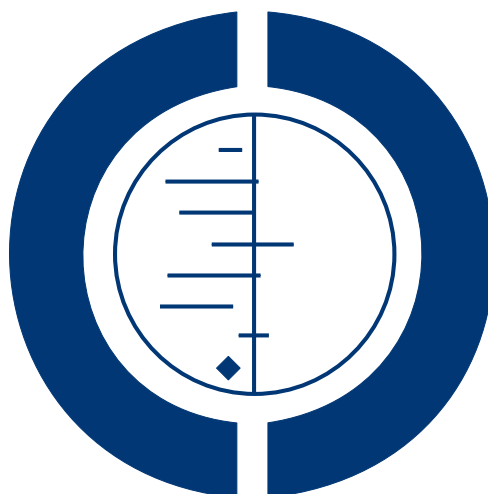


# Participation in environmental enhancement and conservation activities for health and well-being in adults (Protocol)

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[Intervention Protocol]

# Participation in environmental enhancement and conservation activities for health and well-being in adults

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## ABSTRACT

This is the protocol for a review and there is no abstract. The objectives are as follows:

To assess the health and well-being impacts on adults following participation in environmental enhancement and conservation activities.

## BACKGROUND

### Description of the condition

There is growing research and policy interest in the potential of using the environment to enhance human health and well-being (Defra 2011; Maller 2005; RSPB 2004). This is coupled with an increasing interest in the role of health in the context of global environmental agreements (Horwitz 2012; Patz 2012). Environmental enhancement or conservation activities specifically have been suggested as being beneficial across a wide range of population groups, including individuals with mental ill health (Fieldhouse 2003; Mind 2007; O'Brien 2011), children (Hermann 2006), adults (Evans 2008; Hale 2011; Moore 2006; O'Brien 2010; O'Brien 2011; Pretty 2007; Townsend 2006), and older adults (Bushway 2011; Pillemer 2010; Raske 2010). Research has indicated that participation in environmental enhancement activities may have direct and specific impacts on physical and mental health and well-

being factors and behaviours. It has been suggested that these benefits may be brought about not only through increased opportunities for physical activity, but also that contact with the natural world, engagement in meaningful activities and potential for enhanced social cohesion may also improve health and well-being (Morris 2003; O'Brien 2011; Sempik 2010).

This review will assess the multiple health and well-being impacts on adults following participation in environmental enhancement and conservation activities.

### Description of the intervention

A review, for the National Institute of Health and Clinical Excellence (NICE), of the literature on physical activity and environmental activities defined environmental enhancement activities as: "[Those] that involved a physical modification to the natural environment. This included studies that aimed to change an individual aspect or a set of characteristics of the natural envi-

ronment...” (NICE 2006). The definition of ‘environmental enhancement or conservation activities’ used for this review is based on the above and is that in which participation (either voluntary, or non-voluntary such as Community Payback activities, but not through paid employment) is intended to improve the outdoor environment (either urban or rural) at either a local or broader level and in which active participation is required. Our definition differs in that we are considering enhancement and conservation of environments whether ‘natural’ or ‘built’. Enhancement and conservation activities may include:

- watershed restoration;
- landcare (restoration in non-urban contexts);
- habitat restoration, including specific programmes such as ‘Green Gym’;
- litter picking; or
- re-greening of urban waste sites.

The spaces in which the enhancement activities may take place include:

- communal green spaces;
- public (or publicly accessible) parks and green spaces;
- school, hospital or other institutional grounds; or
- public (or publicly accessible) natural areas of urban and built environments.

Activities which do not focus on enhancing the environment, which take place in private spaces, or those in which participation has no practical element, will be excluded. The following examples of environmental conservation or enhancement related activities are excluded from inclusion in this review:

- domestic gardening (including allotments);
- care or therapeutic gardening;
- community farming; or
- environmental surveying.

Mutuality is central: activities will aim to be of benefit to all participants, including human, non-human, and to the environment in which the activity takes place (Burls 2007). In contrast to sustainability action (individual reduction in fuel use etc.), these actions have a physical, outdoor element, and thus potentially directly impact on the participants’ immediate health and well-being.

## How the intervention might work

It is hypothesised that participation in environmental enhancement and conservation activities may have multiple impacts to health and well-being, for example through opportunities for physical activity, stress relief, social contact and engagement, or through improved living environments. Various theoretical hypotheses have been proposed which have sought to identify or explain the mechanisms linking potential health impacts of environmental enhancement and conservation activities. The review will consider ‘academic’ alongside practitioner and service-provision theories.

Physical activity has been shown to impact upon health related quality of life (Bize 2007); it may therefore be a key mechanism through which humans benefit from environmental enhancement activities (Maas 2008). Additional benefits may accrue through the environment in which the activity takes place, for example it has been argued that physical activity in a natural environment is of greater benefit than that which takes place indoors (Haubenhofner 2010; Peacock 2007; Thompson Coon 2011). Outdoor environments offer greater topographical variation which may promote broader physiological benefits (Fjortoft 2001; Plante 2007).

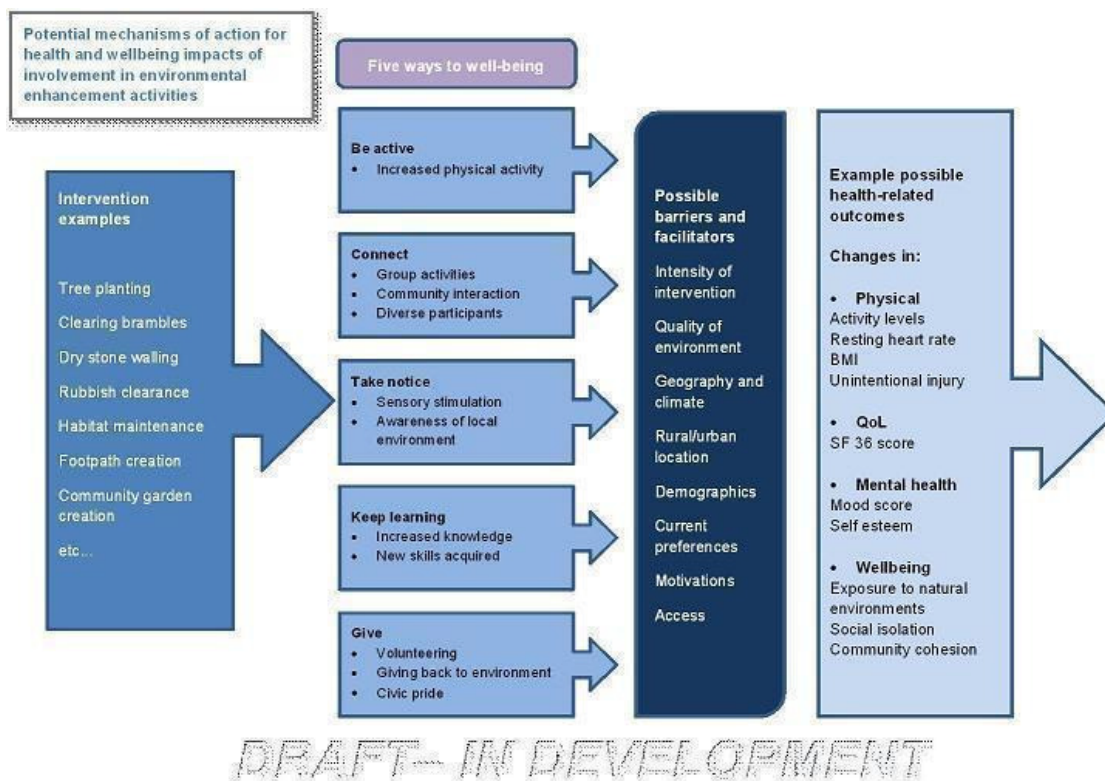
Environmental enhancement and conservation activities when undertaken in a group or within a community have the potential to confer benefit through increased social connectivity. Self-esteem may be enhanced through engagement with valued activities to improve the locality. This may in turn further improve well-being (Sempik 2010), though could also perpetuate health inequalities. While it is recognised that not all environmental enhancement activities are voluntary (for example, those undertaken as community service), the act of volunteering to undertake meaningful activities with clear and defined benefits may have further positive impacts to health, specifically mental well-being (Musick 2003). Satisfaction (when considering factors such as presence of pleasant green spaces, litter or general state of repair) with one’s living environment has been linked to well-being (Herzele 2012). It is hypothesised that activities undertaken to enhance one’s living environment, whether urban or rural, may therefore result in improvements to health and well-being.

