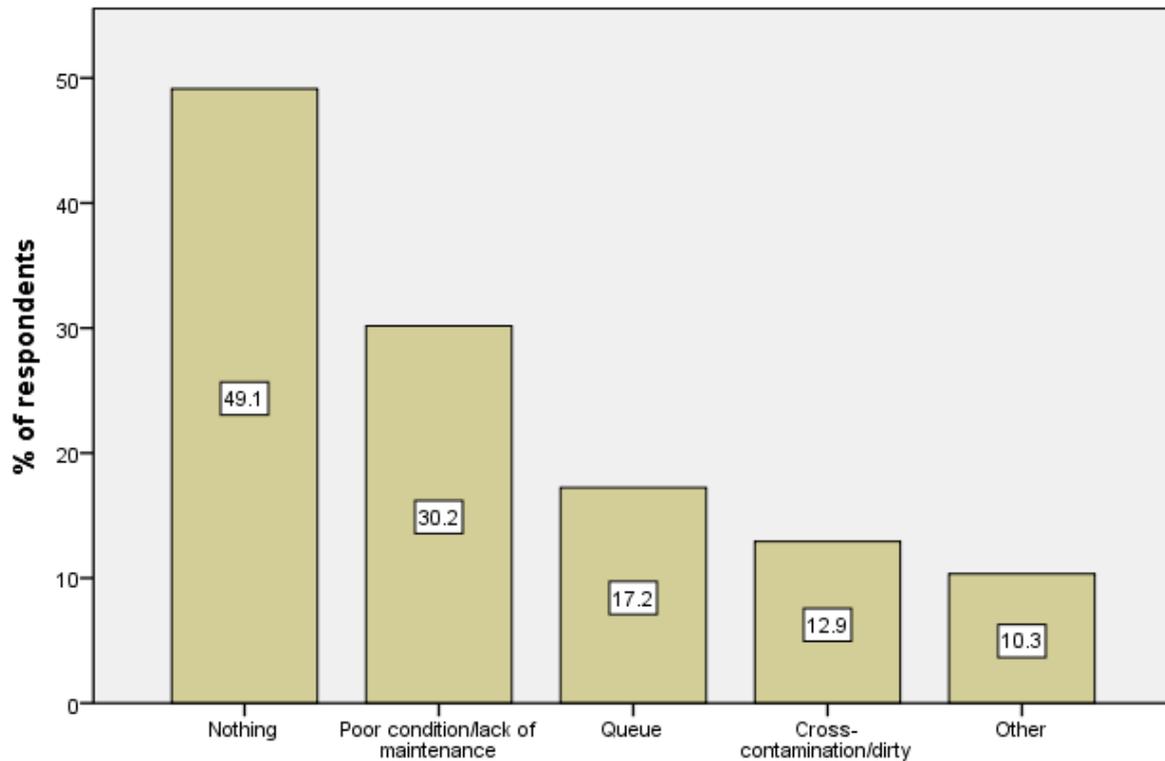


Figure 8 What may be difficult or challenging about using a brush provided at the trailhead?

Similar to using a brush provided at the trailhead, survey respondents indicated cleanliness/maintenance (19%), difficult to use (19%), and queue (18.1%) as the main difficulties or challenges in using a fixed boot brushing station. ‘Cleanliness/maintenance’ summarises respondents’ concerns of “cross-contamination”, “general dirtiness”, or “damage/inoperable equipment”. ‘Difficult to use’ refers to either the perceived physical inability to use the station, the location of the station and ease of access, as well as knowing how to operate the apparatus (see Figure 9). Within this ‘Difficult to use’ category, eight respondents (7%) provided an answer that indicated that knowing how to use the station could be a barrier.

