



Responsible Recreation

Rapid Literature Review

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This literature review is one of four final deliverables from a project undertaken by the Behavioural Insights Team for Natural England, promoting responsible recreation by dog-walkers at two pilot sites. The four deliverables are:

1. **Using Behavioural Insights to Reduce Recreation Impacts on Wildlife: Guidance and Case Studies from Thames Basin Heath and the Solent.** This is the main project report. It summarises each phase of the project (Target, Explore, Solution, Trial and Scale), and establishes guidelines for running similar projects in the future.
2. **Explore phase report.** This details the findings from field research including an online survey, visitor interviews, and expert interviews.
3. **Literature review** (this document). This synthesises existing evidence on the use of behavioural interventions to promote responsible recreation by visitors to nature areas.
4. **Trial phase report.** This details the findings from an online experiment testing the impact of behaviourally-informed communications materials on dog walkers' awareness of wildlife disturbance issues, and recommends how to use these findings in the field.

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Summary











Outdoor recreation can cause disturbances to sensitive wildlife, which can threaten their conservation. Many different interventions have been attempted to mitigate or prevent such disturbances, ranging from the use of fences and fines, to signs and education campaigns. However, such interventions are rarely evaluated robustly and, despite overtly designed to change behaviour, have not always been informed by behavioural science. Indeed the application of behavioural science to environmental conservation is still an emerging field.¹ Accordingly, here we provide a rapid review of the literature on behavioural interventions in responsible recreation, with the aim of informing management options and highlighting areas in need of further exploration or testing. Table 1 provides a summary of our findings. We suggest that the adoption of any interventions from the list presented here should be informed by behavioural insights and assessed using rigorous evaluation methods to maximise their suitability and effectiveness.

Table 1: Evidence summary. The different intervention types for key target behaviors in the literature and the strength of evidence supporting them

Intervention type	Target behaviour	Evidence
Physical		
- Alternative space	 Site choice	 Unknown
- Path & habitat	 Route choice	 Effective
- Affordance cues	  Route choice Dog fouling	 Effective
- Amenities & maintenance	   Site choice Route choice Dog fouling	 Unknown
Cognitive		
- Education	   Site choice Route choice Dog fouling	

¹ Rare and The Behavioural Insights Team. (2019). Behavior Change For Nature: A Behavioral Science Toolkit for Practitioners. Arlington, VA: Rare.

	  <p>Dog control Wildlife avoidance</p>	 <p>Mixed</p>
- Training	  <p>Dog control Wildlife avoidance</p>	 <p>Effective</p>
- Signage	   <p>Route choice Dog fouling Wildlife avoidance</p>	 <p>Promising</p>
Incentives		
- Financial	   <p>Site choice Dog fouling Dog control</p>  <p>Wildlife avoidance</p>	 <p>Mixed</p>
- Non-financial	   <p>Site choice Dog fouling Dog control</p>  <p>Wildlife avoidance</p>	 <p>Promising</p>
Enforcement		
- Regulation	   <p>Site choice Route choice Dog fouling</p>   <p>Dog control Wildlife avoidance</p>	 <p>Mixed</p>
- Patrols	   <p>Route choice Dog fouling Dog control</p>  <p>Wildlife avoidance</p>	 <p>Effective</p>
Engagement		
- Social marketing	   <p>Route choice Dog fouling Dog control</p> 	 <p>Effective</p>

	Wildlife avoidance	
- Stakeholder engagement	 Route choice  Dog fouling  Dog control	 Promising
	 Wildlife avoidance	
- Citizen science	 Route choice  Dog fouling  Dog control	 Unknown
	 Wildlife avoidance	

1. Introduction

There is a large body of evidence showing that recreation can have negative impacts on wildlife conservation. In particular, recreational activities like hiking and watersports impact habitats, nest sites and often disturb wildlife feeding or breeding.² Dog-walking in particular is a major cause of disturbance for birds.³ In the UK, for instance, nightjar (*Caprimulgus europaeus*) nests which failed were found to be significantly closer to footpaths used primarily by dog-walkers.⁴ Predation of eggs and chicks of other ground-nesting species by dogs has been recorded in the UK, and such birds away from the nest longer when disturbed by a dog.⁵ Shore birds in the UK are also disturbed by recreational activities, which particularly impact those feeding in the intertidal zone who incur physiological stress as a result of disturbance.⁶ In the Solent area, the increased use of coastal recreation areas is expected to have negative consequences for wildlife populations if not mitigated effectively.⁷

² Steven, R., Pickering, C., & Castley, J. G. (2011). A review of the impacts of nature based recreation on birds. *Journal of Environmental Management*, 92(10), 2287-2294; Eagles, P. F., & McCool, S. F. (2002). *Tourism in national parks and protected areas: Planning and management*. Cabi; Burgin, S., & Hardiman, N. (2015). Effects of non-consumptive wildlife-oriented tourism on marine species and prospects for their sustainable management. *Journal of environmental management*, 151, 210-220.

³ Banks, P. B., & Bryant, J. V. (2007). Four-legged friend or foe? Dog walking displaces native birds from natural areas. *Biology Letters*, 3(6), 611-613.

⁴ Langston, R. H. W., Liley, D., Murison, G., Woodfield, E., & Clarke, R. T. (2007). What effects do walkers and dogs have on the distribution and productivity of breeding European Nightjar *Caprimulgus europaeus*?. *Ibis*, 149, 27-36.

⁵ Taylor, E. C., Green, R. E., & Perrins, J. (2007). Stone-curlews *Burhinus oedicnemus* and recreational disturbance: developing a management tool for access. *Ibis*, 149, 37-44.

⁶ Fenn, H. (2016). Identifying methods for managing recreational disturbance of wildlife at coastal sites: Review of literature. *The Wash & North Norfolk Coast European Marine Site*.

