# Contents

## Executive Summary

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The Brecon Beacons National Park Authority (BBNPA) undertook a condition survey of approximately 1285 km of mountain paths throughout the National Park in 1996 -97 which identified a substantial problem in terms of upland erosion. Since then some ameliorative work has been undertaken in an attempt to reduce the problem but in recent years the resources available for this type of work have declined considerably.

In 2006 – 07 the BBNPA produced this strategy to establish the extent of upland erosion within the Park, review the effectiveness of various remedial treatments that are available, establish the likely requirement for remedial work in the future, identify potential sources of funding that may be available, review potential delivery mechanisms and examine experience and solutions adopted elsewhere and produce recommendations for the way forward in the Brecon Beacons National Park (BBNP).

On this occasion BBNPA undertook a strategic condition survey of approximately 155 km of mountain paths throughout the National Park.

The key findings of the survey are:

- The scale of path repairs required will require substantial resources – approximately a £3 million capital programme with ongoing annual maintenance costs of approximately £50 000 pa.

- Upland path erosion is a problem across all upland areas of the Park with approximate resource allocation being required as follows: £336 000 in the west, £1.6 million in the east and £1 065 000 in the central area,

- 46 Km of path surveyed was regarded as being priority 1 or 2 (on a scale of 1 – 5, 1 being most urgent) in terms of requirement for ameliorative works,

- Just under 25 Km of path was considered to currently be in very poor or poor condition and would require approximately £1.3 million to repair and would cost on average £73 per metre and £48 per metre respectively

- The cost of repairing priority 1 and 2 path sections only would be approximately £1.9 million because repair of high priority sections tends to be proportionately substantially more expensive than repairing low priority sections,

- Across the Park almost 40% (in terms of path length) of work required is of a pre-emptive nature which has the advantage of maintaining the 'natural' appearance of paths,

Although the cost of repairing paths that are currently in poor condition is significant, comparison with data collected in 1996 -97 would suggest that inaction will simply create a bigger problem and greater costs in the future. Developing a large scale project to tackle the identified issues could bring with it significant economic benefits and may demonstrate that with adequate public sector support land management activity of this nature could add another positive strand to the rural economy alongside farming and tourism.

A realistic timescale to complete works identified in the survey would be five years, this could provide significant economic and social benefit to the area if the work were undertaken by locally based contractors or employees in the public or NGO sector for example.

In order to draw maximum benefit from devoting resources to this issue a strategic approach is required that takes account of skills and training requirements, developing short, medium and longer term work programmes and links with other areas of work that the BBNPA is involved in for example.

Various implementation models have been examined and after analysis of the current situation and other possible scenarios it has been recommended that the BBNPA and its relevant partners move forward to create a charitable Trust or company limited by guarantee as an organisation that will be used to source funding, agree priorities and implement training and erosion repair projects.

# 1. Introduction, Aims and Objectives

This strategy has been designed to inform the work of the BBNPA and its partners in managing upland erosion in the short, medium and long term. It is assumed that the audience will largely be organisations with a conservation remit, affected landowners and graziers/commoners associations and potential funding organisations.

This section explains the background and historical context of the study, and the aims and objectives of producing this document. The information that describes the links to other Plans and strategies used by the BBNPA sets the context for this work and this section concludes by setting out 'Guiding Principles' that have informed the path survey, the analysis of data collected and the recommendations drawn from those results.

## 1.1 Background

The BBNPA has completed a number of upland path erosion repair projects over the past ten years designed to minimise upland path erosion. Upland erosion is perceived to be a significant problem in the Brecon Beacons National Park (BBNP) by a significant proportion of visitors to the area (All Parks Survey 1994, p. 34) and indeed by other organisations and members of staff at BBNPA. Over the past few years ameliorative work has been undertaken on an ad hoc basis in the Central Beacons, and to a lesser extent on the Carmarthen Fans and Offa's Dyke National Trail. The NPA have used a variety of repair methods depending on path context, funds and funding conditions, and human resources that have been available.

During this period, funding for works came from a variety of sources including the European Agricultural Guidance and Guarantee Fund (EAGGF), Welsh Assembly Government (WAG), Adfwyio, BBNPA and National Trust. Largely, because funding has been accessed opportunistically when grant giving programmes have made money available for this type of work, there has been little strategic direction to this work and at least some of it has been driven by availability of funding rather than on a coherent and logical basis.

In 2002 – 03 the BBNPA developed a bid which was intended to be submitted to the Heritage Lottery Fund (HLF) that would have enabled upland path erosion and other conservation issues to be addressed in the Central Beacons area of the National Park. However, following discussions with the Heritage Lottery Fund this bid was not submitted and this has given the BBNPA an opportunity to address the issue of upland path erosion in a more strategic and coherent way across the whole of the Park.

The BBBNPA consider that reducing upland path erosion is important because it negatively impacts on the two Statutory Purposes of the NPA, it can reduce peoples' enjoyment of the area and can have a negative impact on flora, fauna and landscape of the area.

## 1.2 Strategy Research

The following areas of research and analysis have contributed to the production of this strategy:

- Establish the extent of the problem by undertaking a field survey of eroded paths.

- Review the extent and effectiveness of remedial works that have been carried out in the BBNP over the past 10 years and other approaches to erosion control that have been used elsewhere in Wales, Scotland and England.

- Review current and future programmes of remedial work in BBNP in consultation with National Trust and other relevant land owners

- Establish the likely requirement for remedial work in the future both in terms of new work and the, maintenance liability of works previously carried out

- Review the sources of funding that may be available for the control of upland erosion, drawing upon the experience of other National Park Authorities and other bodies as appropriate

- Review potential delivery mechanisms and examine experience and solutions adopted elsewhere.

In practical terms the aims of the strategy are to:

- Manage upland paths in such a way that eroded paths are stabilised and erosion damage is repaired.

- Ensure that upland paths at risk of becoming eroded are subject to pre-emptive works to stabilise them.

- Ensure that techniques used to combat path erosion are as inconspicuous as possible and do not detract from the 'wild landscape' qualities of the area.

* (For the purposes of this project "upland erosion" refers to the erosion of the surface of the ground caused, or exacerbated by, recreational use on the open hill. This includes both public rights of way and other routes.)

## 1.3 Objectives

The main objective of this project was to produce a Plan For Action that will enable the BBNPA and its partners to address the issue of upland path erosion in a strategic and coordinated way. The Plan For Action contains costed programmes of work and recommendations on how to manage them. A number of SMART objectives of the Strategy have been developed following analysis of the path condition audit and techniques available etc and are set out in full in section 8.1.