A group of academic theories suggest that humans have an innate evolutionary connection to the natural world and that contact may be of benefit to health and well-being (Wilson 1984). These connections have repeatedly been argued to reduce both mental fatigue and levels of stress (Kaplan 1989; Ulrich 1991). Given the increasing urbanisation of the social world and the declining contact with natural environments (Beatley 2011; Lee 2011), arguments have been forwarded citing the potential harm inherent in this separation (RSPB 2004). Attention restoration theory and psychophysiological theories suggest that the natural environment is effective in promoting recovery from fatigue and stress (both direct and indirect) (RSPB 2004). However, whilst popular, there is increasing critique of these theories (Joye 2011).

A group of practitioners involved in environmental conservation activities has been convened to form a Project Reference Group, and will help to surface the ‘everyday’ theories of intervention effect used to justify and support policy and practice associated with environmental enhancement (see Appendix 1). These mechanisms are summarised in an initial conceptual framework (Appendix 2; Figure 1). This was developed through an initial reading of the text and consultation with the Project Reference Group, and will be developed through the review process. We have used the ‘Five Ways to Wellbeing’ as an framework through which to understand the suggested potential ways in which participating in environmental enhancement activities may impact on health and well-

being (NEF 2011).

Figure 1. Conceptual model



### Why it is important to do this review

Increasingly, public health concern is focused on rising levels of chronic disease, lifestyle conditions such as obesity and heart disease, and mental health conditions such as depression (Maller 2005). Prevention activities and treatments that avoid or reduce pharmaceutical use are appealing in terms of potential benefits to individuals and cost savings to health care systems (Mind 2007). Active use of the outdoor environment as a setting for interventions may be effective at improving mental and physical health indicators. Such activities could have the potential to not only avoid excess pharmaceutical management, improve physical and mental health and well-being, but may also decrease social isolation, improve practical skills, and enhance local environments (Burls 2005). Active engagement with the environment through,

for example, environmental enhancement activities is potentially an under-used resource in health promotion and as an intervention for health problems (Maller 2009).

We have been unable to find any reviews which specifically focus on health/well-being outcomes and environmental enhancement activities. The review for NICE cited previously (NICE 2006) included only controlled study designs, specifically focused on enhancement of the *natural* environment, and only considered increased physical activity as outcomes. Additionally, the review was conducted eight years previous to this protocol and there has been growing research activity in this area since then.

Previous reviews in this field have arguably lacked methodological rigour (Bowler 2009), or focused on a restricted evidence base (NICE 2006). Our approach aims to address these issues. A group of academics has been convened to form an Expert Advisory Group

to provide methodological input throughout and has commented on drafts of this protocol.

A review currently under consideration with the Cochrane Public Health Group will examine the effects of contact with nature in children. This proposed review by G. Chabot et al. considers parallel, rather than overlapping concerns - the authors plan to look at the health impacts for children of contact with nature more broadly. Our review both takes a different methodological approach, and considers adults engaged specifically in environmental enhancement activities. We hope to keep in touch with the team in Quebec through the course of our review to share insights.

## OBJECTIVES

To assess the health and well-being impacts on adults following participation in environmental enhancement and conservation activities.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

In the systematic review we will include quantitative studies, including:

- randomised controlled trials (RCTs), cluster RCTs;
- quasi-RCTs, cluster quasi-RCTs;
- controlled before-and-after studies with any appropriate comparator groups;
- interrupted time series;
- cohort studies; and
- case-control study.

Definitions of includable study designs are shown in [Appendix 3](#). For non-randomised studies we will apply minimum criteria for studies to meet for inclusion. Controlled before-and-after studies data collection must be contemporaneous and groups comparable on key characteristics. Interrupted time series studies must clearly define intervention points and record at least three outcome measurement points before and after (or before and during) the intervention. Cohort studies must occur over a reasonable timescale for effects to be detectable and attributable ( $T \geq 6$  months) and accurately record drop-out figures/characteristics. Case-control studies must report cases and controls from studies whose comparability on relevant baseline characteristics and potential confounders can be judged, and comprehensively report confounders.

Also tagged during screening will be uncontrolled before-and-after studies (uBAs). These will be included in the review if no controlled studies are located. Whilst uBAs are prone to higher levels of bias, and are unable to determine causality, in the absence

of higher level evidence they are able to demonstrate the settings and contexts of links, as well as key functions and processes in a mapping of the available evidence. A similar approach has been utilised previously in a Cochrane review examining rural hospital settings ([Gruen 2004](#)). Qualitative evidence linked to quantitative intervention studies ('sibling studies') will be included. Further qualitative evidence will be identified during the initial screening process, where those studies which appear to be qualitative will be tagged for screening against the qualitative criteria ([Harriet 2010](#); [Pearson 2010](#)).

#### Qualitative Studies

Included qualitative research will be from any discipline or theoretical tradition that uses recognised qualitative methods of data collection and analysis ([Munro 2007](#)). Data collection methods include (but are not limited to): focus groups; individual interviews; ethnographic interviews; participant or systematic observation; documentary analysis; audio visual/note collection. Methods of analyses include: grounded theory; narrative analysis; thematic analysis; hermeneutic phenomenological analysis; discourse analysis.

#### Types of participants

Adults (>18) participating in the types of environmental enhancement and conservation activities defined below. Analysis will necessarily be sensitive to potential impacts on specific subgroups; such as those with mental ill health or older people. Socio-economic differences will also be explored.

#### Types of interventions

Outdoor, physically active activities involving environmental enhancement and conservation will be included in the review. These activities are those in which participation is intended to improve the natural environment, and can occur in urban or rural areas, built or natural.

In studies where participants engage in a range of activities, and only some participants undertake environmental enhancement, we will include only those studies where data is reported separately for those participating in environmental enhancement. Decisions relating to such studies will be recorded and justified in the report. Studies where participants engage in a mixture of activities (for example, all participate in activities which include urban greening activities but also some art production), will be included when the major activity and focus relates to environmental enhancement. If reported numerically, this will be more than 50%. If not reported numerically, a qualitative judgement will be made by the review team and reasons for including and excluding such studies will be recorded and reported.

Where possible, the impact of different types of programmes (e.g. woodland creation vs. litter picking) and different contexts (e.g.

urban setting vs. rural or woodland vs. coastal) will be investigated in subgroup analysis.

While in most cases, we anticipate that participation was purely voluntary (e.g. volunteer groups), there are also those for whom participation is non-voluntary or at least represents a constrained choice (such as offender groups, community service activities). Studies which include either voluntary or non-voluntary participation will be included. Studies focusing on adults who undertake environmental enhancement activities as part of formal employment (such as park wardens, tree surgeons) will be excluded. Where studies include both employed and non-employed participation we will extract data referring to only non-employed participants. Where possible we will investigate the impact of different routes to participation in subgroup analysis.

Includable activities which are intended to improve the natural environment are listed below (the list is not exhaustive). The review will not consider studies which focused solely on the benefits to the environment following environmental enhancement activities. The review will consider studies which have focused on the impacts of active participation (both in terms of physical activity and engagement with the enhancement activity), to human health and well-being.

Includable activities:

- litter picking;
- re-greening of built environments;
- tree planting and woodland creation;
- hedge building;
- pathway creation;
- watershed restoration;
- habitat restoration;
- landcare;
- community garden creation (but not use or maintenance);
- forestry or woodland management; or
- decontamination/clearing of communal green space.

In areas which are deemed public or publicly accessible:

- communal green spaces (whether urban or rural);
- communal natural features within public urban built environments;
- public parks;
- community gardens;
- school, hospital or other institutional grounds;
- beaches;
- public footpaths;
- indigenous hunting spaces;
- 'Wilderness' spaces; or
- woodlands and forests.

Activities which are excluded from this review include:

- domestic or allotment gardening;
- therapeutic and care gardening;
- community farming; or
- environmental surveying.