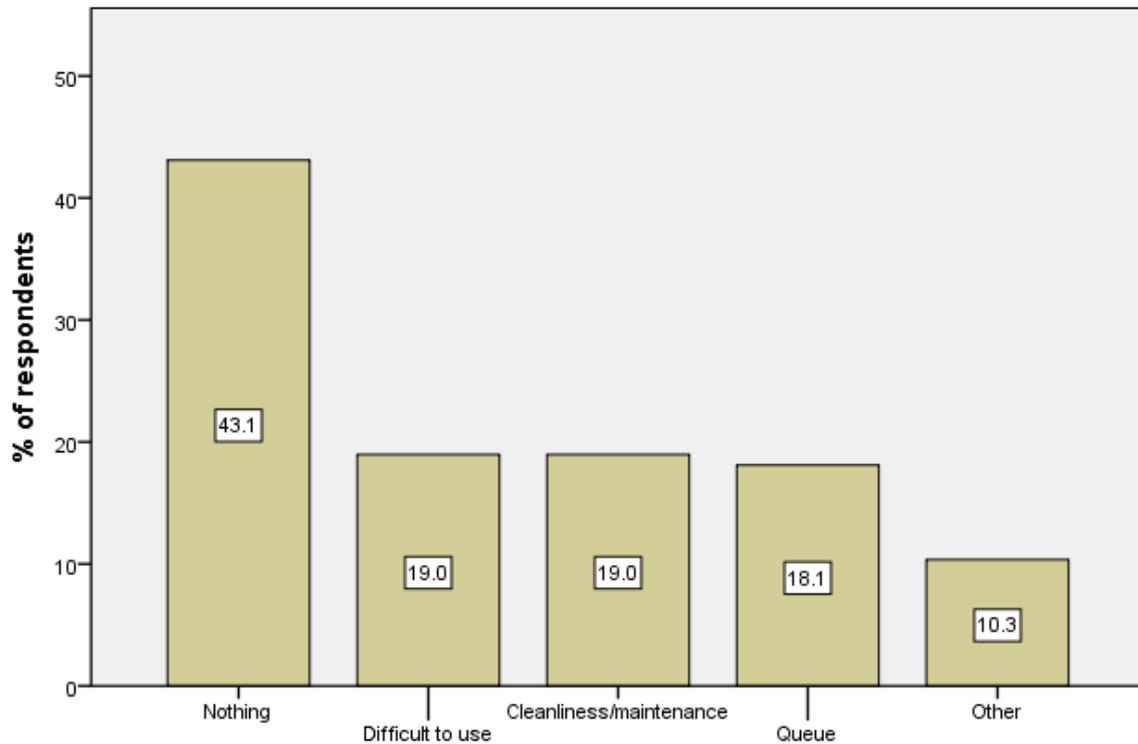


Figure 9 What may be difficult or challenging about using a fixed boot brushing station?

Benefits

The benefits in using each of the three cleaning methods were quite similar. In carrying their own brush, survey respondents highlighted, availability (33.6%); convenience (30.2%); and effective clean (18.1%) as the key benefits. ‘Availability’ refers to track users having a brush to use in the absence of existing facilities. ‘Convenience’ denotes track users citing ease of use, the ability to use anywhere, and not having to wait in a queue. ‘Effective clean’ refers to the ability of track users to remove mud/dirt and containments and be assured of the quality of the job. However, 12.9% also stated there was no benefit (or “nothing”) to carrying their own brush.

The responses to the benefits of a brush provided at the trailhead or a fixed boot brushing station were similar (see Figure 10 and Figure 11). The first key benefit shared by both cleaning methods relates to the quality or effectiveness of the clean. For example, reducing seed spread/pathogens (10.3%) was the third highest response for the benefits of having a brush provided at the trailhead. While the ‘Quality of clean’ (16.4%) provided by a fixed boot brushing station was considered to be more efficient and thorough than a hand-held brush. Importantly, both methods were considered to be effective in cleaning boots, provided they are maintained.

Additionally, respondents also noted the value of these two cleaning methods in prompting or reminding them to clean their boots. In the context of having a brush provided, 22.4% stated the benefit of being “prompted” by seeing a brush at the trailhead, or not having to “remember” to bring a brush themselves. Similarly, 21.6% of respondents noted the benefits of having a physical reminder that the boot brushing station provides, which prompts track users to clean their boots.

Finally, the most frequent response given by track users was the ‘convenience’ of both methods. 69% of respondents noted the convenience of having a brush provided in terms of “saving space and weight”, “constant availability”; and “the ease of use”. 62.1% of track users described the ‘convenience/ease of use’ of the fixed boot brushing station, in terms being easier to use than a brush; not needing to carry a brush; and the constant availability of the station.