## 1.4 The Area

The BBNP has a beautiful and varied landscape with many different facets. There is a skyline of bare sweeping ridges and flat-topped summits. It has steep north-facing sandstone and limestone scarps with long ridges or moors dipping southwards, dotted with prehistoric monuments.
In geographical terms the uplands of the Park can be split into four areas:

1. The Black Mountain in the west comprising common land which is owned by the BBNPA. This area has traditionally been less popular with walkers and as such has maintained its wild and remote character to some degree. However the ridges in particular appear to have become more popular in recent years and there are significant sections of eroded and at risk paths within this area. The public have been able to enjoy access to this area for

some time with permission of the landowner but with the commencement of the Countryside and Rights of Way (CROW) Act 2000 the public can enjoy walking in this area by right.

2. A large part of Fforest Fawr to the east of the Black Mountain is privately owned by Cnewr estate and pre CROW access was by a single permissive path. The NPA manages the remaining upland area in this block on behalf of Welsh Water. The Black Mountain, Fforest Fawr and the western part of the central Beacons have recently been given Geopark status.

3. The Central Beacons area is partly owned by the National Trust and partly by the Honourable Artillery Company. It contains the iconic hills of Pen y Fan and Corn Du and is extremely popular with walkers and very accessible from the A470 trunk road and from a number of other minor roads. Upland erosion is a serious problem in this part of the Park and both NT and BBNPA have undertaken works here.
4. The Black Mountains includes all of the land in the Park to the east of the Usk Valley. This area receives significant numbers of visitors and erosion is a significant problem at honey pot sites such as Hay Bluff and the summit of Waun Fach. Offas Dyke National Trail also follows the Hatterrall ridge in the east of the Park and drainage and erosion are frequently a problem on this route.

A large part of the BBNP comprises old red sand stone which gives the distinctive flat topped hills such as Pen y Fan, Corn Du, Table Mountain and Sugar Loaf. Old red sand stone tends to cleave in relatively narrow planes and the weathered outcrops such as on the north scarp slope of the central Beacons are often very friable. Soils derived from Old red sand stone are variable and range from having a high clay content to stonier soils with a relatively high content (largely dependent on whether they are derived from the Senni beds or the brown stone beds). Other important rocks that occur in the BBNP are limestone and millstone grit. In the east both occur at Llangattock and the Clydach Gorge and on the Black Mountain around Dan yr Ogof caves.

Settlements within the Park are all small and the total population is under 35 000. However, there are large population centres to the south and east of the Park and major cities such as Cardiff and Birmingham are close enough to allow people to visit the area for a day.

## 1.5 Links to Other BBNPA Priorities

### Social Inclusion

There is scope for linking actions on the ground to our Social Inclusion (SI) commitments in a number of ways.

Involving people in works on the ground would involve a significant training and supervision commitment. Previous experience would suggest that the output should be measured in terms of involving socially excluded groups rather than metres of erosion that is repaired, the latter simply being a useful possible benefit of the former. However upland erosion projects could potentially provide excellent opportunities to involve a number of groups who are excluded or at risk of exclusion.

### Disability and Access to the Countryside

The Disability Discrimination Act 1995 (DDA) defines a disabled person as having one or more of the following conditions: impairment of mobility, vision, hearing or speech, learning difficulties, mental illness, a long-term health condition or issues of incontinence. The social model of disability describes a disabled person as not being disabled by their impairment but by the physical, economic, attitudinal and emotional barriers that society has erected. These barriers prevent

people from enjoying the equality of opportunity and access taken for granted by non-disabled people. Put more simply, disabled people are not disadvantaged because of their impairment - rather, they are disadvantaged because of society's attitude to their impairment.

Legislation now requires that the needs of disabled people are taken into account by those organisations and individuals with a responsibility for providing access to the countryside – with reasonable opportunities being provided for disabled people. Clearly, changes made to improve access for those with mobility or visual impairments will inevitably improve access for a large number of other people too.

The rugged nature of the BBNP landscape is such that a great deal of the area is not accessible to everyone. However it should be our aim to make reasonable efforts to provide access to as many people as possible. What constitutes reasonable provision will vary in different situations and according to the needs and capabilities of visitors.

Considering the needs of people with mobility and visual impairments should not be an afterthought, it should be at the forefront when planning work programmes to implement change. Providing access to the countryside for all does not necessarily require large and expensive changes to infrastructure on the ground.

Because we all have different requirements, it is important that any work carried out to improve access to the countryside for people with mobility and visual problems takes into account their specific requirements.

Particular factors that dissuade potential users from visiting the countryside include:

- a lack of readily available and accurate information in formats appropriate to particular disabilities
- the limited expectations that people have about those with mobility and visual problems being able to access the countryside
- accessible public transport in rural areas
- man-made barriers such as stiles, steps and inaccessible gates.
- a lack of understanding of the needs of disabled people
- a lack of financial resources to bring about the changes necessary to meet those needs.

Alison Chapman's report *Sense and Accessibility* makes recommendations about how to improve access on countryside paths, routes and trails for people with mobility impairments. Amongst other things this document high lights that although some people with disabilities may feel happy using certain path others may not be happy to use the same path. It is therefore necessary to provide information on such routes that enable disabled people who are able to take on a degree of challenge in accessing the countryside to decide whether the routes are suitable for their abilities.

In terms of managing upland erosion it is clearly essential to liaise and consult with relevant groups to assess how any works may impact on people with disabilities and wherever possible to ensure that those impacts are of a positive nature.

The view from the track (looking west) as it crosses the project area boundary

Even with improvements to the track it would only be suitable for 'heavy duty' powered scooters.

**Social and Economic Well-being**

Currently there is only one experienced contractor operating in this geographic area and the NT employ two members of staff directly linked to upland erosion work. The BBNPA ran a programme a few years ago with the support of European funding which trained and directly employed between 8 – 10 path workers on a part time and seasonal basis over a three year period. As far as is known only two of these former employees remain in the area working in a related field.

Depending on funding there is likely to be an opportunity to develop local contractors and although projects are likely to be somewhat seasonal, a planned programme of works over a 5 year period for example would provide a significant incentive for contractors to ensure a skilled work force was available in order to benefit from the investment that would be committed.

**Climbing Higher**

Climbing Higher is the Welsh Assembly Government's long term strategy for sport and recreation and details the contribution that sport and recreation can make to the health and well being of the Welsh public over the next 20 years.

Within the document there is acknowledgement that the natural environment has the potential, and already does, provide a wide range of opportunities for physical activity and recreation. Sn 1.2 states that: "Wales needs to maximise the synergy between sport, physical activity and the natural environment".

The strategy goes on to list a number of targets that will impact on the environment of Wales as a resource. For example, Target 9: - In the next 20 years, all children in Wales will have experienced an outdoor adventure activity before the age of 12 and a further experience before the age of 16. Target 10: - The percentage of the people in Wales using the Welsh natural environment for outdoor activities will increase from 36% to 60%.

Climbing Higher recognises the value and importance of the unique natural environment of Wales and also that it should be used and managed in sustainable ways, for the people of Wales as well as for those who visit.