Activities which take place in private environments (e.g. domestic gardening) are excluded. We have excluded activities such as horticultural therapy, community farming and domestic gardening because the aims, motivations and outcomes are likely to differ significantly from those of environmental enhancement (as defined above). We feel that these activities constitute separate reviews and are outside the scope of a single systematic review.

This list is provisional and not exhaustive; other includable activities will be discussed by the team. The Expert Advisory Group (academics) and the Project Reference Group refined the definition of the activities for inclusion ([Appendix 1](#)).

Any appropriate comparator activities will be included, for example non-conservation based physical activities, volunteering in non-conservation activities in controlled trials, and cohort measurements in before and after studies.

## Types of outcome measures

### Quantitative research

Outcomes will include any recognised measure of health or well-being whether physical or mental (including emotional and quality of life), assessed using self-report or objective measures. Mechanisms known to be determinants of health (i.e. physical activity behaviours) will also be included. Listed in priority order:

1. physiological measures (for example, heart rate, cortisol levels, per cent body fat or BMI);
2. physical health measures, general or specific (for example validated measures such as elements of the Short Form Health Survey or other measures of self-reported health status, measures of general function and capacity);
3. mental and emotional health outcomes (these may include validated scales such as the Warwick-Edinburgh Mental Well-being Scale or measures of emotional response, measures of attention restoration/stress recovery); and
4. quality of life measures (e.g. SF-36, EQ-5D).

Additional outcomes, including adverse or unintended outcomes, will be considered where reported alongside health/well-being outcomes:

1. physical activity behaviours (for example, frequency, pattern and intensity of activity, physical activity beliefs and intentions);
2. cognitive performance;
3. rate of recovery from illness or disability (physical or mental);
4. recording of positive feelings, whether the participant enjoyed/liked the experience;
5. data on outcomes related to social cohesion (e.g. UK Citizenship Survey 2009-10 cohesion measures) where reported;
6. measures of increased knowledge about the environment or related educational qualifications gained; and
7. measures of changes in community or volunteering participation.

Adverse or unintended consequences:

1. injury; and
2. allergenic reaction in response to exposure to environmental triggers (i.e. pollen).

Where data allow, a representative outcome measure for each heading will be selected based on the most frequently reported. For example, scoping and grey literature searches have suggested that heart-rate is the most commonly reported physiological measure, and the short-form SF-36 (SF-12) the most commonly reported QoL measure for environmental enhancement activity.

We will extract data referring to the type, quality and features of the environment in which the activity was undertaken. We will also extract data, where available, referring to the level of participation and exposure to the intervention. For study designs with pre and post measures, time point details will be extracted alongside the outcomes. Where possible, we will collect data on the settings in which the activity takes place for included studies, to provide context for the results.

### Qualitative research

For qualitative studies, findings will relate to the perceived health and well-being impacts, both positive and negative, reported by those participating in environmental enhancement activities. Data in the form of key themes, concepts and metaphors about the impact of participation will be extracted.

### Search methods for identification of studies

Search methods are led by an Information Specialist (CC). Locating evidence for this review will draw upon a variety of search methods, reflecting the diffuse nature of the literature base in this topic, and the difficulties in locating relevant evidence from across the environmental health and conservation fields (Pullin 2001). Given the noted heterogeneity of the literature base (Fazey 2004), with items spread between a variety of mixed topical databases, items which have not been formally published, or not published at all, the review requires an innovative search approach. We will draw upon the standard systematic approaches of electronic bibliographic searching, citation chasing, web-searching, grey-literature searching and expert contact.

### Electronic searches

The bibliographic search syntax was extensively discussed within the review team and further tested before being sent to the convened Project Reference Group for additional comments (Appendix 1). The following databases will be searched:

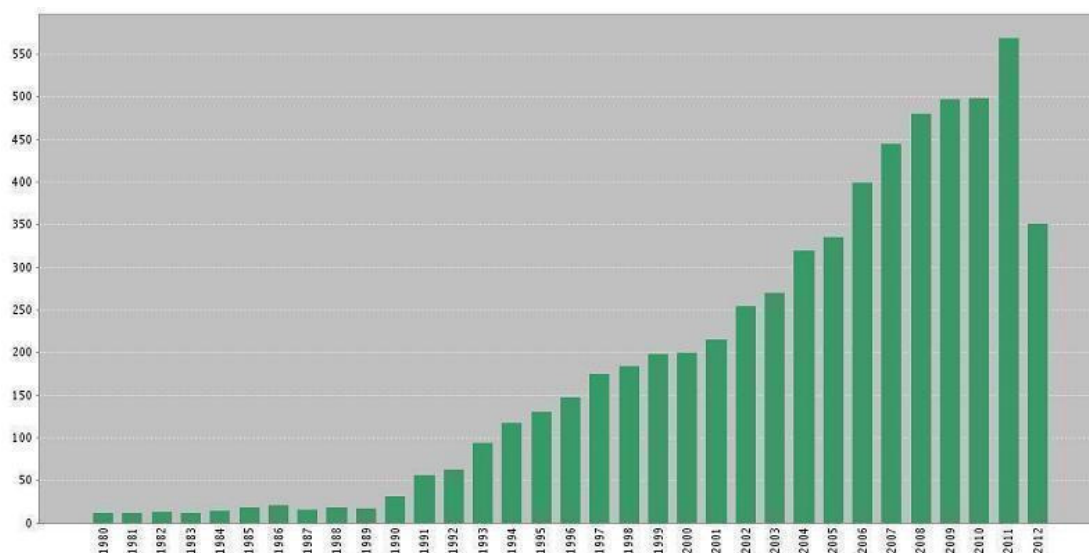
- Assia (ProQuest);
- BIOSIS (ISI);
- British Education Index (ProQuest);
- British Nursing Index (ProQuest);
- CAB Abstracts (CAB Direct);
- Campbell Collaboration;
- Cochrane Public Health Specialized Register;
- DOPHER (EPPI);
- EMBASE (Ovid);
- ERIC (ProQuest);
- Global Health (Ovid);
- GreenFILE (EBSCO);
- HMIC (Ovid);
- IBSS (ProQuest);
- MEDLINE in Process (Ovid);
- MEDLINE (Ovid);
- OpenGrey;
- PsychINFO (Ovid);
- Social Policy and Practice (Ovid);
- SPORTDiscus ;
- TRoPHI (EPPI);
- Social Services Abstracts (ProQuest);
- Sociological Abstracts (ProQuest);
- The Cochrane Library;
- TRIP Database; and
- Web of Science (including conference citations index) (ISI).

An example of the search strategy illustrating the search terms to be used is available in Appendix 4. Only intervention terms are used in the strategy. The populations included are necessarily broad and terms cannot be included which narrow the field. Similarly, included study designs prevent reduction by comparator group as evidence is likely to exist which has single group samples. Grey literature and scoping searches also highlight the disparity in outcome labelling in this field, which prohibits the inclusion of outcome terms in the strategy.

A year limit has been applied, 1990-current, which is the period in which environmental enhancement activities became widely recognised (the Green Gym project was developed in the late 1990s) and health impact research emerged (see Figure 2).



**Figure 2. Citation report for papers including 'environmental enhancement' in title 1980-2012 (Source: Thomson Reuters 2012)**



Only papers in English will be included. While we recognise that there is a potential for bias to be introduced as a result, the direction and degree of such bias is unknown. As outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011), there is conflicting evidence about the potential bias introduced by an English language limit: Juni 2002 reported that non-English trials were more likely to report significant results, whilst Moher 2003 reported no significant difference in meta-analyses which excluded trials in languages other than English. Further, such assessments relate to the results of meta-analyses of RCT data which, based on initial scoping searches, are unlikely to form the bulk of evidence in this topic and which, due to the heterogeneity of interventions to be included, is likely to preclude meta-analysis. We anticipate that the synthesis will therefore rely on formal methods of narrative synthesis (Popay 2006). Through the process of the review we will consider the possible impact of the language restriction and will reflect on the limitations in the final report.