⁷ Stillman, R. A., Cox, J., Liley, D., Ravenscroft, N., Sharp, J. & Wells, M. (2009) Solent disturbance and mitigation project: Phase I report. Report to the Solent Forum

Much effort is therefore directed towards trying to reduce or mitigate the impacts of recreation on wildlife, and encourage visitors to use natural areas more responsibly. Such efforts commonly involve awareness-raising, community engagement or ranger patrols.⁸ In particular many of these efforts focus on keeping walkers on particular paths or dogs on the lead, where they may be under greater control.⁹ However, these approaches face a number of key challenges, including:

- There is not always a clear link between awareness and the recreational behaviours which impact wildlife.¹⁰
- There are strong motivations to overcome. For example, off-lead dog walking is often a primary reason for visiting natural areas, and many users of such spaces have a strong desire to maintain their relative freedom and independence, which makes achieving behaviour change difficult.¹¹
- Although legislation exists - such as the Countryside Right of Way (CRoW) Act in the UK, which requires that dogs should be kept on a short fixed lead when on open access land during the breeding season for wild birds¹² - such legislation is difficult to enforce, and rarely known about.
- Despite the fact that nature-based recreation interventions ostensibly aim to influence human behaviour, like other conservation interventions, they may not always be informed by behavioural insights and there remains little evaluation of the effects of different intervention options.¹³ Important behavioural factors are therefore often overlooked, leading to likely low impacts.

To better inform management approaches and highlight promising areas for further exploration, here we provide a rapid review of the literature on wildlife-related recreation interventions. The results are specifically tailored towards informing behaviour interventions in a UK context.

⁸ For example the Norfolk 'Wild Recreation Guide' <https://wnnmp.co.uk/home/the-wild-recreation-guide/>

⁹ Westgarth, C., Christley, R. M., Pinchbeck, G. L., Gaskell, R. M., Dawson, S., & Bradshaw, J. W. (2010). Dog behaviour on walks and the effect of use of the leash. *Applied Animal Behaviour Science*, 125(1-2), 38-46.

¹⁰ Sterl, P., Brandenburg, C., & Arnberger, A. (2008). Visitors' awareness and assessment of recreational disturbance of wildlife in the Donau-Auen National Park. *Journal for Nature Conservation*, 16(3), 135-145.

¹¹ Eagles, P. F., & McCool, S. F. (2002). *Tourism in national parks and protected areas: Planning and management*. Cabi. p.99,

¹² Langston, R. H. W., Liley, D., Murison, G., Woodfield, E., & Clarke, R. T. (2007). What effects do walkers and dogs have on the distribution and productivity of breeding European Nightjar *Caprimulgus europaeus*?. *Ibis*, 149, 27-36.

¹³ Nilsson, D., Fielding, K., & Dean, A. (2019). Achieving conservation impact by shifting focus from human attitudes to behaviors. *Conservation Biology*; Schultz, P. W. (2011). Conservation means behavior. *Conservation Biology*, 25(6), 1080-1083.

2. Methods

Method of evidence search

We conducted this rapid literature review via a targeted literature search, as opposed to a meta-analysis or systematic literature search. We reviewed relevant government agency reports, independent reports and published peer-reviewed literature related to recreation management or mitigation efforts in the UK and international conservation contexts. We recovered materials first via contacts working in this area, and then we found additional resources through targeted search strings on Google Scholar (such as ‘recreation interventions’), consideration of relevant known psychological research, and by citation strings within this literature. We also reviewed output by international conservation bodies, such as the International Union for Conservation of Nature (IUCN), for protected area management best-practice.¹⁴

Method of evidence review and interpretation

From these sources, we:

- Compiled a list of different intervention types drawing upon a pre-existing framework for behavioural interventions in conservation.¹⁵ The final categorisation includes the following intervention types: physical, cognitive, incentives, enforcement and engagement (though there is some overlap, and some intervention blend elements of more than one).
- Alongside each intervention type, highlight the barriers which the intervention aims to address. The barriers to behaviour-change are taken from the COM-B model of behaviour change, which uses the three domains of capability, opportunity and motivation to explain a person’s behaviour.¹⁶ Capability covers an individual’s psychological and physical capacity to engage in behaviour (including knowledge and skills), motivation covers the reflective and automatic brain processes that energize and direct behaviour (including habits, emotions and rationalising) and opportunity covers the factors that lie outside the individual that enable or prompt behaviours (including both physical and social environments).
- Indicate for each intervention type the relevant recreation behaviors it could feasibility target and assess the strength of evidence for each intervention type. These are denoted as ‘effective’ (experimental or consistently positive observational studies), ‘promising’ (some observational or tangentially related evidence), ‘mixed’ (at least some negative results) and ‘unknown’ (lack of analyses).

¹⁴ Eagles, P. F., Bowman, M. E., & Tao, C. H. (2001). *Guidelines for tourism in parks and protected areas of East Asia*. IUCN.

¹⁵ Baynham-Herd, Z., Redpath, S., Bunnefeld, N., Molony, T., & Keane, A. (2018). Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biological Conservation*, 222, 180-188; Heberlein, T. A. (2012). Navigating environmental attitudes. *Conservation Biology*, 26(4), 583-585..

¹⁶ Michie, S., Atkins, L., & West, R. (2014). The behaviour change wheel. *A guide to designing interventions*. 1st ed. Great Britain: Silverback Publishing, 1003-1010.

3. Findings

In reviewing the literature we found little direct evidence for the impact of interventions targeting changes in outdoor recreational behaviour for the purposes of wildlife conservation, such as keeping to paths, use of the lead whilst dog-walking or litter prevention. We found a large number of examples of *suggested* interventions, such as those reviewed in previous reports to UK conservation bodies and policy makers,¹⁷ but much less evidence assessing the *effectiveness* of such suggestions. These identified evidence gaps in the literature mirror those found by previous authors, in particular regarding dog-walking behaviours.¹⁸ However, we did find a range of other studies which were not specifically focussed on changing recreational behaviour for the purposes of wildlife conservation, but which we also deemed relevant enough to include in this review.

While some interventions aim to influence behaviour directly (such as introducing a physical barrier to block a footpath), often interventions aim to influence behaviour by first changing attitudes or intentions (such as via an educational message). However, in many cases even where environmental education or messages do change attitudes or intentions, they may still fail to change behaviour for various reasons, from competing attitudes to small hassles ('frictions') in performing the behaviour - an effect known as the 'intention-action gap'.¹⁹

1. Physical interventions:

Barriers being addressed: Aim to influence the **automatic motivation** and **capability** for a behaviour by changing the external environment (e.g., affecting the ease or attractiveness of given behaviours).

1a. Alternative green spaces

Target behaviours:



Site choice

Strength of evidence:



Unknown

Description of intervention: Providing alternative suitable areas might displace recreational behaviours from sensitive sites. For instance, the provision of alternative green recreation

¹⁷ Fenn, H. (2016). Identifying methods for managing recreational disturbance of wildlife at coastal sites: Review of literature. The Wash & North Norfolk Coast European Marine Site; Heath, M. (2017). Tackling livestock worrying and encouraging responsible dog ownership. All-Party Parliamentary Group for Animal Welfare.