The Strategy also recognises that local authorities will play an essential role in enabling access to sport and physical activity for all through the provision of appropriate physical infrastructure and

human resources and by increasing participation in sustainable ways that ensures that the quality natural environment is maintained and enhanced.

Outdoor activity could be undertaken in a number of ways such as walking, cycling horse riding etc. However it seems inevitable that walking will be a major part of this activity in terms of number of participants and, correspondingly, that hill walking will absorb a significant part of that increase (especially given the target to ensure that all children experience at least 2 outdoor adventure activities).

The Strategy states that:

> "In order to sustain an increase in participation there will be a requirement for capital investment in infrastructure as well as changes in attitudes."

In order to maintain and improve the outdoor activity product to encourage more people to participate in walking etc it seems inevitable that expenditure on management of areas where this activity will take place must increase.
Within BBNP the effects of visitor pressure on sites such as the central Beacons but also in more remote locations are already visible in the form of severe erosion. The 1994 All Parks survey cited upland erosion as a major factor that spoiled visitors experience in the hills. In order to continue to attract visitors and to encourage them to take active exercise in the hills it would therefore seem sensible to provide as enjoyable an experience as possible and this would include managing upland erosion.

An increase in visitors will almost inevitably increase this problem unless measures are taken to sustainably manage the effects of visitors.

**Walking Tourism Strategy**
The BBNPA Walking Tourism Strategy (WTS) was produced in 2005 and identified priorities for action that would increase visitor numbers and/or the amount of money that they spend in the area and methods for improving the quality of their stay. The Foot and Mouth Disease outbreak in 2002 demonstrated the importance of tourism to the rural economy and in protected areas such as National Parks this is probably more the case.

The focus of the WTS is largely on identifying current and potential visitors, reviewing current provision and suggesting methods for increasing visitor numbers and spend per visitor.

As part of the above process a number of tourism providers were questioned about what type of experience they thought their clients were looking for. Their responses are ranked in the following order with most important first:

1. Rolling hills and open ridges,
2. Upland terrain including popular summits
3. Gentle terrain – paths through farmland
4. Managed countryside sites
5. Rugged upland terrain, wild and remote.

(Walking Tourism Strategy, p.8 & p.40)

The WTS quotes a grading system of walks that is an indication of the terrain and using this system within the BBNP no routes were identified at the more extreme end of the spectrum (ie mountain scrambles, rugged and remote) but a significant proportion were identified in a category that would include rolling hills, open ridges and upland terrain (p8-9). Elsewhere the Strategy

suggests that the primary markets that BBNPA should be concentrating on to maximise benefit from walking tourism are:

- Independent centre based walking holiday and break takers,
- primary holiday walkers
- incidental holiday walkers and
- independent hill walking break takers.

Within all but one these sectors the walking opportunities in hilly terrain are important. During the research stage of the WTS tourism providers undertook a SWOT analysis that identified a range of access opportunities from high level to low level walks, accessible summits and ridges, BBNPA management of access, and views as strengths.

High management demands of rights of way maintenance and perceived lack of appreciation of economic importance of walking tourism were perceived as weaknesses.

Development of the Beacons Way was seen as an opportunity as is the development of the ROWIP.

Potential degradation of NP quality, upland/footpath erosion is seen as a threat as is CROW as competing areas of Wales are opened up.

This final point is recognised elsewhere and the WTS states that:

> "Five main factors can be considered to have a bearing on the growth and development of walking opportunities within the BBNPA *(including)* Control of upland erosion damage "(p.10)

The WTS priorities for action include:

- To develop a high quality and environmentally robust walking infrastructure that is appropriate to the identified target markets, and

- To monitor the impact of walking tourism on the economy communities and the environment.

The summary of actions include:

- NPP1 Invest to assure improvement and maintenance to at least an agreed minimum standard across the NPA access network,

- MA1 Agree a USP for BBNP as the walking destination of choice for southern Britain based on its upland setting.

Given that the WTS estimates that the value to the local economy of walking tourism is between £25.04m and £31.23m annually (P.29) (estimates calculated after production of the WTS suggest that this figure should be c. £50M) it would appear sensible to invest money in the product to ensure that visitors continue to return to and recommend the area to others.

**Powys Community Strategy**
The Local Government Act 2000 requires local authorities to prepare Community Strategies which are designed to ensure that publicly funded activity best meets the needs of local people.

In terms of providing well managed opportunities for the enjoyment of open spaces and the wider environment, The Powys Community Strategy, specifically identifies restoring damaged sites such as Pen y Fan as an action in the short and mid term. The survey of routes in the BBNP and in Powys identified numerous sites as damaged and in worse condition than Pen y Fan and the Strategy has been interpreted as requiring action across all of these sites.

**Environment Strategy for Wales**
The Environment Strategy for Wales is the Welsh Assembly Government's long term strategy for the environment of Wales, setting the strategic direction for the next 20 years. It is supported by a series of regularly updated action plans and a policy map setting out the key actions that will be taken to deliver the outcomes in the Strategy. The purpose of the Strategy is to provide the framework within which to achieve an environment which is clean, healthy, biologically diverse and valued by the people of Wales.

'The Strategy states that access must be managed properly to ensure that the very asset that we want people to use is not degraded'. (P. 46). One of the desired outcomes of the strategy is that there will be sustainable, widespread and equitable access to the countryside and that damaging access will be discouraged. The focus of activity will include a number of strands including increasing access to the countryside and managing the volume of people and ensuring that associated infrastructure minimises its impact on the environment. Action 26 of the 'First Action Plan' states that:

> 'We will seek to manage increased access to the countryside effectively and develop best practice through supporting pilot projects on sustainable public recreation that can be replicated elsewhere'. (P.6)

**BBNP Draft Rights of Way Improvement Plan**
The Rights of Way Improvement Plan (ROWIP) contains a fundamental review of the condition of the public path network, how it is managed and how it can be improved for all legal users, in the BBNP. It is a statutory document that local authorities are required to produce under section 60 of the CROW Act; in this case the BBNPA (in conjunction with the constituent Highways Authorities) has produced a single plan for the whole National Park.

It is intended that the ROWIP will set out the NPA's priorities in terms of access management for the next 10 years. It is also designed to act as a bidding document that will explain to potential donors what the issues are and where the priorities lie.

The ROWIP concentrates primarily on the public path network although it also recognises the importance of access land designated under the CROW Act and occasionally other legislation and agreements. Most upland erosion in the BBNP occurs on paths that do not yet appear on the Definitive Map, on paths that have nevertheless developed as a result of use by the public on a de facto basis - this access is now as of right.

Section 3.2.3 of the ROWIP states as a policy that:

"The BBNPA will continue to take positive steps to control erosion on public rights of way and tracks within access land". It also concludes that assessments of the prow and access network have identified a need to establish a system of monitoring erosion of public rights of way and to

establish a programme for dealing with erosion of public rights of way. Key Action 10 of the same section of the ROWIP states that BBNPA should take positive steps to monitor and control erosion on public rights of way and on tracks in CROW access land.