Our search for grey literature will unavoidably be mainly focused on UK organisations. The requirement to discuss the project aims with contacts alongside the quantity of organisations in the field could not, realistically, be repeated globally. However we will include evidence from non-UK/European English speaking countries as far as possible. We will ask the Project Reference Group to identify key international organisations and these will also be contacted for relevant unpublished reports. Our website searches (see section below) will include extensive searching of non-UK/European English speaking countries. The database searches will enable us to identify the implications and limitations of a UK centred grey literature search.

### Searching other resources

Given the difficulties in locating relevant evidence, our bibliographic searching will form one arm of our search strategy for this review. We began with a scoping stage of expert/stakeholder contact searching using web-resources and speaking with organisations of note to identify unique or unpublished items (these organisations can be found in Appendix 5).

We plan to follow with forwards and backwards citation chasing on included items identified above, and 'related article' searches on any items identified.

We shared the initial list of includable studies with the Project Reference Group and known academics in the field to seek further references. We also discussed formal search terms with the Project Reference Group, who will also form a frame of reference for the literature base.

Secondly, and again in development with the Project Reference Group (who will help inform the growth of the list), hand searching will be conducted on the web-sites of the organisations. We recognise that these organisations will have a UK focus and so we will also include non-UK/European English speaking countries, a list of organisations identified can be found in Appendix 6. Sites will be searched using selected terms (see Appendix 6) entered into website search boxes and a manual trawl of the first 100 results. If the first 100 results yield a high level of includable items (i.e. >10%) then more hits will be trawled. For websites where searches with a single term result in an excessive number of hits (for ex-

ample the American EPA), terms will be combined to return only relevant items. Sites where only a small number of publications are listed will be crawled in full. Items will then be downloaded or requested via email.

Grey literature searching will be conducted through bibliographic databases (such as Social Policy and Practice, [www.spandp.net](http://www.spandp.net)), we will also web-search known portals (e.g. Open Grey, [www.opengrey.eu](http://www.opengrey.eu)) in addition to library catalogues, such as the British Library ([www.bl.uk](http://www.bl.uk)). Google ([www.google.com](http://www.google.com)) will also be searched.

As with the citation and related article chasing used in the first step, every includable item will be chased to locate further information. This is important given the variety of places relevant literature is stored.

We will also use citation alerts on included items as there is a delay between acceptance and publication in the conservation literature (Fazey 2004; Kareiva 2002).

## Data collection and analysis

### Selection of studies

Study selection will be in two parts. Firstly, two team members (KH and RL) will independently screen titles, and, where available, abstracts of any identified studies. Where these appear to be relevant given the inclusion criteria detailed, the full text will be obtained and, again, screened by two team members. Where there is disagreement, the researchers will discuss the decision and come to an agreement, or a third researcher (RG) will be brought in to aid consensus.

### Data extraction and management

The exported files from the searching will be uploaded and de-duplicated in [Endnote 2011](#). Where an export is not possible, for example from a resource without RIS functionality, the data will be exported to a word file and saved. The searches will be recorded using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher 2009).

Data will be extracted into bespoke data extraction forms developed for the review. Data will be extracted by one reviewer, and checked by another (KH and RL). The final agreed data extraction will be entered into the Cochrane Collaboration's statistical software, [Review Manager 2012](#), by one author (KH). Extracted quantitative data will include: full details of the nature of the intervention (content, time frame of activity and frequency of engagement) and any theory informing it; setting and provider; sample characteristics of the included population; and results of outcomes measured. For included qualitative research, themes, concepts and quotes will be extracted together with details of the sample, methodology and intervention as appropriate.

Equity data will be extracted where study authors have reported on any of the PROGRESS-Plus factors. However variables which impact on participation and outcomes will be prioritised during synthesis: age, gender, race and socio-economic status. The resources and costs of interventions will not be extracted.

## Assessment of risk of bias in included studies

### Quantitative studies

Our study-level appraisal of included randomised studies will utilise the Cochrane Collaboration's tool for assessing risk of bias (Higgins 2011). This two-part tool addresses six domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other issues. All other quantitative studies will be appraised, where appropriate, based on the Effective Public Health Practice Project (EPHPP) criteria for potential sources of bias (Armijo-Olivo 2012). The EPHPP tool is recommended by the Cochrane Public Health Group as suitable for systematic reviews of effectiveness (Armstrong 2007). The tool assesses studies based on selection bias; study design, confounders, blinding, data collection methods, withdrawals and drop-outs, intervention integrity and analysis. Tools will be piloted on a sub-set of included studies to check criteria application consistency within the team. Each study will be assessed for bias by two reviewers (KH and RL), and disagreements resolved through discussion and, where necessary, a third reviewer (RG).

### Qualitative studies

Qualitative studies will be included in the review to help develop the conceptual framework. Quality of qualitative evidence will be assessed in relation to the "ability and efforts of the researcher to make his or her influence and assumptions clear and to provide accurate information on the extent to which the findings of a research report hold true" (Hannes 2011). We will use the Wallace criteria for appraising each study, to determine quality of reporting and appropriateness of method (Wallace 2004), which we have used in several previous reviews of qualitative research in public health questions (Garside 2010; Smithson 2010). These criteria assess studies based on theoretical perspective; question; study design; context; sampling; data collection; analysis; reflexivity; generalizability; and ethics. Appraisal will be undertaken by two reviewers independently (KH and RL), and disagreements resolved through discussion, and a third reviewer (RG) if necessary. All of the tools utilised for assessing risk of bias are detailed in [Appendix 7](#).

## Measures of treatment effect

We will report continuous data as mean and standard deviation (SD). Where possible, we will use the original scale and standardised mean differences (SMDs) will be calculated where we need to combine data across different scales. Ordinal data, in the form of validated measurement scales, are also likely and, in line with current guidelines by the Cochrane Collaboration, shorter scales will be grouped and analysed as dichotomous outcomes for which we will calculate odds ratios. Longer ordinal scales will be treated in analyses as continuous. Counts and rates will be treated as continuous. Based on the activity inclusion criteria and outcome selection, odds ratios (ORs) (rather than risk ratios) will be reported for dichotomous data.

## Unit of analysis issues

Unit of analysis issues relating to repeated observation and event re-occurrence may be present. In these two specific cases, distinct outcomes will be defined and several analyses performed representing each time-frame. Additional care will be taken to include the same group of participants only once in any meta-analyses. Cluster RCTs, whilst unlikely to occur in this review, will be analysed using a summary measurement from each cluster. Multi-arm studies, where available, will be included using group combination to create single pair wise comparisons.

## Dealing with missing data

Missing data will be requested from primary study authors via email. For sets which are missing data meta-analyses will be conducted in accordance with intention to treat analysis. Other analyses will use available data and the final report will reflect this limitation.

## Assessment of heterogeneity

The broad scope of this review means that a wide range of studies will be included and issues of heterogeneity (clinical, methodological and resulting statistical heterogeneity) are increased. Meta-analysis will only be undertaken where there is sufficient homogeneity across participants and outcomes. Meta-analysis may be conducted in this case (in the form of forest plots) where there is limited heterogeneity of intervention to inform broader enhancement activity conclusions.

Chi-squared tests will be used to evaluate heterogeneity, with the appropriate caution of results associated with small-sized studies expected in this case. Inconsistencies in meta-analyses undertaken will be examined using  $I^2$ , it may be necessary to exclude specific studies.

## Assessment of reporting biases

Environmental enhancement is an emerging field which has been growing in research interest since the 1990s. The nature of the origins of the research (often conducted by environmental enhancement practitioners and those without formal research methods training and not reported through traditional channels) means that reporting biases are likely to be somewhat of an issue in this review. Particularly time-lag, location and multiple publication biases. If data allow meta-analysis to be undertaken we will explore reporting biases through funnel plots. The possible presence and implications of reporting biases will be considered in the report. To counter the introduction of reporting biases three strategies will be used. Firstly, searches include a comprehensive set of databases as identified by the Information Specialist (CC), and the search strategy has been extensively discussed both within and outside the team to be as inclusive as possible. Secondly, grey literature searches and hand-searching of relevant websites will be undertaken by two members of the review team (KH and RL), to identify unpublished reports and items which are location specific. Lastly, the Project Reference Group will be contacted to identify key items in the unpublished literature ([Appendix 1](#)).

## Data synthesis

We anticipate that the synthesis will use several tools, depending on the nature of the evidence identified, and in response to the different types of data to be included in the review: these approaches are described in more detail below.