¹⁸ Weston, M. A., Fitzsimons, J. A., Wescott, G., Miller, K. K., Ekanayake, K. B., & Schneider, T. (2014). Bark in the park: a review of domestic dogs in parks. *Environmental management*, 54(3), 373-382.

¹⁹ Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?. *Environmental education research*, 8(3), 239-260.

spaces (e.g. Suitable Alternative Natural Greenspaces (SANGs)) is a key facet of development mitigation approaches.

Behavioural Insight: enabling a substitute behaviour.

Evidence: In Thames Basin Heaths, following the implementation of SANGs, bird numbers have been stable but SANGs do not appear to be attracting users away from the SPAs.²⁰ In Dorset the amount of existing green space surrounding people's homes seems to have no impact on the extent to which people visit the heaths, but it is not yet possible to establish whether SANG provision has affected heath usage.²¹ Elsewhere, the introduction of specific dog exercise areas has also been trialed but their effectiveness is not yet clear.²²

1b. Path and habitat

Target behaviours:



Route choice

Strength of evidence:



Effective

Description of intervention: The physical environment can be manipulated to make certain routes or areas more or less attractive or usable.

Behavioural Insight: Adding or removing friction.

Evidence: Introducing or improving existing paths (e.g. with improved maintenance or addition of boardwalks) has been shown to be effective in controlling footfall, for example to reduce vegetation erosion in many natural parks.²³ In coastal areas, this could also include the location of boat slipways or mooring areas. The addition of artificial barriers (such as fences) to restrict or discourage access to certain areas has also proved effective at reducing wildlife disturbances. For example, a natural experiment in a Californian wetland found that in highly visited areas, birds in fenced-off areas were much less disturbed and behaved more similarly to birds in low-visitation sites.²⁴ The use of natural barriers (ditches, vegetation) has also been suggested as a less intrusive means to achieve the same result.²⁵

²⁰ Allinson, E. (2018). *The role of suitable alternative natural greenspace strategy in protecting high-value wildlife sites* (PhD thesis, University of Southampton).

²¹ R. A., Cox, J., Liley, D., Ravenscroft, N., Sharp, J. & Wells, M. (2009) Solent disturbance and mitigation project: Phase I report. Report to the Solent Forum; Fearnley, H., & Liley, D. (2011). Analysis and Presentation of IPF monitoring and projects to inform the Heathland DPD. Footprint Ecology

²² Hampshire County Council (2008). Taking the lead managing walkers with dogs on your site. Countryside Service.

²³ Carlson, L. H., & Godfrey, P. J. (1989). Human impact management in a coastal recreation and natural area. *Biological Conservation*, 49(2), 141-156.

²⁴ Ikuta, L. A., & Blumstein, D. T. (2003). Do fences protect birds from human disturbance?. *Biological Conservation*, 112(3), 447-452.

²⁵ R. A., Cox, J., Liley, D., Ravenscroft, N., Sharp, J. & Wells, M. (2009) Solent disturbance and mitigation project: Phase I report. Report to the Solent Forum

1c. Affordance cues:

Target behaviours:



Strength of evidence:



Effective

Description of intervention: The design of physical objects and environments can unconsciously provide instructions on how to interact. For instance, flat surfaces on doors indicate a 'push' rather than a 'pull' (and vice versa), and whole areas (such as airports) can be designed to subtly direct footfall.

Behavioural Insight: Providing directional prompts or signals.

Evidence: In a recent pilot study on the London Underground, footprint cues were used to encourage passengers to stand on both sides of the escalator (rather than one) and increased passenger flow by 30%.²⁶ In a trial by Keep Britain Tidy, introducing paw print signs nudged walkers to follow specific dog-walking routes which had bins at regular intervals, reducing dog fouling by 38% as a result.²⁷

1d. Amenities and maintenance

Target behaviours:



Strength of evidence:



Unknown

Description of intervention: The provision of amenities in particular places can shift how users behave in public or private spaces.

Behavioural Insight: Changing opportunities or attractiveness.

Evidence: Amenity-based suggestions to shift dog-walking routes include dog activity trails, lighting, dog wash stations, canine community notice board, dog swimming areas, dog bins, dog friendly catering/shops, shaded car parks, dog friendly seating, and enclosed dog training areas.²⁸ Car parks can also be designed (or changed) to encourage access to certain areas over others. However, in the literature there is little evidence to assess the effectiveness of such interventions.

Related to the provision of amenities, is their maintenance and upkeep. There is evidence showing that active management of recreation sites can promote more responsible behaviour. For instance, in accordance with the 'broken window effect' - whereby signs of

²⁶ Kukadia, C. H. N., Stoneman, P., & Dyer, G. (2016). Pilot for Standing on Both Sides of Escalators. *NECTAR*, 11.

²⁷ Keep Britain Tidy. (2017). *The Big Scoop*.

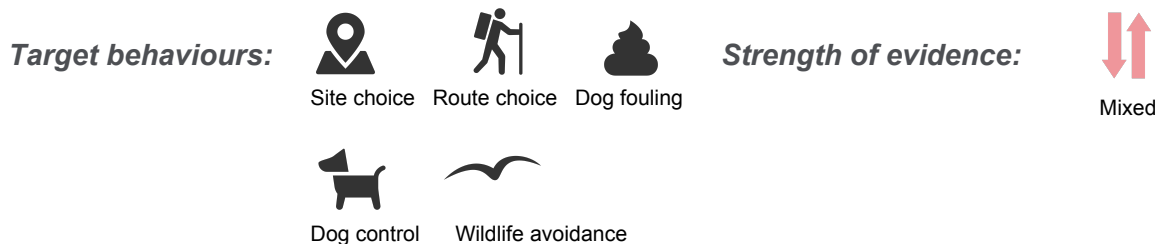
²⁸ Managing Visitors with Dogs: A Natural England Toolkit (2015) Internal Document

damage or litter suggest that disorder behaviours are the norm, and thus license others to follow suit - the extent to which outdoor recreation areas are well-maintained (e.g, by staff and other visitors) seems to influence how responsibly visitors behave.²⁹

2. Cognitive interventions:

Barriers being addressed: Aim to influence the **reflective motivation**, psychological **capability** or social **opportunity** unpinning a behaviour (e.g, changing attitudes, awareness or providing instructions).

2a. Education



Description of intervention: Educational messaging (e.g. in leaflets or classroom lessons) often aims to influence the intention to carry out a certain behavior by changing attitudes or raising awareness.