**National Park Management Plan**
The National Park Management Plan (NPMP) for 2000 – 2005 includes in its aims, objectives and actions, the aim to promote public access to the Park for the enjoyment of its special qualities by implementing the Upland Erosion Project to repair eroded paths. The NPMP is currently under review since it is at the end of its current cycle. However since the issue is still a problem in the Park it seems likely that it will remain an action to be dealt with.

**Sustainability**
BBNPA uses a sustainable impact assessment for any recommendations requiring Authority decisions. The assessment is based on scoring the impact of actions on a list of criteria (below).

| | Positive | Neutral/ not applicable | Negative |
|---|---|---|---|
| Natural resources and materials | | | |
| Energy | | | |
| Land/ air/ water quality | | | |
| Environmental awareness | | | |
| Community involvement (national and local) | | | |
| Access for all | | | |
| Transport | | | |
| Biodiversity | | | |
| Landscape | | | |
| Built environment | | | |
| Health | | | |
| Leisure/ recreation | | | |
| Waste management (production/ reduction) | | | |
| Meeting needs from local resources | | | |
| Meeting needs of local people | | | |
| Ethics | | | |
| Other | | | |

Whilst the desired impact of undertaking works is that they will have a positive impact on sustainability of the Park it will be important to ensure that the impact of the actual works is minimised as far as is practicable. Consideration of materials to be used, whether they can be obtained on site, transport of materials etc are all issues that should be considered at an early stage of project design.

## 1.6 Guiding Principles

The following principles have been formulated by the Lake District Upland Access Management Group, adapted from the BMC policy statement on the repair and management of upland paths. They have been accepted and adopted by the House of Commons Environment Select Committee (in 1995) as the best practice guidelines to establish a nationwide approach for the repair and maintenance of upland footpaths.

The repair and maintenance of paths in open country are subject to the following considerations that:

- Repairs are necessary to prevent or ameliorate visual intrusion and environmental damage.
- Works should be of a high standard of design and implementation using indigenous materials, sympathetic in colour and texture to the immediate surrounding area. Uniformity of construction should be avoided e.g. steps
- Techniques used should protect existing vegetation and, normally, only locally occurring plant species should be used in restoration. Non local species will be accepted only where necessary as a nurse crop and where natural succession will rapidly result in their disappearance.
- The more remote the path, the more stringently the criteria for path repairs should be applied. This will be a matter of judgment but in general, the more remote or wild the location the less acceptable an obviously engineered path will be.
- Repaired paths should be suitable to the routes use and constructed on a scale appropriate for the intended use as a footpath, bridleway or byway.
- Before any repair work is agreed the question should be asked 'is there a better solution?'
- The use of way marks, cairns or other intrusive features, other than those traditionally established on summits and path junctions will be discouraged.
- A sustained commitment of resources to path management will be sought, so that small-scale continuous maintenance can replace infrequent major repairs as the normal method of path management.

(BUFT, Mending our Ways)

The path survey had regard of these principles and the work that was identified reflects the philosophy underlying these principles. In more detailed terms the survey also had regard to 'Upland Pathwork - construction standards for Scotland', which sets out broad standards for path work and could easily be adapted to the BBNP context.

## 1.7 Recommendations from Section 1

- BBNPA adopt the Guiding Principles identified in 1.4 as policy
- BBNPA adapt where necessary the standards described in 'Upland Pathwork - construction standards for Scotland' and adopt as standards to be used when BBNPA undertake upland path works in the BBNP, and encourage other land owners and organisations to also adopt these standards.

## 2. Path Survey

A medium scale survey of upland paths in the BBNP was undertaken during the summer of 2006. This section describes the survey methodology and geographical location of the paths that were surveyed. The full survey data are held in Annex 1 or more usefully can be accessed on Microsoft Excel Application from the enclosed CD ROM.

### 2.1 Background

The Definitive Map covering the BBNP records 1,983 km of public rights of way, but the density varies across the Park and in the upland areas relatively few are currently recorded on the Definitive Map, largely for historical reasons. However a large number of paths do exist on the ground in the hills and in order to make the survey manageable it was necessary to employ a filter system so that only the most eroded or most important paths in terms of access provision were surveyed. Some other paths lying outside these criteria were also surveyed when it made sense to complete a circular route on the survey day for example.

Since access and subsequent erosion is a dynamic process it is accepted that some areas of upland erosion may not have been included in the survey at this time (e.g. the Blorenge, Twmpa – Capel y Ffinn) partly due to time constraints and partly due to gaps in our knowledge at the time of identifying paths to be surveyed. It is therefore recognised that additional paths may be surveyed and data added to that already collected when appropriate. For the purposes of this report the list of eroded paths that was surveyed was compiled through the detailed knowledge of the BBNPA warden service and access and rights of way section and is detailed below (table 1).

### 2.2 Path Locations and Lengths

The path survey examined 154,850 metres of upland paths across the entire BBNP. Table 1 provides the length of individual paths that were surveyed and figures 1 - 4 have been used to plot paths spatially. Table 2 shows the distribution of surveyed across the BBNP based on BBNPA's three management areas.

***Table 1 – Length of Individual Paths***

| Path name | Length (metres) |
|---|---|
| Bal Bach - Grwyne Fawr | 1255 |
| Bwlch - Blaen Twrch | 251 |
| Llyn y Fan Fawr - Bwlch y Giedd | 433 |
| Blaen Llia - Craig cerrig gleisiad | 7558 |
| Beacons Way, central | 1495 |
| Beacons way n escarp base | 2771 |
| Cwm Bwchel | 1289 |
| Cwm Cwnstab - Waun Fach | 3544 |
| Chwarel y Fan - Bal Bach | 3731 |
| Gap rd - Craig Cwmoergwm | 976 |
| Capel y Ffinn (The Grange) - Chwarel y Fan | 1708 |
| Carn Pica | 4607 |
| Craig y Fan | 5809 |
| Craig y Fan Ddu - n. escarp | 2873 |
| Bwlch y Giedd - Fan Foel | 6222 |
| Fan Foel - Llyn y Fan Fawr | 2219 |
| Fan Fawr | 2621 |