1. Where relevant data are available from trials, it will be meta-analysed to establish pooled effect measures for the stated outcomes.
2. Where data from trials are not available, or where outcomes used or interventions examined are too diverse for sensible pooling, outcomes across studies will be synthesised narratively.
3. Qualitative findings will be initially synthesised separately to provide a comprehensive picture of the themes and concepts available across the studies.
4. An overarching conceptual framework will be used as a mechanism to produce an overarching synthesis of the quantitative qualitative data included in the review. This will illustrate the proposed mechanisms of action, and use data from the studies, and an indication of the strength and quality of the evidence to population this framework. Initially a conceptual framework will be developed (and later refined throughout the project) to try and understand the proposed modes of action through which it is believed that involvement in environmental enhancement activities produces health and well-being effects. This will take the form of both explicit academic theories referenced in project descriptions, as well as implicit 'lay' theories. The framework will both aid evidence identification and help revise the review parameters. It will form a picture of how and why effects occur by positioning theories/mechanisms alongside

outcomes. The review will populate the links between these areas and an overarching conceptual framework will be a product of the overarching synthesis.

#### **Pooling quantitative evidence: controlled study designs**

Where appropriate trial data are available, random-effects meta-analyses will be undertaken, for which analysis will be performed in [Review Manager 2012](#). uBAs will not be considered for inclusion in this analysis. Experimental and non-experimental data will be synthesised separately, and their impact on an overall pooled effect investigated. Separate synthesis will be conducted, where appropriate, for poorer quality studies to investigate the impact on outcomes and we will conduct a sensitivity analysis to estimate the effect of including or excluding studies with greater risk of bias. Other subgroup analyses will be conducted where data are available relating to: population characteristics (age, gender, race etc), type of involvement and type of activity to explore the possible impact of population and interventions characteristics. Where appropriate we will investigate subgroup heterogeneity through examining the forest plots and the  $I^2$  statistic.

Where outcome data are incomplete across the sample, the principles of intention-to-treat analysis (at least available case analysis) will be followed.

A 'Summary of Findings' table will be presented for the outcomes identified, possibly making use of representative outcome measures ([Types of outcome measures](#)). The amount and strength of the evidence base for each outcome will be assessed.

#### **Narrative synthesis of quantitative evidence (including uBAs)**

If no, or limited evidence is identified from studies using comparative designs, we will include uBAs in the review. For these uncontrolled before and after studies, and for outcomes from controlled studies where statistical pooling is not possible, or ill advised due to heterogeneity, narrative synthesis methods will be used ([Popay 2006](#)). This will include grouping outcomes by type and measure and presenting them in tabulated form, as well as writing a narrative summary of the findings. Where useful, we may convert findings to ORs and SMDs and present them illustratively, without pooling. We will explore similarities and differences in the findings by grouping and juxtaposing them based on: study design; type of participant; type of activity; proposed mechanism of action etc.

#### **Qualitative evidence**

Exact methods of synthesis for the included qualitative research will depend on the nature of the evidence identified. For example, where data are largely descriptive, we will use thematic analysis, whereas more conceptually rich studies may be better suited to a meta-ethnographic approach ([Campbell 2003](#); [Garside 2008](#); [Thomas 2008](#)).

#### **Overarching synthesis**

A narrative synthesis of all included evidence will be produced, with particular consideration given to methodological and intervention heterogeneity through the categorisation of studies by their underlying theoretical approaches (both academic and lay theories, including, for example, Wilsons' Biophilia) ([Popay 2006](#)). Study-level moderator (and sample characteristic) variables such as study design or population heterogeneity will also be examined to assess the impact on outcomes. Indeed, such contextual factors are central to the review.

We will then use this synthesis to refine the conceptual framework built around proposed mechanisms of health impacts (utilising the best evidence available as described by an evidence hierarchy, including, where appropriate, qualitative studies) ([Anderson 2011](#)). In addition, the input of the Project Reference Group will be sought; we have already held our first workshop with this Group and they will continue to be involved through email correspondence and a further workshop planned for the end of 2012. Further details of the conceptual framework can be found in [Appendix 2](#).

#### **Subgroup analysis and investigation of heterogeneity**

The approach taken in this review will examine and try to draw out the interacting effects between mechanisms, outcomes and sub-groups. Interventions will be categorised according to theoretical underpinning (main mechanism of action) consisting of both lay and academic theories. Interventions might also be usefully grouped based on the exposure and type of activity undertaken by participants; there may well be differences between hard physical activities and those with less physical components. Along with participant and intervention characteristics, data will also be analysed using the characteristics of the environment in which the activity was undertaken as a mediating variable.

Analysis will be sensitive to differential impacts by: mental health status; age; socio-economic status; gender and, potentially, ethnicity. Initial exploration of the grey literature and scoping searches indicate that there may be significant potential for levels of health inequality to be perpetuated across those from lower socio-economic backgrounds and those with mental ill health. As such, these two groups will be prioritised in our subgroup analysis.

Where possible, meta-analysis that combine subgroups will be undertaken. These will split participants across the groups mentioned for all outcomes (or summary outcomes for broader headings). However, we anticipate that formal analysis is unlikely to be possible and so observational differences will be explored comprehensively through modelling the subgroup interacting effects on the conceptual framework.

## **ACKNOWLEDGEMENTS**

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\* Indicates the major publication for the study

## APPENDICES

### Appendix I. Expert Advisory Group and Project Reference Group

An Expert Advisory Group has been convened and whose primary role will be to act as “critical friends” for the review methods. Each brings distinct expertise to the project.

A Project Reference Group has been convened in an advisory capacity, and is comprised of workers and participants in environmental enhancement and conservation activities. Included are representatives from a wide range of key organisations such as the Conservation Volunteers, Mind, Local Authorities, and Green-space. The list was populated through direct author contacts, web searches, and snowball contacting. Due to the necessity of a physical meeting the participants are representatives from UK-based national and local organisations.

The group contributed to:

- Sharing knowledge of organisations involved in relevant schemes and the nature of these activities;
- Ensuring we had a comprehensive picture of the research and evaluations that have been undertaken in this area (especially the grey literature); and
- Ensuring that we are appropriately conceiving that anticipated benefit for participation across difference groups and how these are achieved (programme theories).

The Project Reference Group was convened at an initial meeting, which explained the purpose and scope of the project. The practical and theoretical experience of the group informed the initial conceptual framework which outlines the mechanisms through which involvement in these activities is thought to impact on physical and mental health and well-being. The framework will also allow us to draw out expected similarities and differences between settings, activities and participants. The conceptual framework will necessarily evolve throughout the review and thus the Project Reference Group input will continue. A second meeting will be held towards the end of the project, during which the initial findings, and the conceptual framework will be presented to the group, and opportunities for dissemination discussed.



## Appendix 2. Conceptual framework

An initial conceptual framework, which has been developed through a reading of the literature and consultations with the Project Reference Group, outlines the way in which participation in environmental enhancement and conservation activities is believed to impact on physical, mental, social and emotional well-being. The review will focus on identifying research in key areas of this framework to establish the amount and strength of evidence to support the proposed links.

The further developed framework will be circulated, on at least one occasion, amongst the expert advisory group of academics and the Project Reference Group.

## Appendix 3. Definitions of study designs

### *Randomised controlled trial (RCT)*

A trial where participants (or clusters) are randomly allocated to receive either intervention or control. If well implemented, randomisation should ensure that intervention and control groups only differ in their exposure to treatment.

### *Cluster randomised controlled trial*

A trial where the unit of randomisation is a cluster of participants (for example, a school). See randomised controlled trial (RCT).

### *Controlled before-and-after (CBA) study*

A trial where participants (or clusters) are allocated to receive either intervention or control (or comparison intervention) but the allocation is not randomised.

### *Interrupted time series*

An approach in which multiple (more than two) observations are made on the same individuals, or groups of individuals, over time.