Behavioural Insight: increasing motivations

Evidence: In outdoor recreation settings, as in others, educational messages vary in their effectiveness.³⁰ For instance, in an experimental study of hikers' behavioural intentions, participants who viewed the educational message were actually *more* likely to indicate they would hike off the trail.³¹ There are a number of reasons for such backfire effects, including unintentionally normalising the behaviour, or simply raising it as a viable option. However, in other studies, including at Lulworth coastal site in England, education interventions did result in more environmentally responsible recreation intentions.³² Educational messages around wildlife tolerance appear to be more effective when including the benefits of wildlife alongside the required actions to take³³. More sustained education programs, such as classroom

²⁹ Liu, J., Wu, J. S., & Che, T. (2019). Understanding perceived environment quality in affecting tourists' environmentally responsible behaviours: A broken windows theory perspective. *Tourism Management Perspectives*, 31, 236-244.

³⁰ Marion, J. L., & Reid, S. E. (2007). Minimising visitor impacts to protected areas: The efficacy of low impact education programmes. *Journal of sustainable tourism*, 15(1), 5-27.

³¹ Guo, T., Smith, J. W., Leung, Y. F., Seekamp, E., & Moore, R. L. (2015). Determinants of responsible hiking behavior: results from a stated choice experiment. *Environmental management*, 56(3), 765-776.

³² Guo, T., Smith, J. W., Moore, R. L., & Schultz, C. L. (2017). Integrating off-site visitor education into landscape conservation and management: An examination of timing of educational messaging and compliance with low-impact hiking recommendations. *Landscape and Urban Planning*, 164, 25-36; Kim, A. K., Airey, D., & Szivas, E. (2011). The multiple assessment of interpretation effectiveness: Promoting visitors' environmental attitudes and behavior. *Journal of Travel Research*, 50(3), 321-334.

³³ Slagle, K., Zajac, R., Bruskotter, J., Wilson, R., & Prange, S. (2013). Building tolerance for bears: a communications experiment. *The Journal of Wildlife Management*, 77(4), 863-869.

lessons, can be also effective at promoting conservation awareness, and as an educational experiment with school-children in Costa Rica demonstrates, this gained knowledge can also be passed on to wider family and community members.³⁴ Information could also be provided about alternative recreation sites and walking routes (to incorporate aspects of the physical interventions discussed above).

The wider behavioural literature provides a great deal of evidence on the mixed effectiveness of education and information provision, and some common recipes for success and failure emerge. These include:

- Ensuring the information is easily comprehensible and salient (attention-grabbing);
- Including clear calls to action (rather than merely highlighting problems);
- Avoiding blame (which tends to reduce people's willingness to engage with the information);
- Personalising the information.

To ensure people are able to act on that information, it is beneficial to:

- Provide it at (or close to) the point of decision or action (e.g. calories labels on food packaging are more effective than general healthy eating campaigns);
- Carefully evaluate (and if necessary address) other barriers to action to ensure newfound intentions to act can easily translate to action - this includes removing hassle and frictions, creating sufficient self-efficacy, and ensuring there are no strong, competing motivations (including conscious motivations, such as for profit, enjoyment or convenience, and less conscious motivations, such as social norms directing behaviour away from the desired outcomes);
- Provide the information at timely moments, when habits and non-conscious routines are momentarily disrupted or not yet established, or when the information is temporarily more salient or relevant. These might include when moving house (still creating new habits in how they use the local environment) or immediately after acquiring a dog.

2b. Training

Target behaviours:



Dog control



Wildlife avoidance

Strength of evidence:



Effective

Description of intervention: Training programs often aim to increase the psychological capacity to undertake a given behaviour.

Behavioural Insight: Increasing capacity.

³⁴ Vaughan, C., Gack, J., Solorazano, H., & Ray, R. (2003). The effect of environmental education on schoolchildren, their parents, and community members: A study of intergenerational and intercommunity learning. *The Journal of Environmental Education*, 34(3), 12-21.

Evidence: Giving people training can be resource- and time-intensive but can be effective at changing behavior in outdoor recreational settings. For instance, in an Australian pilot programme koala conservation officers and dog trainers developed a four-week dog-training programme for dog-owners.³⁵ The training was effective in improving dog obedience and control behaviours, but it remains to be assessed whether improved dog control also reduces dog-koala interactions, which is the main aim of the program. Training programs have also been used effectively elsewhere in conservation, such as those used to change existing livelihood practices in order to reduce conflicts with predators such as cheetahs and lions in East Africa.³⁶

Whilst training is resource-intensive, there may be opportunities to target it at professional dog-walkers to achieve outside impacts (provided the training is to shift the dog-walkers' behaviour, rather than the dogs').

The wider behavioural science literature provides further insight into developing effective training and engagement which maximises the likelihood of behaviour-change. One technique particularly well-evidenced is the use of 'implementation intentions'. This approach encourages people to make specific 'if, then' plans in response to likely barriers or events. For example, encouraging a dog-walker to establish a response along the lines of 'If my dog runs into the heather, I will.....', or 'if I see litter on the ground, I will...'. This affords them with a pre-set plan of action that can easily and more automatically be adopted (rather than relying on improvisation in the moment). It also serves as a process of making a commitment. For example, in our own work with JobCentre Plus, re-designing the job-seeker process towards planning for next week's job searching activities (rather than scrutinising last week's) and incorporating implementation intentions to address likely barriers ('if my child is ill, I will....' / 'if I struggle to motivate myself to search for jobs, I will....') led to a significant increase in the number of jobseekers finding work within 3 months.

2c. Signage

Target behaviours:    **Strength of evidence:**  Promising

Route choice Dog fouling Dog control

Description of intervention: Although signs may also carry educational messages, they differ in commonly offering precise instructions or information to direct behaviour in the immediate vicinity, rather than indirectly through attitudinal change.

³⁵ David, P., Pang, B., & Rundle-Thiele, S. (2019). Applying Social Marketing to Koala Conservation: The "Leave It" Pilot Program. In *Social Marketing in Action*, 379-390

³⁶ Marker, L. L., & Boast, L. K. (2015). Human-wildlife conflict 10 years later: lessons learned and their application to cheetah conservation. *Human Dimensions of Wildlife*, 20(4), 302-309.

Behavioural Insight: Timely communications.