| | |
|---|---|
| Bwlch y Giedd - Fan Hir -Tafarn y Garreg | 5035 |
| Fan y Big North escarp | 3841 |
| Gap - Cribyn | 2198 |
| Bwlch ar y Fan(Gap) - Fan y Big | 562 |
| Graig Fan Ddu - Corn Du | 4678 |
| Grwyne Fawr dam - north escarp | 4048 |
| Gospel Pass - Twmpa | 1246 |
| Gospel Pass - Hay Bluff - Standing stone car park | 2743 |
| Hay Bluff CP - Offas Dyke | 7371 |
| Loxidge - Capel y Ffin (Offas Dyke) | 3333 |
| Llanthony - Loxidge | 1311 |
| Llyn y Fan Fach - ridge | 4533 |
| MacNamara's road - Crickhowell | 10687 |
| Neuadd - Grig y fan ddu | 1153 |
| Offas Dyke - Hay Bluff | 1170 |
| Neuadd - ridge | 980 |
| Offas Dyke - Three Wells | 8782 |
| Pen y Fan - Gap Rd | 2702 |
| Pen y Fan - Pont ar Daf | 3163 |
| Pen y Fan Traverse (new path) | 734 |
| Pen y Gadair Fawr - Waun Fach - Crickhowell | 5840 |
| Queens Haed - Cwm Bwchel | 5827 |
| Skirrid | 1554 |
| Storey Arms - Pen y Fan | 3939 |
| Trig point - Bal Bach | 6769 |
| Tafarn y Garreg - Llyn y Fan Fawr | 4846 |
| Old Trecastle Road - Llyn y Fan fawr | 2855 |
| Twmpa - Cwm Cwmstab | 3588 |
| | |
| Total length | 154 851 |

***Figure 1 – Paths Surveyed, Eastern area (north)***

***Figure 2 – Paths Surveyed, Eastern area (south)***

***Figure 3 – Paths Surveyed, Central area***

***Figure 4 – Paths Surveyed, Western area***

***Table 2 - Distribution of Surveyed Paths Across the BBNP***

| | Western area | Eastern area | Central area | Total |
|---|---|---|---|---|
| Metres Surveyed | 29 163 | 75 798 | 49 888 | 154 849 |
| % of total m | 19 | 49 | 32 | 100 |

## 2.3 Upland Path Survey

The objective of undertaking the path survey was to collect information about path condition in as objective a way possible. This survey method was designed to collect information relatively quickly that would allow a strategic picture to emerge and that would allow calculation of global costs for repair, maintenance and pre-emptive works required to the network. This survey technique was not designed to be used as specification for works documents.

A total of 154 850 metres of path were surveyed. The data was recorded by a single surveyor walking the path line and this data was later down loaded to a PC in the office. The survey methodology was based on a similar survey method developed by Scottish Natural Heritage, Pathcraft Ltd and ITE, for the Cairngorm Upland Footpath Survey 1995, and now used as a standard for upland path surveys in Scotland.

The paths identified in table 1 were identified as having sections that were eroded or potentially in danger of becoming eroded by staff working for BBNPA.

Each path was divided into sections in the field, each section along a path being more or less homogenous in nature. When the character of the path changed a new section was recorded. The start and end points of each section were identified by a 10 figure grid reference generated by global positioning system (GPS) handset. A range of site conditions were measured, such as path width, gradient, roughness and so on (see Annex 2).

The conditions that were measured were chosen because generally they are the key factors that affect path erosion or are a consequence of erosion and therefore indicate that it is actually occurring. The number of factors measured was kept to a minimum in order to keep the survey concise and to speed data collection. For a number of elements such as average width of bare ground, measurements recorded a range such as <0.5metres, 0.5 – 1m, 1m - 2m, 2 - 3m, 3 - 4m etc. This method provided adequate information and speeded data collection.

It was judged that this type of survey method would be as objective as possible given constraints of time and resources, but did require the surveyor to make judgements in the field about certain aspects of path condition. There was also a certain amount of subjectivity involved in making decisions about when one path section should stop and another section should start. The path surveyor drew on previous experience of path dynamics when deciding whether a path section was deteriorating, stable or recovering. The BBNPA survey did not assign a priority (in terms of how urgent it was to actively manage a path section) in the field but simply recorded whether the path section was stable, deteriorating or recovering and what type of management would be required to ensure that it was stabilised. It was felt that the field data could be examined in more detail in the office and that it would be more appropriate to assign priorities then.

In the office the various path elements were assigned a 'weighting' depending on their perceived significance in terms of path condition, erosion and development so, for example, gradient scores were multiplied by 4 whereas worn path width was multiplied by 2. The scores for all attributes for each path section were added together to provide an overall priority to undertake works for that section in terms of physical path condition.

It had been hoped that it would be possible to use data about levels of use and promotion to arrive at an overall priority for works but unfortunately this has not been possible. Data on levels of use is not comprehensive to attribute objective levels of use to individual paths and the situation regarding promotion is even more complicated (e.g. most guides provide information about more than one route and Ordnance Survey maps provide infinite route options). The survey did not have adequate resources to undertake sufficient face to face surveys to obtain sufficient information to make data reliable.

## 2.4 Cost Calculations

The surveyor identified the type of work (e.g. stone pitching, sub soiling etc.) required for each path section in the field. Costs for each section of path were then calculated using average costs per metre for each type of treatment required. These average costs were calculated from costings based on recent experience of using these solutions.

The survey sheets and surveyor guidance notes appear in Annex 3

## 2.5 Recommendations from Section 2

- BBNPA to undertake path surveys (using the methodology adopted here) on individual paths that may have been missed during this survey that are eroded or likely to become eroded due to increased promotion and use etc.

- BBNPA to undertake a survey (using the methodology adopted here) of all paths covered on this occasion and including any other paths subsequently surveyed every 3 years.

- BBNPA to compare data subsequently collected with base line to detect improvements or deterioration.

## 3. Significant Results – Path Condition

A large amount of data has been collected during the path survey and the following section presents the significant conclusions that can be drawn from that data. (The complete data derived from the path survey is held in Annex 4).

### 3.1 Priority

The highest score for a path section was 113 on the Pen y Gadair Fawr - Waun Fach path however to simplify the prioritising process the score levels have been grouped into the following categories:

| Priority | Score | |
|---|---|---|
| 1 | 80 or more | Very high priority |
| 2 | 70 - 79 | High priority |
| 3 | 60 – 69 | Medium priority |
| 4 | 50 – 59 | Low priority |
| 5 | under 50 | Monitor only |

Table 3 shows the length of path in each priority group. Nearly 30 % of paths were in the categories of high or very high priority. Approximately 57% of paths were priority 4 or 5, which are low priority.

***Table 3 – Length of Path in Each Priority Group***

| Priority | Length in metres | % |
|---|---|---|
| 1 | 24,562 | 16 |
| 2 | 21,522 | 14 |
| 3 | 19,799 | 13 |
| 4 | 29,185 | 19 |
| 5 | 59,784 | 38 |
| Total | 154,851 | 100 |

An attempt was made to attribute overall priority to whole paths by aggregating the scores of the sections within them (Table 4). Although this could be used to provide an indicative ranking of paths in terms of path condition it is not particularly useful since it hides so much variation between sections within entire paths. It also is affected by the overall length of the path, for example the path from Llyn y Fan Fawr - Bwlch y Giedd comprises 433 metres all scoring more than 80 and is ranked as the highest priority path overall, However the Pen y Gadair Fawr - Waun Fach - MacNamara's road path comprises 5840 metres of which 2191 metres score over 80.