### *Cohort studies*

An observational study in which a group or 'cohort' of people are observed over time in order to see who develops the outcome of interest. An approach that is often called a longitudinal study. Cohort studies differ from experimental studies such as randomised or non-randomised controlled trials because individuals effectively allocate themselves according to the extent of their exposure to the risk factor of interest. Prospective cohort studies involve following groups of people forward in time to assess who develops the outcome of interest, often by conducting a series of cross-sectional studies. Conversely, in retrospective cohort studies, both the exposure and outcomes of interest all take place in the past relative to the starting point of the study.

### *Case-control studies*

A comparative observational study in which the investigator selects people who have an outcome of interest (for example, developed a disease) and others who have not (controls), and then collects data to determine previous exposure to possible causes. Case-control studies are often reserved for early hypothesis testing or for investigating the causes of rare outcomes.

### *(Uncontrolled) Before-and-after studies*

An approach where the dependent variables are measured before and after an intervention has been delivered. The intervention can either be delivered by the investigator or by others (observational before and after study). An approach that is often called a pre-post study. Study participants in pre- and post-intervention stages can either be the same (A) - as is often the case for simple one-to-one intervention studies - or different (B) - as is often the case for assessing large scale interventions.

Derived from [NICE 2009](#)

## Appendix 4. Search syntax

Database(s): Ovid MEDLINE(R)

Host: OVID

Data Parameters: 1946 to September Week 3 2012

Date Searched: Wednesday October 3<sup>rd</sup> 2012

Searched By: CC

Strategy Checked by: KH, RL and RG

## Search Strategy

#	Searches	Results
1	(conservation\$ and natural and environment\$ and (renewal or volunteer\$ or voluntary or participat\$ or practical or regenerat\$ or restor\$ or maintain\$ or care or enhance\$ or preserve or creat\$ or activ\$ or action\$ or involve\$)).ti,ab	377
2	(Conservation adj3 interventions).ti,ab.	29
3	((environmental\$ adj3 (conservation\$ or volunteer\$ or steward\$) and (Regenerat\$ or restore or restoration or redevelop or maintain or enhance or preserve or preserving or create or creation or establish or establishing or founding or build\$ or cultivat\$ or cultivation or participate or participation)).ti,ab	73
4	(conservation\$ adj3 (group\$ or volunteer\$ or voluntary or association\$ or organisation\$ or organization\$ or participa\$ or stakeholder\$ or steward\$ or trust or ranger\$ or activit\$)).ti,ab	747
5	(conservation\$ adj5 (nature or rural or countryside or outdoor\$ or outside or backcountry or hinterland or outback or wood\$ or park\$1 or parkland or garden\$ or meadow\$ or farm\$ or (farm adj1 land) or horticultural or floricultural or botanical or arboretum or allotment\$ or forest\$ or rainforest or moor\$ or dale\$1 or marsh\$ or mountain\$ or beach\$ or wilderness or landscape\$ or tree\$ or copse\$ or river\$ or lake\$ or canal\$ or waterway or wetland\$ or (open adj1 space\$) or (protected adj1 area\$) or green\$ or planning\$ or footpath\$ or trail\$ or coast\$ or cliff\$ or dune\$ or (bio adj1 diversity) or (eco adj1 system) or (protected adj1 area\$))).ti,ab	1688
6	(geoconservation or (geo adj3 conservation)).ti,ab.	0
7	((activ\$ or practical or participat\$) adj3 conservation\$).ti,ab	481
8	exp "Conservation of Natural Resources"/ or *Environment/ or *Environment Design/	42248
9	(volunteer\$ or voluntary).ti,ab. or *Voluntary Workers/ or *Consumer Participation/ or *Health Status/	199928
10	8 and 9	638
11	1 or 2 or 3 or 4 or 5 or 6 or 7 or 10	3520
12	((Volunteer\$ or voluntary) adj5 (environment\$ or nature or rural or countryside or outdoor\$ or outside or backcountry or hinterland or outback or wood\$ or park\$1 or parkland or garden\$ or meadow\$ or horticultural or floricultural or botanical	1142

(Continued)

	or arboretum or allotment\$ or forest\$ or rainforest or moor\$ or dale\$1 or marsh\$ or mountain\$ or beach\$ or wilderness or landscape\$ or tree\$ or copse\$ or river\$ or lake\$ or canal\$ or waterway or wetland\$ or (open adj1 space\$) or (protected adj1 area\$) or green\$ or planning\$ or footpath\$ or trail\$ or coast\$ or cliff\$ or dune\$ or (bio adj1 diversity) or (eco adj1 system) or (protected adj1 area\$)).ti,ab	
13	(((voluntary or volunteer\$) adj5 (group\$ or association or stakeholder\$ or steward\$ or ranger\$)) and (environment\$ or nature or rural or countryside or outdoor\$ or outside or backcountry or hinterland or outback or wood\$ or park\$1 or parkland or garden\$ or meadow\$ or horticultural or floricultural or botanical or arboretum or allotment\$ or forest\$ or rainforest or moor\$ or dale\$1 or marsh\$ or mountain\$ or beach\$ or wilderness or landscape\$ or tree\$ or copse\$ or river\$ or lake\$ or canal\$ or waterway or wetland\$ or (open adj1 space\$) or (protected adj1 area\$) or green\$ or planning\$ or footpath\$ or trail\$ or coast\$ or cliff\$ or dune\$ or (bio adj1 diversity) or (eco adj1 system) or (protected adj1 area\$)).ti,ab	667
14	*Voluntary Workers/	3989
15	(environment\$ or nature or rural or countryside or outdoor\$ or outside or backcountry or hinterland or outback or wood\$ or park\$1 or parkland or garden\$ or meadow\$ or horticultural or floricultural or botanical or arboretum or allotment\$ or forest\$ or rainforest or moor\$ or dale\$1 or marsh\$ or mountain\$ or beach\$ or wilderness or landscape\$ or tree\$ or copse\$ or river\$ or lake\$ or canal\$ or waterway or wetland\$ or (open adj1 space\$) or (protected adj1 area\$) or green\$ or planning\$ or footpath\$ or trail\$ or coast\$ or cliff\$ or dune\$ or (bio adj1 diversity) or (eco adj1 system) or (protected adj1 area\$)).ti,ab	1253503
16	14 and 15	356
17	12 or 13 or 16	2010
18	(Green\$ adj3 (space\$ or gym or exercise or volunteer\$ or voluntary or conservation or infrastructure or care or streets or communal or Guerrilla)).ti,ab	402
19	greenspace.ti,ab.	25
20	18 or 19	425
21	(urban adj3 (green\$ or park\$1 or parkland or garden\$ or horticultur\$ or wood\$ or forest\$ or botanical or arboretum or allotment\$ or (open adj1 space\$)).ti,ab	579

(Continued)

22	((work\$ or renewal or volunteer\$ or voluntary or practical or regenerat\$ or restor\$ or maintain\$ or care or enhance or preserve or creat\$) and (urban or city or metropolis or town\$) and (garden\$ or park\$1 or parkland or allotment\$)).ti,ab	370
23	*Cities/ and ((work\$ or renewal or volunteer\$ or voluntary or practical or regenerat\$ or restor\$ or maintain\$ or care or enhance or preserve or creat\$) and (garden\$ or park\$1 or parkland or allotment\$)).ti,ab	5
24	*Urban Health/ and (*Conservation of Natural Resources/ or *Voluntary Workers/)	19
25	21 or 22 or 23 or 24	914
26	((garden\$ or horticulture or allotment\$ or botanical or arboretum) adj5 (kitchen or school\$ or college\$ or university or campus or hospital\$ or prison\$ or penitentiary or institution or urban or green\$ or communit\$ or communal or group\$ or guerrilla or (bio adj1 diver\$) or eco or ((grow or pick) adj3 your own))).ti,ab	595
27	((garden\$ or horticulture or allotment\$ or botanical or arboretum) adj5 (maintain\$ or creat\$ or cultivat\$ or enhance\$ or preserve or voluntary or volunteer or conservation\$ or participat\$)).ti,ab	120
28	Gardening/ and (*Conservation of Natural Resources/ or *Voluntary Workers/)	13
29	*Gardening/ and (kitchen or school\$ or college\$ or university or campus or hospital\$ or prison\$ or penitentiary or institution or urban or green\$ or communit\$ or communal or group\$ or guerrilla or (bio adj1 diver\$) or eco or maintain\$ or creat\$ or cultivat\$ or voluntary or volunteer or conservation\$ or participat\$).ti,ab	118
30	26 or 27 or 28 or 29	754
31	((communit\$ adj5 (group\$ or team\$ or association\$ or organisation or organization or participa\$ or stakeholder\$ or steward\$ or trust\$ or ranger\$ or activit\$)) and (garden\$ or allotment\$ or forest or (natural and environment) or conservation\$)).ti,ab	363
32	(communit\$ and (work\$ or renewal or volunteer\$ or voluntary or practical or regenerat\$ or restor\$ or maintain\$ or care or enhance\$ or preserve or creat\$ or activ\$ or action\$ or involve\$) and ((natur\$ adj3 environment\$) or (environmental\$ and conservation\$))).ti,ab	479