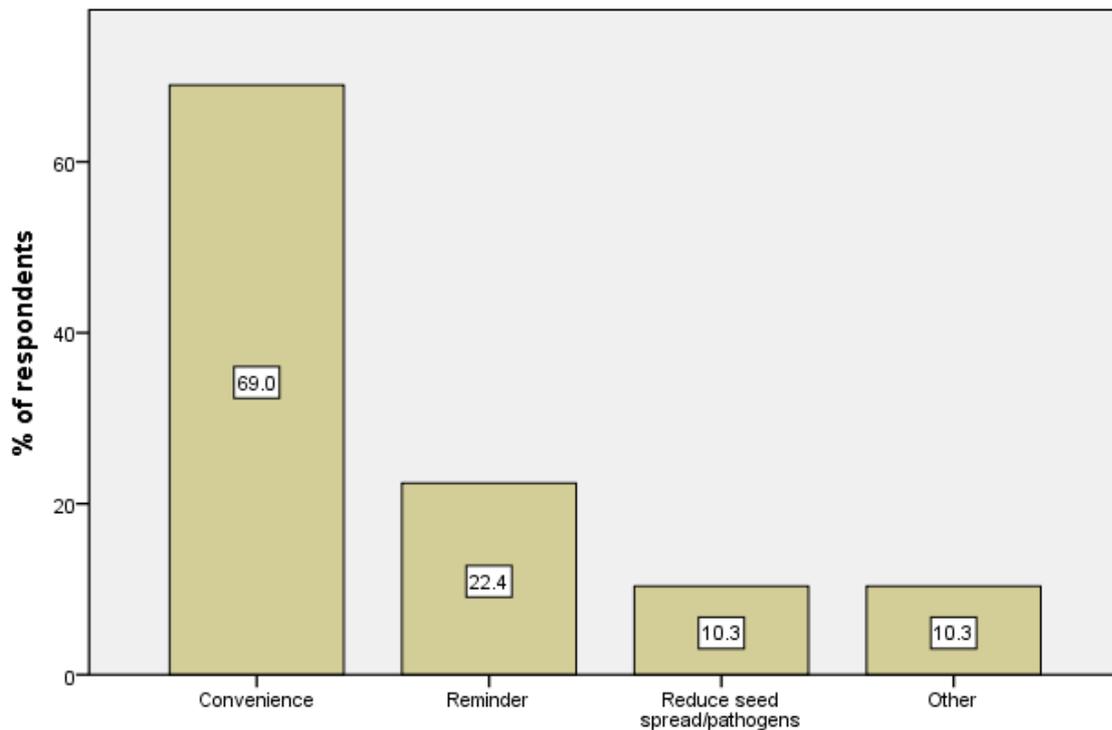


Figure 10 What may the benefits in using a brush provided at the trailhead?