Evidence: Signage is commonly used in environmental management, with experimental evidence showing how different types of signs can be more or less effective at changing behaviour.³⁷ One parameter to consider is the use of simple graphics to show rules of thumb: for instance, variable ‘traffic-light’ signs (green paw signs for off-lead, amber for on-lead, red for no dogs) introduced by Hampshire County Council appears to have reduced dog attacks on grazing livestock.³⁸ Another parameter, where signs include text, is the use of positive versus negative framing: signs with negatively framed messages (“Please don’t go off the established paths and trails”) appear to be more effective than those with positively framed messages (“Please stay on the established paths and trails”).³⁹ The addition of an attribution message such as “Your feet have trampled the vegetation on this island. Please stay on the main wood-chipped trail” can also be more effective than just the instruction.⁴⁰ Emphasizing the prevalence of the positive behavior can work where that behaviour is common, but emphasizing the prevalence of a negative behaviour can backfire by increasing the perceived norm around that behavior. For example, one well-known study in a US national park found that messages highlighting the problem of past visitors taking fossilised wood, increased visitors’ theft.⁴¹ Another parameter is the size and position of signs: larger signs and those placed closer in proximity to where a behaviour occurs (such moving off the hiking trail) also appear to be most effective.⁴²

Incentives:

Barriers being addressed: Aim to make a behaviour more or less attractive by influencing the **reflective motivation**.

Financial

Target behaviours:



Site choice



Route choice



Dog fouling



Wildlife avoidance

Strength of evidence:



Mixed

³⁷ Saunders, R., Weiler, B., Scherrer, P., & Zeppel, H. (2019). Best practice principles for communicating safety messages in national parks. *Journal of Outdoor Recreation and Tourism*, 25, 132-142; Weiler, B., Zeppel, H., Saunders, R., & Scherrer, P. (2015). A review of safety signage for Queensland Parks and Wildlife Service: report 1: literature review.

³⁸ Heath, M. (2017). Tackling livestock worrying and encouraging responsible dog ownership. All-Party Parliamentary Group for Animal Welfare.

³⁹ Winter, P. L. (2006). The impact of normative message types on off-trail hiking. *Journal Of Interpretation Research*.

⁴⁰ Bradford, L. E., & McIntyre, N. (2007). Off The Beaten Track: Messages As A Means Of Reducing Social Trail Use At St. Lawrence Islands National Park. *Journal of Park & Recreation Administration*, 25(1).

⁴¹ Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., & Winter, P. L. (2006). Managing social norms for persuasive impact. *Social influence*, 1(1), 3-15.

⁴² Vande Kamp, M. E., Johnson, D. R., & Swearingen, T. C. (1994). Preventing visitor-caused damage to national park resources: What do we know? What should be done. *Park Science*, 14(3), 8-10; Bradford, L. E., & McIntyre, N. (2007). Off The Beaten Track: Messages As A Means Of Reducing Social Trail Use At St. Lawrence Islands National Park. *Journal of Park & Recreation Administration*, 25(1); Sussman, R., & Gifford, R. (2012). Please turn off the lights: The effectiveness of visual prompts. *Applied ergonomics*, 43(3), 596-603.

Description of intervention: Monetary incentives in conservation commonly include reward-based payments or compensation, aiming to change the pay-off structure underpinning behaviours.

Behavioural Insight: Change motivations.

Evidence: The effect of monetary incentives on influencing conservation behaviours is mixed. In some cases they are effective, but in others they can backfire, due to broken promises, rising expectations, or where other pre-existing non-monetary motivations are 'crowded out' by the introduction of monetary incentives.⁴³ It is also worth exploring different forms of monetary incentives: for example lotteries, with big but unlikely rewards, can be more effective at encouraging a behaviour than small consistent payouts.⁴⁴ In addition, monetary *disincentives* (financial frictions such as car park fees or permits) are also mechanisms which could influence recreational behaviour.

There is much more evidence on the variable impacts of financial incentives, and the mechanisms through which they can work, or backfire (though it is often difficult to predict the impacts). However we understand introducing financial incentives is not within the scope of this project. We therefore direct interested readers to our report, *Behaviour Change for Nature*, section 3.1, strategies 5 and 7.⁴⁵

Non-financial

Target behaviours:



Site choice



Route choice



Dog fouling



Wildlife avoidance

Strength of evidence:



Promising

Description of intervention: Non-financial incentives include gift-giving, or the opportunity for social prestige.

Behavioural Insight: Increase motivation.

Evidence: In some cases, particularly where there is a risk of financial incentives crowding out intrinsic motivation, non-monetary rewards can be more effective at influencing behaviour. For instance, in a public-health context, rewarding small businesses in Zambia with gold star stickers to display in windows (i.e. a social reward) was more effective than rewarding them with cash in getting them to do the desired behavior (hand out condoms to customers). Similarly, people appear more likely to incur some kind of cost for an

⁴³ Jack, B. K., Kousky, C., & Sims, K. R. (2008). Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms. *Proceedings of the National Academy of Sciences*, 105(28), 9465-9470.

⁴⁴ Rare and The Behavioural Insights Team. (2019). *Behavior Change For Nature: A Behavioral Science Toolkit for Practitioners*. Arlington, VA: Rare.

⁴⁵ Ibid

environmental benefit if that cost is made public rather than private, again indicating a role for social rewards (in this case, gaining social kudos). For instance, in an experimental study in Costa Rica, levels of public donations were 25% higher than private donations.⁴⁶ This exemplifies the broader point that making behaviours more observable tends to increase our tendency to comply with social norms, etiquette, or expectations - both because doing so can gain us social favour, and not doing so can bring social disapproval.

A wide range of techniques exist to leverage observability or surveillance in this way - for example, publishing performance standards tends to increase performance (e.g. publishing the energy use of UK government departments in a league table, drove significant reductions in energy use), as can building systems of accountability or whistleblowing (e.g. allowing users of a service to tweet about others who mis-use a service). This is also why some councils have taken to spraying dog mess bright pink, to make the behaviour more observable (and thus socially consequential and embarrassing) - though we are not aware of this technique being robustly evaluated.⁴⁷

Note also, that the use of patrols is a common strategy aiming to use observability / surveillance of a behaviour. We discuss Patrols separately below.