(Continued)

33	((communit\$ or local) adj5 (garden\$ or park\$ or green\$ or greenspace or outdoor\$ or outside\$ or pavement\$ or sidewalk\$ or wood\$ or allotment\$ or lake\$ or canal\$ or river\$)) and (work\$ or renewal or volunteer\$ or voluntary or practical or participat\$ or regenerat\$ or restor\$ or maintain\$ or enhance or preserve or creat\$)).ti,ab	813
34	31 or 32 or 33	1556
35	11 or 17 or 20 or 25 or 30 or 34	8554
36	exp animals/ not humans.sh.	3785951
37	35 not 36	6941
38	(clinical or surgery or surgical or cell or cells or laboratory or placebo or bladder or uterus or breast or gene or genes or genetic or bowel or liver or enzymes or viral or lymph or molecular).mp	9317419
39	37 not 38	4815
40	limit 39 to english language	4349
41	limit 40 to yr="1990 -Current"	3896

Hits: 3896

Notes: N/A

File Saved: Medline Endnote RIS 3896.txt

## Appendix 5. List of organisations contacted

The Conservation Volunteers (BTCV)	Hush Farms
2020 Vision	Isle of Anglesey County Council
Aaron Pyecroft	Isle of Wight AONB
Active Wales	Isles of Scilly AONB
Age UK	Keep Britain Tidy, Beach Care
Ambios	Keep Wales Tidy
Arnside and Silverdale AONB	Kent Downs AONB

(Continued)

Avon Wildlife Trust	Kent High Weald Partners
Bailies of Bennachie	Kent nat tr vol
Basingstoke con vol	LANTRA
BeachCare (Keep Britain Tidy)	Lea Bridge con vol
Berkshire con vol	LEAF/Let nature feed your senses
B'ham Guild (Broader)	Leicester con vol
Biodiversity SW	Lincolnshire Wolds AONB
Biosphere CLS	Liverpool PCT
Birmingham Guild for Student Colunteers	Llyn Peninsula AONB
Blackdown Hills AONB	London and w/msex vol
Blackdown Hills Hedge Association	Lothian con vol
Blackwater Valley countryside volunteers	Love where you live
Bolton conservation vol	Malvern Hills AONB
Bolton Wildlife Programme	Manchester nat tr vol
Bournemouth nat tr vol	Marine Conservation Society
Bracknell con vol	Medway Valley Countryside Partnership
British Waterways	Mendip Hills AONB
BVSC (Birmingham)	MIND (Eco Minds)
Cambridge con vol	MoD
Camp Kernow	Moor Trees
Cannock Chase AONB	NAAONB
Canterbury Environmental Education Centre	Nat Eng Big Lottery projs
Cardiff con vol	National Parks
Carymoor Env trust	National Trust

(Continued)

Causeway Coast and Glens Heritage Trust	National Trust for Scotland
CCD	Natural England
Change Agents UK	Natural England
Chichester Harbour AONB	Naturally Active project - Kent
Chichester Harbour AONB Officer	Neroche
Chilterns Conservation Board	New Forest Volunteers
City Farms and Community Gardens	Newlands Project
Clwydian Range AONB	Newquay Zoo
CN4C	NHS Forest
CoAST	Nidderdale AONB
Coastnet	Norfolk Coast AONB Partnership
Community Environmental Trust	Norfolk nat tr vol
Community Payback	North Devon AONB
Confor SW	North Devon Council
Conservation Foundation	North East Wales Wildlife
Conservation Volunteers Australia	North Pennines AONB Partnership
Glasgow Con Vol	North Wessex Downs AONB
Cornwall AONB	Northumberland Coast AONB
Cornwall Council	OPAL
Cotswolds Conservation Board	Outdoor and Experiential Learning Group
Countryside Recreation Network	Outdoor health forum
Countryside Trust	Oxford cons vol
Cove Brook Greenway group	Oxford Urban Wildlife Group
Coventry nat tr vol	Pembroke 21C

(Continued)

CPRE	People and Planet
Cranborne Chase and West Wiltshire Downs AONB	Plantlife International
CRCC	Plymouth Environmental Action
CRESH	Plymouth Student Scientist
CSV	PROSPECTS
Cusgarne Organic Farm	Quantock Hills AONB
CVS	Reforestation Scotland
Dartmoor Preservation Association	Rowhill con vol
Dean Green Team Volunteers	Royal Horticultural Society
Dedham Vale AONB and Stour Valley Project	RSPB
Derbyshire con vol	Scarborough con vol
DofE	Scottish Wildlife Trusts
Dorset AONB Partnership	Scouts
Durham Uni con vol	SeaSchool
Durlston Volunteers	Sheffield W'experience programmes
Earth Trust	Shropshire Hills AONB
East Devon AONB Partnership	Silvanus Trust
Egham/Staines con vol	Small Woods Association
Environment Kernow	SNCV (Sutton)
Epping forest con vol	SNH
Europarc	Snowdonia Society
FEVA	Solway Coast AONB
Fleet Pond Soc	Somerset Community Food
Forest of Bowland AONB	South Devon AONB Partnership



(Continued)

Forest Research	South Down National Park
Forest School	South West Environmental Action Trust
Forestry Commission	South West Lakes Trust
Forestry Commission Scotland	South West London Environment Network
Forum for Environmental Volunteering Activity	Steeple Woodland Reserve
Friends of Par Beach	Suffolk Coast & Heaths AONB Partnership
Friends of the earth	Surfers Against Sewage
Frimley Fuel Allot con team	Surrey Hills AONB
Froglife	Sustrans
Gibbonsdown and Court Partnership	Tamar Valley AONB Partnership
Glentress Trail Fairies	Teignbridge vols
Global Boarders	TFL volunteers
Gloucester vale con vol	Thames 21
Gower AONB	The Mendip Society
Green Space Community Network	THRIVE
Green Team	Venture Scotland
Greener Ilfracombe	vInspired
Greenham and Crookham con vol	Volunteer Bristol
Greenpeace Cornwall	Volunteer Cornwall
Groundwork	Volunteer development Scotland
Guernsey con vol	Wandle Trust
Haldon Forest Volunteers	Wednesday con vol
Haldon4Horses	West Country Rivers Trust
Hampshire con vol	Wicken Fen con vol

(Continued)

Harlow con vol	Wildlife Trust
Haven Holidays	Wirral county vols
High Weald AONB JAC	Woodland Trust
Highland Environmental Network	Wychwood Project
Hill Holt Wood	Wycombe District Council
Howardian Hills AONB	Wye Valley AONB

## Appendix 6. Website hand searches

### Terms:

1. Environment;
2. Conservation;
3. (1) and (2);
4. Environmental enhancement;
5. Volunteering; and
6. Health/well-being.