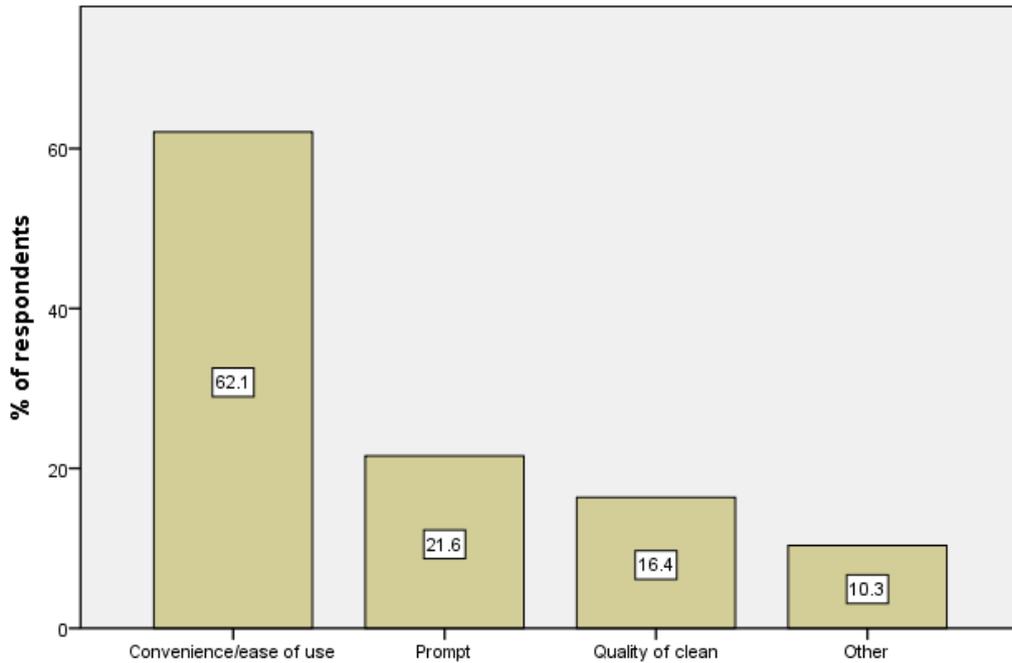


Figure 11 What may the benefits in using a fixed boot brushing station?

Knowledge of Weeds in National Parks and Willingness to Clean if Advised

We asked respondents to rate their knowledge as to how weeds are affecting the environment in national parks. Their responses are summarised in Figure 12. Sixty-eight percent of respondents rated their knowledge as ‘neither low nor high’ at best.

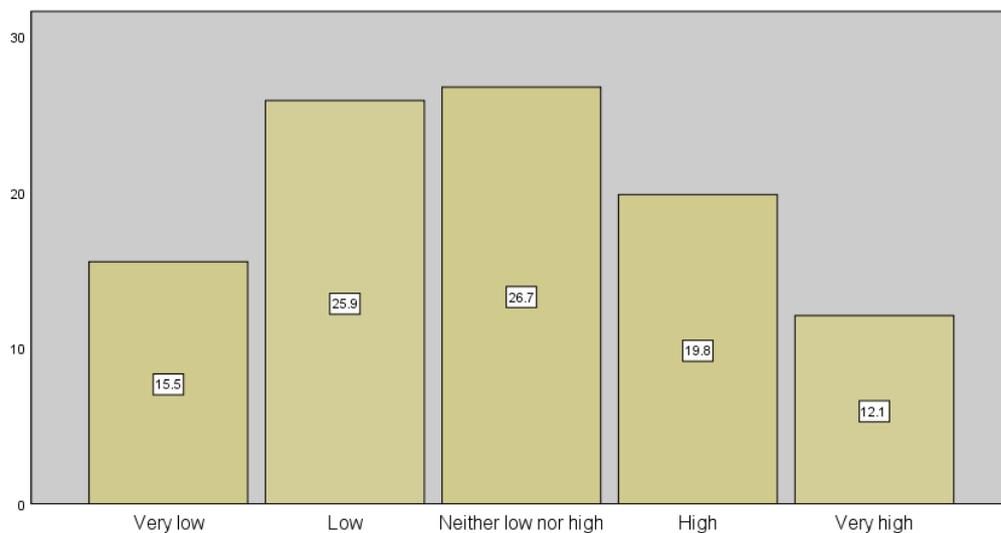


Figure 12 Respondent self-rated knowledge of how weeds are affecting national parks (n=116)

Those with a high ('high' or 'very high') knowledge of weed impacts in national parks do clean their footwear before a walk to a somewhat greater degree than those with low knowledge but this difference is not statistically significant (Table 12). The result is similar for cleaning after a walk and is also not statistically significant ($\chi^2(1) = 1.963, p=0.161$).

Knowledge of weed impacts	Do they clean before a walk?		χ^2
	Cleaners	Non-cleaners	
Low	10.1%	89.9%	$\chi^2(1)= 2.800, p=.094$
High	21.6%	78.4%	

Table 12 Cleaning before a walk by knowledge of weed impacts in national parks (n=116)

As discussed above, respondents are very likely to clean their footwear before a walk if advised but, as Table 13 shows, their knowledge of how weeds impact national parks does not make a statistically significant difference to this likelihood. The result is the same for their likelihood of cleaning after a walk ($p=0.480$).

Knowledge of weed impacts	Likelihood to clean before a walk if advised		Fisher's exact Test
	Not so likely	Likely	
Low	8.9%	91.1%	P=0.407
High	5.4%	94.6%	

Table 13 Likelihood of cleaning footwear before a walk by knowledge of weed impacts in national parks (n=116)

Conclusion

Overall, the survey results indicate that while track users seldom clean their boots at the trailhead before and after a walk, they are aware of reasons for cleaning their boots, and also demonstrate a strong willingness to clean their boots.