***Table 4 – Overall Priority to Whole Path***

| Path | Length | Total Priority |
|---|---|---|
| Llyn y Fan Fawr - Bwlch y Giedd | 433 | 89 |
| Neuadd - ridge | 980 | 80 |
| Gospel Pass - Twmpa | 1246 | 79 |
| Pen y Fan - Gap Rd | 2702 | 75 |
| Cwm Cwnstab - Waun Fach | 3544 | 75 |
| Craig y Fan Ddu - n. escarp | 2873 | 71 |
| Pen y Gadair Fawr - Waun Fach - MacNamara's road | 5840 | 71 |
| Gap – Cribyn | 2198 | 70 |

| | | |
|---|---|---|
| Graig Fan Ddu - Corn Du | 4678 | 70 |
| Fan y Big North escarp | 3841 | 69 |
| Llyn y Fan Fach - ridge | 4533 | 68 |
| Carn Pica | 4607 | 66 |
| Bwlch - Blaen twrch | 251 | 64 |
| Loxidge - Capel y Ffin (Offas Dyke) | 3333 | 64 |
| Grwyne Fawr dam - north escarp | 4048 | 64 |
| MacNamara's road - Crickhowell | 10687 | 63 |
| Pen y Fan - Pont ar Daf | 3163 | 63 |
| Fan Fawr | 2621 | 62 |
| Bwlch y Giedd - Fan Foel | 6222 | 61 |
| Chwarel y Fan - Bal Bach | 3731 | 61 |
| Capel y Ffinn - Chwarel y Fan | 1708 | 60 |
| Gap rd - Craig Cwmoergwm | 976 | 59 |
| Bal Bach - Grwyne Fawr | 1255 | 59 |
| Hay Bluff CP - Offas Dyke | 7371 | 59 |
| Llanthony - Loxidge | 1311 | 58 |
| Cwm Bwchel | 1289 | 58 |
| Twmpa - Cwm Cwmstab | 3588 | 57 |
| Neuadd - Grig y fan ddu | 1153 | 53 |
| Skirrid | 1554 | 52 |
| Gospel Pass - Hay Bluff - Standing stone car park | 2743 | 52 |
| Storey Arms - Pen y Fan | 3939 | 51 |
| Blaen Llia - Craig cerrig gleisiad | 7558 | 50 |
| Pen y Fan Traverse (new path) | 734 | 50 |
| Offas Dyke - Three Wells | 8782 | 50 |
| Queens Haed - Cwm Bwchel | 5827 | 49 |
| Bwlch ar y Fan(Gap) - Fan y Big | 562 | 46 |
| Craig y Fan | 5809 | 45 |
| Old Trecastle Road - Llyn y Fan fawr | 2854 | 44 |
| Bwlch y Giedd - Fan Hir -Tafarn y Garreg | 5035 | 43 |
| Fan Foel - Llyn y Fan Fawr | 2219 | 42 |
| Beacons Way, central | 1495 | 42 |
| Offas Dyke - Hay Bluff | 1170 | 39 |
| Beacons way n escarp base | 2771 | 39 |
| Trig point - Bal Bach | 6769 | 38 |
| Tafarn y Garreg - Llyn y Fan Fawr | 4846 | 34 |

Figures 5 - 8 graphically illustrate the location of paths surveyed and priorities of sections within each path

***Figure 5 - Section Priorities, Eastern area (north)***

***Figure 6 - Section Priorities, Eastern area (south)***

***Figure 7 – Section Priorities, Central Area***

***Figure 8- Section Priorities, Western area***

## 3.2 Gradient

Path gradient (steepness of path) is one of the physical characteristics that most influences path development. Paths that are on gradients of more than 15° are frequently unstable and liable to gullying. Eric Langmuir suggests the following analogies: a slope angle of 5° is equivalent to a gentle slope allowing normal walking but equivalent to a fairly steep road, on a slope of 10° walkers can still walk directly uphill but it is the equivalent of a very steep road or an easy ski slope angle, a slope of 15° is the limit of road gradients, 20° requires careful foot placement by walkers, and at 25° most people tend to zig zag when walking uphill. In addition walkers' behavior may vary depending on whether they are ascending or descending a steep slope. In ascent the line of vision is much shorter and it is easier to encourage people to remain on a path that is well designed that does not necessarily climb the slope directly because it will be more difficult to see the destination. In descent the walker will often be able to see the path line below them and unless the alignment is reasonably direct or other design features are used many walkers are liable to short cut corners of paths that zig zag in order to reduce gradient.

If path gradients are particularly low then the path may be liable to holding surface water and, depending on the substrate material may be boggy.

Table 5 shows the total length of path in terms of three gradient categories.

***Table 5 - Path Length by Path Gradient***

| Gradient | Length (m) | % |
|---|---|---|
| <10° | 99 761 | 64.42 |
| 10 ° - 15 ° | 32 824 | 21.20 |
| >15 ° | 22 265 | 14.38 |
| | | |
| Total | 154 850 | 100 |

Table 6 shows the relationship between priority 1 and 2 path sections against gradient. It is very clear that a high percentage (just over 40%) of priority 1 and 2 path is on gradient of more than 15°.

***Table 6 - Path Gradient - Priority 1 and 2 by Length***

| Gradient | Length priority 1 | % of priority 1 & 2 length |
|---|---|---|
| <10° | 11 217 | 11.24 |
| 10 ° - 15 ° | 6 176 | 18.82 |
| >15 ° | 7 139 | 32.06 |
| | Length priority 2 | % of priority 1 & 2 length |
| <10° | 14 748 | 14.78 |
| 10 ° - 15 ° | 4 901 | 14.93 |
| >15 ° | 1 872 | 8.41 |

## 3.3 Path width

Both bare path width and worn path width were measured. Traditionally constructed or recently repaired paths for pedestrians tend to be around 0.75 - 1.2 metres wide in upland settings. Paths that have bare widths in excess of 2 metres can have a significantly detrimental effect on the

upland landscape (for context, a single track vehicle road is about 3 metres wide). The data in Table 7 illustrates that 14% of the path length surveyed had a bare width of 2 metres or more. Interestingly just over 63 Km (41 %) of the path length surveyed had a bare width of less than 0.5 metres and this includes nearly 44 km with no bare ground at all.

Nearly 20% of path surveyed had worn width of more than 5 metres, in some circumstances worn width has increased due to drainage problems or because the path surface is rough but in other situations worn width may be relatively wide because walkers are not confined to a single narrow line.

***Table 7 - Length of Bare and Worn Path Widths***

| Bare width (m) | length | % | Worn width (m) | length | % |
|---|---|---|---|---|---|
| 0 - 0.49 | 63018 | 41 | <0.99 | 19580 | 13 |
| 0.5 - 0.99 | 32050 | 21 | 1 – 1.99 | 27517 | 18 |
| 1 -1.99 | 37206 | 24 | 2 – 2.99 | 44266 | 29 |
| 2 – 3.99 | 20317 | 13 | 3 – 4.99 | 33805 | 22 |
| >4m | 2259 | 1 | >5m | 29682 | 19 |

## 3.4 Drainage

In the context of upland paths both running water and standing water can be damaging to paths or path margins.