Other forms of non-monetary incentives, such as small gift-giving (to promote reciprocity) do not appear to have been assessed in recreation contexts, but do have good potential. Reciprocity (our tendency to reciprocate effort, or a favour) can be used in various ways. This includes giving a gift, to elicit reciprocal kindness (e.g. when we gave free sweets to bankers alongside a charitable request, donations increased significantly).⁴⁸ But more subtly, merely highlighting the help that you are giving another person can elicit a more helpful response. For example, in a number of our trials across different issues (such as mortgage arrears) taking an explicitly helpful tone in existing communications (e.g. offering a deadline extension or offering to help find a solution) increased engagement by over 30%. It is also possible to highlight the beneficial actions that others are taking to illicit reciprocity - a similar technique to highlighting the social norm (where in this case, the social norm directly benefits the target individual). Specifically, asking people 'if you needed an organ transplant would you take one?' significantly increased the number choosing to join the organ donor register.⁴⁹

⁴⁶ Alpizar, F., Carlsson, F., & Johansson-Stenman, O. (2008). Anonymity, reciprocity, and conformity: Evidence from voluntary contributions to a national park in Costa Rica. *Journal of Public Economics*, 92(5-6), 1047-1060.

⁴⁷ <https://www.mirror.co.uk/news/uk-news/london-council-spraying-dog-poo-4666424>

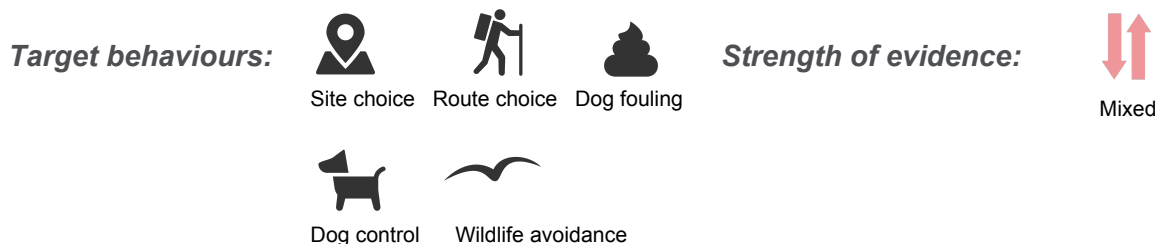
⁴⁸ Sanders, M. (2015). In search of the limits of applying reciprocity in the field: Evidence from two large field experiments. Behavioural Insights Team and Harvard Kennedy School of Government.

⁴⁹ Haper, H. (2015). Applying Behavioural Insights to Organ Donation: preliminary results from a randomised controlled trial. The Behavioural Insights Team.

Enforcement:

Barriers being addressed: Aims to make a behaviour less attractive by influencing the reflective motivation.

Regulation



Description of intervention: Behaviors known to be damaging to the environment are often outlawed or regulated against.

Behavioural Insight: Change motivation and norms.

Evidence: Policies prohibiting certain behaviours have been effective in many outdoor recreation settings, but not universally. For instance, a natural experiment with dog lead policies in Canadian parks found mixed effects of policy on activity rates and dog fouling compliance.⁵⁰ Elsewhere, seasonal beach closures have also been found to reduce impacts on ground-nesting birds, but not in the busiest areas.⁵¹ Moreover, it appears that people are more willing to comply with regulations when they were told of the reasons for the rule, as well as the negative consequences of not obeying them, and when the source of the message (messenger) is deemed more credible.⁵² However, where a high rate of non-compliance is clearly observable (such as seeing dog-waste on the street, or foot-trodden paths in no access zones) it can be normalised and may increase as a result - however such effects are dependent on the perceived risk and costs of sanction as well as the strength of relationships of those in a community.⁵³

Though there is not a great deal of evidence explicitly looking at when regulations, bans and mandates are effective, and when they are not, a broad understanding of human behaviour offers some clues. Specifically, when a behaviour is long-standing and habituated; when it is normalised and socially acceptable *despite* the regulations; when there is a strong motivation to continue; and when enforcement or surveillance is very difficult (e.g. due to unobservability

⁵⁰ Rock, M. J., Graham, T. M., Massolo, A., & McCormack, G. R. (2016). Dog-walking, dog-fouling and leashing policies in urban parks: Insights from a natural experiment designed as a longitudinal multiple-case study. *Landscape and Urban Planning*, 153, 40-50.

⁵¹ Weston, M. A., Dodge, F., Bunce, A., Nimmo, D. G., & Miller, K. K. (2012). Do temporary beach closures assist in the conservation of breeding shorebirds on recreational beaches?. *Pacific Conservation Biology*, 18(1), 47-55.

⁵² Espiner, S. R. (1999). *The use and effect of hazard warning signs. Managing visitor safety at Franz Josef and Fox Glaciers*. Department for Conservation. New Zealand.

⁵³ Keuschnigg, M., & Wolbring, T. (2015). Disorder, social capital, and norm violation: Three field experiments on the broken windows thesis. *Rationality and Society*, 27(1), 96-126.

of the actors, or diffusion of systems and agents) enforcement is generally less effective. A prototypical example which ticks all of these conditions would be attempts to prohibit alcohol, which historically have never worked. However, where there are key points at which actions can be observed and controlled; and when motivations are not that strong (e.g. because we can easily manage without, or substitute to a legal alternative), bans tend to be more effective. A good example is the banning of plastic straws, where surveillance is easy (retailers wouldn't be able to publicly sell them) and where the motivation to use them is low (we can manage without, and the market can rapidly provide non-plastic alternatives).

The question, then, is whether the behaviours of interest to us are closer to the alcohol example, or the plastic straw example? We would suggest irresponsible recreation behaviours are often quite difficult to observe, normalised, and often quite strongly motivated (if only because existing habits are ingrained, and there is a desire against using a lead or using alternative sites.) As such regulation and enforcement is likely to be difficult (not to mention unpopular), though a strong-enough disincentive (i.e. a large fine) may have some effect.

Patrols

Target behaviours:



Strength of evidence:



Description of intervention: The deployment of rangers and wardens is commonplace in protected areas globally and aims to increase compliance with regulations and deterring target behaviours.

Behavioural Insight: Increase fear of detection.

Evidence: For instance, the physical presence of wardens has been found to reduce off-trail hiking in a major US national park, and in another study, the presence of rangers contributed to a 20% reduction in the number of dogs off the lead.⁵⁴ However, because the effectiveness of deterrents is associated with the perceived risk of getting caught, the effectiveness of patrolling large areas is limited by human resource constraints.⁵⁵ Additional interventions which create the perception that someone is being observed, such as installation of cameras (real or fake), or even including the image of eyes on signs, can also deter illicit activities.⁵⁶

⁵⁴ Swearingen, T. C., & Johnson, D. R. (1995). Visitors' responses to uniformed park employees. *Journal of Park and Recreation Administration*, 13, 73-85; Muhar, A., Arnberger, A., & Brandenburg, C. (2002). Methods for visitor monitoring in recreational and protected areas: An overview. *Monitoring and Management of Visitor Flows in Recreational and Protected Areas. Institut for Landscape Architecture & Landscape Management Bodenkultur University Vienna, 2001*, 1-6.