The barriers to cleaning are primarily physical rather than motivational. For non-cleaners, the primary barrier to cleaning boots was a lack of facilities/equipment. For cleaners, the primary barrier was a concern for the quality and/or efficacy of the clean. The physical barriers to boot cleaning are further emphasised by the overwhelming support for having a brush provided at the trailhead or a fixed boot brushing station. Indeed, respondents indicated the main barrier for using both of these interventions is “nothing”. This suggests that significant improvements in boot cleaning participation could be made through supplying equipment at the trailhead.

Further, the majority of survey respondents (cleaners and non-cleaners) also acknowledge the main motivation or benefit for cleaning their boots is to prevent weeds spreading. Similarly, preventing contamination and stopping pathogens were also cited as motivators for cleaning boots. This knowledge is also matched with a general concern for protecting the environment, particularly from invasive weed species. Hence, there is a strong understanding of the relationship between boot cleaning and weed hygiene among track users. When paired with the physical barriers for track users to cleaning boots before and after a walk, the survey results indicate that there is a strong likelihood of track users practicing weed hygiene if sufficient equipment is made available.

Survey

The survey is appended on the following pages.

Hawkweed Survey for Trail Users in Kosciusko National Park

By completing this survey, you consent to providing information for the uses outlined previously in the Participant Information Sheet.

1. Do you brush all vegetation and dirt off your boots/ footwear at the trailhead BEFORE a walk?

- Always
- Often, but not all the time
- About half the time
- Sometimes
- Only occasionally
- Never (go to Q3)

2. How do you brush your boots/ footwear before a walk?

- I bring a brush with me.
- I use a brush provided at the trailhead.
- I use a fixed boot brushing station provided at the trail.

Other (please specify)

* 3. If you were advised to brush your boots/ footwear at the trailhead BEFORE a walk, how likely would you be to do this all of the time?

Rate likelihood:

	Somewhat unlikely to do		Somewhat likely to do	
Not very likely to do this	this	Neither likely nor unlikely	this	Very likely to do this
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. What is difficult or challenging about brushing all of the vegetation and dirt off your boots/ footwear at the trailhead BEFORE a walk?

5. What may be the benefits about brushing all of the vegetation and dirt off your boots at the trailhead BEFORE a walk?

6. Do you brush all vegetation and dirt off your boots/ footwear at the trailhead AFTER a walk?

- Always
- Often but not all of the time
- About half the time
- Sometimes
- Only occasionally
- Never (go to Q8)

7. How do you brush your boots/footwear after a walk?

- I bring a brush with me
- I use a brush provided at the end of the walk
- I use a fixed boot brushing station at the end of the trail
- Other (please specify)

8. If you were advised to brush your boots/footwear at the trailhead AFTER a walk, how likely would you be to do this all the time?

Rate likelihood:

Not at all likely to do this	Somewhat unlikely to do this	Neither likely nor unlikely	Somewhat likely to do this	Very likely to do this
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. What may be difficult or challenging about brushing all of the vegetation and dirt off your boots/footwear at the trailhead AFTER a walk?

10. What may be the benefits in brushing all of the vegetation and dirt off your boots/footwear at the trailhead AFTER a walk?

11. What may be difficult or challenging about carrying your own brush?

12. What may be the benefits in carrying your own brush?

13. What may be difficult or challenging about using a brush provided at the trailhead?

14. What may be the benefits in using a brush provided at the trailhead?

15. What may be difficult or challenging about using a fixed boot brushing station?

16. What may be the benefits in using a fixed boot brushing station?

17. How would you rate how frequently you go bushwalking?

Neither frequently nor
infrequently

Infrequently Somewhat infrequently Somewhat frequently Frequently

18. How would you rate your knowledge about how weeds are affecting the environment in national parks?

Very low Low Neither low nor high High Very high

19. Group Size

20. Are there children under 12 in the group? (Don't ask, use your best judgement)

Yes

No

21. AGE

22. Gender

Male

Female

Unspecified

23. Residency

Australian Resident

Visitor of Australia

24. If you would like more information about our project please include your email. Your email will be kept private and not linked to your responses.