Running water on unsealed upland paths can be extremely damaging especially on steep slopes and tends to lead to path gullying. Large volumes of surface material can be removed from the path surface and this material can also cause damage by inundating material where it is deposited. Walkers tend to avoid gullied paths especially if they run directly up a slope and this obviously leads to further trampling of the path margins. Paths that traverse slopes can also be significantly affected by running water if the path intercepts natural flow lines and the direction of flow becomes diverted along the path surface.

Standing water can deter walkers from staying on path line as they try to avoid the water. Standing water will also affect the path surface unless it is sealed, so waterlogged peat for example can become extremely boggy. Walkers tend to avoid water logged paths especially if they are also muddy this obviously leads to further trampling of the path margins.

Table 8 shows the length of path affected by running water and standing water. The large length of path that it was considered would not be affected by standing water is probably affected to a certain degree by the very dry weather during and preceding the survey. However it was thought that a significant length of path was heavily affected by running water (18% in category 4 or 5) and it was probably the case that this was more easily and accurately recorded because the evidence of the effects of running water are more easily identifiable than standing water.

***Table 8 – Length of Path Affected by Running/Standing Water***

| Standing water as % of section | Length | % | | Running water | Index | Length | % |
|---|---|---|---|---|---|---|---|
| none | 83673 | 54 | | absent | 1 | 39610 | 26 |
| 1 – 9 | 36241 | 23 | | | 2 | 53426 | 35 |
| 10 – 19 | 28107 | 18 | | moderate | 3 | 34888 | 23 |
| 20 - 49 | 5101 | 3 | | | 4 | 15277 | 10 |
| > 50 | 1729 | 1 | | severe | 5 | 11650 | 8 |
| Total | 154851 | 100 | | | | 154851 | 100 |

Table 9 illustrates the relationship between running and standing water and path condition. 89% of path length that it was considered to be severely affected by running water (5), for example was also in the priority 1 or very high priority category in terms of requiring ameliorative action. To a slightly lesser extent path sections badly affected by standing water tend to be of high priority, e.g. 55% of path scoring 5 for standing water was also in the priority 1 category.

***Table 9 - Relationship between Running and Standing Water and Priority***

| | Running water | | Running water | | Standing water | | Standing water | |
|---|---|---|---|---|---|---|---|---|
| | 5 | % | 4 | % | 5 | % | 4 | % |
| Priority | | | | | | | | |
| 1 | 10335 | 89 | 7177 | 47 | 955 | 55 | 2684 | 53 |
| 2 | 805 | 5 | 6483 | 42 | 0 | 0 | 382 | 7 |
| Sub total | 11140 | 93.98181 | 13660 | 89.41546 | 955 | 55.23424 | 3066 | 60.10586 |

## 3.5 Surface

Inevitably, the informal evolution of mountain routes, or the lack of maintenance on formally constructed paths, means that their surfaces tend to comprise a mix of materials. Even on constructed paths, materials are washed onto or away from the path surface over time, and what may have started life as a fairly uniform surface dressing may eventually become quite varied in content.

The most significant surface material to deal with in the context of mountain paths is exposed peat due to its low tolerance to trampling. This makes it especially unsuitable as a path surface on anything other than very lightly used paths. In addition to this, there are no low cost solutions to managing paths on peat at present. Table 10 describes the path length of various surface types

***Table 10 - Path Surface by Length***

| Path surface | Length | % |
|---|---|---|
| Vegetation | 43909 | 28 |
| Mineral and rock | 65550 | 42 |
| Mineral material | 6158 | 4 |
| Peat and rock | 10582 | 7 |
| Shallow Peat (<0.5m) | 23462 | 15 |
| Deep Peat (>0.5m) | 5191 | 3 |
| Total | 154 852 | 100 |

18 % of the path length surveyed comprised surfaces of peat only and a further 7% comprised a matrix of material where peat was a significant component. It has been observed elsewhere that where peat is relatively well drained and remnant root systems are still present, or gravels have washed onto the exposed peat surface and trampling is not too heavy, peat appears to hold up reasonably well to light trampling. Poorly drained peat however, such as that found on the Waun Fach path, will not support trampling. Table 11 illustrates this point – 85 % of path length that occurred on deep peat was considered to be priority 1 and 55% of path length that occurred on shallow peat was considered to be priority 1 or 2.

***Table 11 – Path Surface by Priority***

| Path surface | Pr 1 | % of total surface type | Pr 2 | % of total surface type | Pr 3 | % of total surface type | Pr 4 | % of total surface type | Pr 5 | % of total surface type |
|---|---|---|---|---|---|---|---|---|---|---|
| Vegetation | 0 | 0 | 0 | 0 | 0 | 0 | 8781 | 20 | 35127 | 80 |
| Mineral & rock | 9155 | 14 | 9964 | 15 | 12242 | 19 | 13413 | 20 | 20775 | 32 |
| Mineral material | 1203 | 20 | 1230 | 20 | 858 | 14 | 1229 | 20 | 1638 | 27 |
| | | | | | | | | | | |
| Peat & rock | 3709 | 35 | 3695 | 35 | 1707 | 16 | 1470 | 14 | 0 | 0 |
| Shallow Peat <0.5m deep | 6084 | 26 | 6197 | 26 | 4645 | 20 | 4292 | 18 | 2243 | 10 |
| Deep Peat >0.5m deep | 4409 | 85 | 436 | 8 | 347 | 7 | 0 | 0 | 0 | 0 |
| | 24560 | | 21522 | 14 | 19799 | 13 | 29185 | 19 | 59783 | 39 |

One difficulty in trying to restore vegetation cover to exposed peat is that it can be extremely comfortable to walk on when dry and unless measures are taken to deter trampling on it then this can impede recovery.

28% of path length is vegetated, mainly due to low use historically, spread of wear over a wide area or good substrate and drainage conditions for example. A number of path sections that were surveyed may be subject to imminent changes in levels of use, for example along the line of the Beacons Way, and this may well have an effect on surface composition and condition. Currently however 80 % of surveyed path length which was vegetated was considered to be priority 5 (low priority for action).

Different species of plants have differing tolerance to trampling. Narrow leafed grasses generally have a much higher tolerance to trampling than heather. Other factors also affect the survival of path vegetation, especially drainage, compaction and substrate. If the ground were a poorly drained peat substrate with high levels of use, one would not expect robust vegetation to survive on the path line.

46% of the path length surveyed was on aggregate surfaces, or aggregate and rock surfaces. Almost all of these sections were on paths that had evolved over time and had not been formally constructed, the surface was therefore naturally occurring and not necessarily well graded.