⁵⁵ Keane, A., Jones, J. P., Edwards-Jones, G., & Milner-Gulland, E. J. (2008). The sleeping policeman: understanding issues of enforcement and compliance in conservation. *Animal conservation*, 11(2), 75-82.

⁵⁶ Nettle, D., Nott, K., & Bateson, M. (2012). 'Cycle thieves, we are watching you': Impact of a simple signage intervention against bicycle theft. *PloS one*, 7(12), e51738.

However, such interventions could backfire, as where rule-enforcement is perceived to be illegitimate, non-compliance and retaliatory behaviour can actually increase.⁵⁷

Engagement:

Barriers being addressed: Aims to influence the social **opportunity** and make a behaviour more attractive by influencing the automatic and reflective **motivations** (e.g., tying actions to identities or creating social groups)

Social marketing

Target behaviours:



Strength of evidence:



Effective

Description of intervention: Social marketing campaigns involve outreach, brand-building, slogan creation, audience segmentation and communications

Behavioural Insight: raise awareness, change attitudes, harness identity, motivations, and norms

Evidence: Social marketing campaigns have been effective in changing behaviour in a number of conservation settings.⁵⁸ They often use a combination of interventions (such as education messages and social club creation) but all tend to focus on finding the messages and approaches that best engage a particular audience. In the UK, a recent pilot social marketing campaign by Keep Wales Tidy used chalk-based spray and signage to tackle dog-fouling.⁵⁹ Although the pilot was limited to one measurement at three-sites (a week before the intervention and a week after), dog-fouling rates did decline at each site. Other UK dog-walking examples, include South Downs National Park's 'Take the Lead' initiative and North Wales Police's 'Operation Flock'.⁶⁰ However, rigorous evaluations of these initiatives similarly remain to be conducted or have not been published.

- More effective social marketing campaigns often manage to harness the power of social identities to change behaviour. Attaching actions to one's identity is important since we more commonly act consistently with our identity (our perception of *who we are* and what defines us), than with our mere knowledge. For example, 'are you a nature lover?' is a subtle different framing to 'do you love nature?'. A classic example is the 'Don't Mess with Texas' campaign which effectively reduced road-side littering

⁵⁷ Holmes, G. (2016). Conservation crime as political protest. *The Routledge international handbook of rural criminology*, 309-315.

⁵⁸ Smith, R. J., Veréssimo, D., & MacMillan, D. C. (2010). Marketing and conservation: how to lose friends and influence people. *Trade-offs in conservation: deciding what to save*, 215-232; Andriamalala, G., Peabody, S., Gardner, C. J., & Westerman, K. (2013). Using social marketing to foster sustainable behaviour in traditional fishing communities of southwest Madagascar. *Conservation Evidence*, 10, 37-41.

⁵⁹ Keep Wales Tidy (2016). Tackling Dog Fouling through Social Marketing: a trial by Keep Wales Tidy. keep Wales Tidy.

⁶⁰ Heath, M. (2017). Tackling livestock worrying and encouraging responsible dog ownership. All-Party Parliamentary Group for Animal Welfare.

by appealing to the prideful, self-reliant Texan self-image - particularly among male truck drivers who were a key target audience.⁶¹

- Appealing to specific personal circumstances can also make messages or campaigns more successful. For instance, field-experiments have shown that norm-based messaging (e.g., “the majority of guests reuse their towels”) is also more effective when more closely matching individuals’ immediate situational circumstances (e.g., “the majority of guests in this room reuse their towels”).⁶²
- Choosing the most influential individual or organization to provide information or support a message is also hugely important. For instance, in Malaysia the biggest factor found to influence whether people fed free-roaming cats (which was increasing human-wildlife conflict and predation) was perceived approval by family members.⁶³ Likewise, the importance different messengers in influencing how people respond and remember messages has demonstrated in other conservation contexts - such as donation appeals.⁶⁴

Stakeholder engagement

Target behaviours:



Strength of evidence:



Description of intervention: Trust-building approaches (such as mediation workshops, consultations, participatory mapping) aim to improve relationships among stakeholders and as a result, reduce problem behaviours and increasing support for interventions.

Behavioural Insight: Change motivations and build stronger social networks and obligations

Evidence: In Scotland, a mediation process, driven by a trusted independent local champion, helped develop a conflict co-management plan between seal conservation advocates and salmon fisheries.⁶⁵ Where pre-existing conflicts are less inhibiting, simply reaching out to stakeholders and asking them to take part voluntarily in conservation efforts

⁶¹ Reddy, S. M., Montambault, J., Masuda, Y. J., Keenan, E., Butler, W., Fisher, J. R., ... & Gneezy, A. (2017). Advancing conservation by understanding and influencing human behavior. *Conservation Letters*, 10(2), 248-256.

⁶² Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of consumer Research*, 35(3), 472-482.

⁶³ Davey, G., Khor, M. M., & Zhao, X. (2019). Key beliefs underlying public feeding of free-roaming cats in Malaysia and management suggestions. *Human dimensions of wildlife*, 24(1), 1-13.

⁶⁴ Duthie, E., Verissimo, D., Keane, A., & Knight, A. T. (2017). The effectiveness of celebrities in conservation marketing. *PloS one*, 12(7), e0180027.

⁶⁵ Young, J. C., Searle, K., Butler, A., Simmons, P., Watt, A. D., & Jordan, A. (2016). The role of trust in the resolution of conservation conflicts. *Biological Conservation*, 195, 196-202.

(such as farmers protecting raptor nests from logging in Norway) can be effective.⁶⁶ Engaging strategically with commercial dog-walkers has been suggested as a promising approach for conservation bodies.⁶⁷

Citizen science

Target behaviours:



Strength of evidence:



Unknown

Description of intervention: Citizen science refers to the contributions of members of the public and non-experts to data collection, such as monitoring populations and implementing interventions.