Website URL	Website Name
<a href="http://www.dtic.mil/whs/directives/index.html">http://www.dtic.mil/whs/directives/index.html</a>	US Military DoD
<a href="http://www.ccw.gov.uk/default.aspx">http://www.ccw.gov.uk/default.aspx</a>	Countryside Council for Wales
<a href="http://www.tsrc.ac.uk/">http://www.tsrc.ac.uk/</a>	Third Sector Research
<a href="http://www.vssn.org.uk/">http://www.vssn.org.uk/</a>	Voluntary Sector Studies Network - Journal
<a href="http://www.ivr.org.uk/ivr-evidence-bank?q=&amp;t%5B%5D=362">http://www.ivr.org.uk/ivr-evidence-bank?q=&amp;t%5B%5D=362</a>	Institute for Volunteer Research
<a href="http://www.naturaleconomynorthwest.co.uk/">http://www.naturaleconomynorthwest.co.uk/</a>	Natural Economy North West
<a href="http://www.oecd-ilibrary.org/;jsessionid=136d54v2tehqa.delta">http://www.oecd-ilibrary.org/;jsessionid=136d54v2tehqa.delta</a>	OECD iLibrary
<a href="http://www.oecd.org/department/0,3355,en_2649_33713_1_1_1_1,00.html">http://www.oecd.org/department/0,3355,en_2649_33713_1_1_1_1,00.html</a>	OECD Environmental Directorate
<a href="http://www.epa.gov/">http://www.epa.gov/</a>	US Environmental Protection Agency
<a href="http://hero.epa.gov/index.cfm">http://hero.epa.gov/index.cfm</a>	Health and Environmental Research Online - US

(Continued)

<a href="http://www.eea.europa.eu/">http://www.eea.europa.eu/</a>	European Environment Agency
<a href="http://www.npca.org/">http://www.npca.org/</a>	US National Parks Conservation
<a href="http://www.environment.gov.au/">http://www.environment.gov.au/</a>	Australian Environment Agency
<a href="http://www.ec.gc.ca/default.asp?lang=en">http://www.ec.gc.ca/default.asp?lang=en</a>	Environment Canada
<a href="http://www.npws.ie/">http://www.npws.ie/</a>	Ireland Parks
<a href="http://www.epa.ie/">http://www.epa.ie/</a>	Environmental Protection Ireland
<a href="http://www.doeni.gov.uk/niea/">http://www.doeni.gov.uk/niea/</a>	Dept of Env Ireland
<a href="http://www.epa.govt.nz/Pages/default.aspx">http://www.epa.govt.nz/Pages/default.aspx</a>	NZ EPA
<a href="http://www.doc.govt.nz/publications/">http://www.doc.govt.nz/publications/</a>	NZ Conservation Authority
<a href="http://www.forestry.gov.uk/publications">http://www.forestry.gov.uk/publications</a>	Forestry Commission
<a href="http://www.forestry.gov.uk/forestresearch">http://www.forestry.gov.uk/forestresearch</a>	Forest Research
<a href="http://www.snh.gov.uk/publications-data-and-research/">http://www.snh.gov.uk/publications-data-and-research/</a>	Scottish Natural Heritage
<a href="http://www.feve-scotland.org/display/library">http://www.feve-scotland.org/display/library</a>	FEVA
<a href="http://publications.naturalengland.org.uk/">http://publications.naturalengland.org.uk/</a>	Natural England
<a href="http://www.sehn.org/">http://www.sehn.org/</a>	Science and Environmental Health Network
<a href="http://www.sustainweb.org/publications/">http://www.sustainweb.org/publications/</a>	Sustain Web
<a href="http://www.fph.org.uk/policy%2c'publications'and'events">http://www.fph.org.uk/policy%2c'publications'and'events</a>	Faculty of Public Health College - London
<a href="http://www.carefarminguk.org/case-studies.aspx">http://www.carefarminguk.org/case-studies.aspx</a>	Care Farming UK
<a href="http://www.mod.uk/DefenceInternet/MicroSite/DIO/OurPublications/EstateAndSustainableDevelopment/Sanctuary.htm">http://www.mod.uk/DefenceInternet/MicroSite/DIO/OurPublications/EstateAndSustainableDevelopment/Sanctuary.htm</a>	Sanctuary Magazine, MoD UK
<a href="http://www.hphpcentral.com">http://www.hphpcentral.com</a>	International 'healthy parks healthy people' network
<a href="http://www.ecohealth.net">http://www.ecohealth.net</a>	International association for ecology and health
<a href="http://www.ramsar.org/cda/en/ramsar-pubs/main/ramsar/1-30'4000'0'">http://www.ramsar.org/cda/en/ramsar-pubs/main/ramsar/1-30'4000'0'</a>	Healthy wetlands and healthy people initiative of Ramsar Convention on Wetlands

(Continued)

<a href="http://www.cbd.int/">http://www.cbd.int/</a>	Healthy planet healthy people initiative of the convention on biodiversity
<a href="http://www.saveourseine.com/">www.saveourseine.com/</a>	Save our Seine
<a href="http://www.landcareonline.com/">http://www.landcareonline.com/</a> ; <a href="http://www.landcareonline.com.au/?page_id=9608">http://www.landcareonline.com.au/?page_id=9608</a>	Landcare online

## Appendix 7. Tools for critical appraisal

### The Cochrane Collaboration's tool for assessing risk of bias

Domain	Description	Review authors' judgement
<b>Sequence generation.</b>	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups	Was the allocation sequence adequately generated?
<b>Allocation concealment.</b>	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment	Was allocation adequately concealed?
<b>Blinding of participants, personnel and outcome assessors</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective	Was knowledge of the allocated intervention adequately prevented during the study?
<b>Incomplete outcome data</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors	Were incomplete outcome data adequately addressed?

(Continued)

<b>Selective outcome reporting.</b>	State how the possibility of selective outcome reporting was examined by the review authors, and what was found	Are reports of the study free of suggestion of selective outcome reporting?
<b>Other sources of bias.</b>	State any important concerns about bias not addressed in the other domains in the tool If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry	Was the study apparently free of other problems that could put it at a high risk of bias?

Derived from Higgins 2011

### **EPHPP quality assessment tool (quantitative studies)**

#### **A. Selection bias**

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

(Q2) What percentage of selected individuals agreed to participate?

#### **B. Study design**

Indicate the study design.

Was the study described as randomized?

If Yes, was the method of randomization described?

If Yes, was the method appropriate?

#### **C. Confounders**

(Q1) Were there important differences between groups prior to the intervention?

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

#### **D. Blinding**

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

(Q2) Were the study participants aware of the research question?

#### **E. Data collection methods**

(Q1) Were data collection tools shown to be valid?

(Q2) Were data collection tools shown to be reliable?

## F. Withdrawals and drop-outs

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

## G. Intervention integrity

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

(Q2) Was the consistency of the intervention measured?

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

## H. Analyses

(Q1) Indicate the unit of allocation

(Q2) Indicate the unit of analysis

(Q3) Are the statistical methods appropriate for the study design?

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

### Global rating for this paper (circle one):

1 STRONG (no WEAK ratings)

2 MODERATE (one WEAK rating)

3 WEAK (two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

If yes, indicate the reason for the discrepancy

### Final decision of both reviewers (circle one):

1 STRONG

2 MODERATE

3 WEAK

## Wallace criteria

1	<b>Question</b>	Is the research question clear?	E
2	<b>Theoretical Perspective</b>	Is the theoretical or ideological perspective of the author (or funder) explicit, and has this influenced the study design, methods or research findings?	D
3	<b>Study Design</b>	Is the study design appropriate to answer the question?	E

(Continued)

4	<b>Context</b>	Is the context or setting adequately described?	
5	<b>Sampling</b>	(Qualitative) Is the sample adequate to explore the range of subjects and settings, and has it been drawn from an appropriate population? (Quantitative) Is the sample size adequate for the analysis used and has it been drawn from an appropriate population?	E
6	<b>Data Collection</b>	Was the data collection adequately described and rigorously conducted to ensure confidence in the findings?	E
7	<b>Data Analysis</b>	Was there evidence that the data analysis was rigorously conducted to ensure confidence in the findings?	E
8	<b>Reflexivity</b>	Are the findings substantiated by the data and has consideration been given to any limitations of the methods or data that may have affected the results?	D
9	<b>Generalisability</b>	Do any claims to generalisability follow logically, theoretically and statistically from the data?	D
10	<b>Ethics</b>	Have ethical issues been addressed* and confidentiality respected?	D
E = essential, D = desirable, * Ethics may be essential in other sensitive fields			

## CONTRIBUTIONS OF AUTHORS

RG is the lead reviewer and will lead all aspects of the review. KH and RL are co-reviewers and will screen, appraise, extract, and approve the final synthesis of the review. CC will develop the search strategy and conduct bibliographic searches.

## DECLARATIONS OF INTEREST

There are no competing interests from any of the review team.

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