Behavioural Insight: Increase motivations

Evidence: In Norfolk, a recent project involved both specialists and non-specialists monitoring bat populations using smartphones.⁶⁸ It has been found that engaging in citizen science can also expand scientific knowledge and literacy.⁶⁹ Furthermore, sharing the positive results of interventions back with volunteers is thought to help encourage further voluntary interventions, such as volunteers implementing nest protection interventions for Montagu's harrier (*Circus pygargus*) in France.⁷⁰ However, the extent to which such schemes impact wider target behaviours remains to be assessed.

4. Discussion

This report has highlighted a number of promising types of intervention to promote more responsible nature-based recreation. However, much of the strongest evidence underpinning these interventions has not been tested specifically with regards to changing the key target behaviours of dog-walking and dog-control. Indeed, much of the literature we uncovered focussed on hiking behaviours and relatively little on dog-walking or other wildlife disturbance

⁶⁶ Santangeli, A., Lehtoranta, H., & Laaksonen, T. (2012). Successful voluntary conservation of raptor nests under intensive forestry pressure in a boreal landscape. *Animal Conservation*, 15(6), 571-578.

⁶⁷ Jenkinson, S. (2015). Creating positive opportunities to engage with commercial dog walkers. Scottish Natural Heritage.

⁶⁸ Newson, S. E., Evans, H. E., & Gillings, S. (2015). A novel citizen science approach for large-scale standardised monitoring of bat activity and distribution, evaluated in eastern England. *Biological Conservation*, 191, 38-49.

⁶⁹ Bonney, R., Cooper, C. B., Dickinson, J., Kelling, S., Phillips, T., Rosenberg, K. V., & Shirk, J. (2009). Citizen science: a developing tool for expanding science knowledge and scientific literacy. *BioScience*, 59(11), 977-984.

⁷⁰ Santangeli, A., Arroyo, B., Dicks, L. V., Herzon, I., Kukkala, A. S., Sutherland, W. J., & Moilanen, A. (2016). Voluntary non-monetary approaches for implementing conservation. *Biological Conservation*, 197, 209-214.

behaviours, which is a pattern also demonstrated in a recent review of the outdoor recreation literature.⁷¹ It is also important to note that many of these interventions are likely to have different effects on different sub-groups within a population. For instance, one study in New Zealand found that female and less-experienced hikers are more likely to be influenced by images of degraded trail conditions and less likely to hike on a severely degraded trail or off the trail entirely.⁷²

That said, we still believe there are important lessons to learn from the reviewed literature, as some of the motivations and mechanisms for behaviour change, as well as the barriers to be addressed, are common (or similar) between different recreation behaviours. Importantly, though, evaluating any intervention prior to wider roll-out will help establish how the target audience is likely to respond, and whether there might be any unintended consequences.

Some interventions, like education campaigns, some social marketing approaches, or signage, typically aim to influence behaviour through changing attitudes, awareness, and perceptions. However, as mentioned previously, attitudes and intentions are often not the strongest predictor of behaviour: there are legitimate mechanisms through which changes attitudes *do* lead to changed behaviours, but also many 'gaps' and barriers along this path. If we choose to deliver an intervention which depends upon some combination of altered awareness, attitudes, perceptions, etc. (which is relatively likely, given the limited range of levers we have at our disposal to influence the users of Thames Basin Heaths and Bird Aware Solent), then we must simultaneously do our utmost - using the relevant behavioural science - to ensure such an intervention is designed in such a way as to address these gaps and barriers. This typically involves two key steps, paraphrased from the earlier comments under strategy 2a:

- Ensuring the messages reach, are attended to, understood, trusted and remembered by the target audience. This requires us to, for example, use humour, simplified heuristics to boost comprehension, calls to action, and to choose the messenger wisely.
- Ensure these changed attitudes or awareness can freely translate to action. Appropriate techniques include removing psychological and physical frictions or hassles; identifying timely moments of delivery when change is most likely; or further strengthening motivations by co-opting other motivators, such as identity, peer pressure (social norms), cost-savings, convenience, or enjoyment.

There are also a number of critical research questions which have not been answered by this evidence review. For instance, although we have highlighted the promising potential of signage, education messaging and social marketing, the content or key motivation around which these messages are crafted, is open to speculation. For example, a message could be well designed and 'behaviourally informed', built around increasing dog-walkers' concern for and awareness of the risk of wildlife disturbance. This is the intuitive approach, but may or

⁷¹ Godtman Kling, K., Fredman, P., & Wall-Reinius, S. (2017). Trails for tourism and outdoor recreation: A systematic literature review. *Turizam: međunarodni znanstveno-stručni časopis*, 65(4), 488-508.

⁷² Guo, T., Smith, J. W., Leung, Y. F., Seekamp, E., & Moore, R. L. (2015). Determinants of responsible hiking behavior: results from a stated choice experiment. *Environmental management*, 56(3), 765-776.

may not be the most effective. An equally well-designed and behaviourally-informed message could be constructed around the benefits to the individual (e.g. risk of receiving a fine, or highlighting the potential to save on parking costs, or the greater convenience of using certain sites); or perhaps the risks to the dog (e.g. of injury or disease through snakes or ticks).⁷³ In parallel to this evidence review, we have undertaken a small-sample online survey with dog-walkers, in part to help identify the most powerful motivators we might seek to harness.

Finally, it may be the case that combinations of interventions are most effective at changing target behaviours. For example, on-site prompts (such as signage) may be most effective if wider awareness is also raised through a broader engagement campaign (meaning the combination of effects may be greater than the sum of the parts). This additive effect is not uncommon: for example, plastic bag charges are quite effective because people understand the detrimental impacts of plastic use. Without this understanding, 5p would typically be a weak economic incentive - its power is more as a reminder and as a mechanism for establishing a social norm, which depends on that wider awareness. This combined approach could also work well in this context, whereby Natural England develops an evidence-based social marketing campaign (i.e. drawing upon good behavioural science, and rigorously evaluated to maximise comprehension, trust, retention, attitude change, etc.) which is rolled out widely, in combination with specific on-site interventions (be they signage, training for dog-walkers, fines, or other) which act as timely prompts to act on, or make it easier to act on, the knowledge provided by the wider campaign.

One key conclusion from this evidence review is that changing recreational behaviours is not easy. Nonetheless, this evidence provides a rich basis on which to develop intervention ideas, particularly when combined with the wider evidence of what works in other contexts, where research is more plentiful and more rigorous.

⁷³ Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current directions in psychological science*, 15(6), 322-325; Rickard, L., McComas, K., & Newman, S. (2011). Visitor proficiency profiling and risk communication at a national park. *Environmental Communication*, 5(1), 62-82.