## 3.6 Depth

Gullying was a significant but not huge problem across the Park and approximately 4% of the total path length had a depth of more than 400mm. Taking into consideration data about path surface it is possible to calculate that 1473 metres showed no signs of gullying at all and 56% in terms of length have a depth of less than 50 mm. The deepest gully recorded was 750mm deep however problems of this scale tended to be fairly localised.

Table 12 illustrates the relationship between gullying and priority. 87.7% of the path length with a depth of over 400 mm for example was considered to be priority 1, and conversely less than 1%

of path with a depth of less than 50 mm was considered to be of that priority. It should be remembered that gullying is usually the result of poor drainage and if a path section is severely gullied it is likely that other negative features will be associated with it

***Table 12 - Path Depth***

| Depth mm | metres | Metres of Priority 1 | % of depth: pr 1 category | Metres of Priority 2 | % of depth: pr 2 category | Total % of Pr 1 + 2 |
|---|---|---|---|---|---|---|
| >400 | 6378 | 5595 | 87.72 | 783 | 12.28 | 100.00 |
| 200 - 399 | 14514 | 9694 | 66.79 | 3530 | 24.32 | 91.11 |
| 100 -199 | 14887 | 4370 | 29.35 | 5716 | 38.40 | 67.75 |
| 50 - 99 | 32162 | 4585 | 14.26 | 9275 | 28.84 | 43.09 |
| 0 - 49 | 86910 | 319 | 0.37 | 2217 | 2.55 | 2.92 |
| Total | 154851 | 24563 | 198.49 | 21521 | 106.38 | 304.87 |

## 3.7 Existing Path Condition

Path condition was an assessment made by the surveyor of whether a path was currently in good, moderate or poor condition. The surveyor used a scale of 1 – 5 to indicate his assessment, 1 being in good condition and 5 being in very poor condition. This measure differs from path priority because a path may be in very poor condition but may also be stable in which case the priority for works may not be extremely high because the path is not continuing to deteriorate, or a section of path may currently be in good condition but in danger of deteriorating if no pre-emptive works are undertaken and in such a scenario priority to undertake works would probably be high despite the current condition being good.

Interestingly 24 469 metres or 16% of path was considered to be in poor or very poor (score 4 or 5) condition (table 13) however 46 084 metres or 30%, almost double the length, were considered to be high or very high priority in terms of requiring work to be undertaken on them.

***Table 13 - Path Condition***

| Condition Score | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2 | | 3 | | 4 | | 5 | |
| metres | % of total length | metres | % of total length | metres | % of total length | metres | % of total length | metres | % of total length |
| 5796 | 4 | 18673 | 12 | 31891 | 21 | 51084 | 33 | 47406 | 31 |

In terms of cost it is calculated that it will cost approximately £73 per metre to repair path considered to be in very poor condition (score 5), and as can be seen from Table 14 below, cost per metre declines significantly as condition improves.

***Table 14 - Condition and Cost***

| | Condition Score | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Cost | 424,620 | 890,192 | 680,616 | 377,554 | 63,383 |
| Metres | 5796 | 18673 | 31891 | 51084 | 47406 |
| £/m | 73 | 48 | 21 | 7 | 1 |

There are potentially large cost benefits in ensuring that path sections do not deteriorate as cost of works increase as condition declines. Additionally the scale of works required to repair grossly damaged path sections is much greater than taking a pre-emptive approach and the style of works

may appear heavily engineered and out of context if no action is taken until major works are required.

## 3.8 Dynamism

Path dynamism describes a process and because the survey simply looked at paths on one occasion there is obviously a level of speculation when using the Dynamism index. However, this judgment was informed by experience of a surveyor with over 15 year's experience of upland path management. Some sections of path on the slopes of Pen y Fan that have not been repaired are obviously highly dynamic, there is evidence of gullying, of material being lost from the path line and of widening of the path and visitor numbers are have been consistently high over a number of years. Other path sections (for example on the line of the Beacons Way between Blaen Llia and Craig Cerrig Gleisiad) however currently have vegetated surfaces, largely on low gradients, but is anticipated to have increasing visitor numbers due to its recent designation. Increased visitor numbers may be a trigger that increases dynamism of this path section in the future however on this occasion it appeared to be relatively stable.

Table 15 describes the length of path in the five categories of dynamism against priority groupings. Cost of works against each length and the percentage of path length in terms of each priority are also shown. Therefore 5,227 metres of path were considered to score 5 on the index of dynamism (most dynamic) and were also considered to be of the highest priority (1). 5227 metres also represented 100% of path length in the Category 5 for dynamism.

In overall terms, only 3% of the total path length was considered to score 5 on the dynamism index; however that represents approximately 17% of total costs for repair of all paths. If we combine scores of 4 and 5 in terms of dynamism the length of path is 14% and equates to 49% of cost.

The most dynamic path sections tended to require the most expensive work treatments due to the level of damage that has already occurred, whilst the least dynamic required cheaper solutions or monitoring only (Table 16). Prior to survey it had been anticipated that it may be possible to treat some of the more dynamic paths with lower cost solutions however in practice this is not the case because path sections that are most dynamic have already deteriorated to such an extent that major intervention is now required. There are sections along the Beacons Way that are currently stable but may become dynamic fairly quickly. In order to ensure that major works are not required in the future along this route the condition should be monitored so that low key intervention can occur if necessary to prevent major deterioration.

## 3.9 Recommendations from section 3

- Review cost of works to take account of potential above inflation increases – i.e. cost of each type of treatment – and edit any potential funding applications appropriately.

- Maintain spreadsheet of survey data and analyses for comparison with subsequent surveys

***Table 15 – Dynamism – Length of Path in Each Category***

| | Dynamism | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | Total m |
| Priority | Metres | Cost £ | % | Metres | Cost £ | % | Metres | Cost £ | % | Metres | Cost £ | % | Metres | Cost £ | % | |
| 1 | 5,227 | 408,639 | 100 | 15,565 | 715,707 | 91 | 3769 | 161,003 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 24561 |
| 2 | 0 | 0 | 0 | 1574 | 68811 | 9 | 19,880 | 473,863 | 50 | 67 | 3,355 | 0.1 | 0 | 0 | 0 | 21521 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 12,226 | 187,280 | 31 | 7,574 | 83,471 | 15 | 0 | 0 | 0 | 19800 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2,186 | 38,468 | 6 | 24,151 | 121,214 | 48 | 2,848 | 1,940 | 7 | 29185 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 1,657 | 6,454 | 4 | 18,626 | 116,228 | 37 | 39,501 | 49,708 | 93 | 59784 |
| Total | 5,227 | 408,639 | 100 | 17,139 | 784,518 | 100 | 39,718 | 867,068 | 100 | 50,418 | 324,268 | 100 | 42,349 | 51,648 | 100 | 154,851 |
| % of total path length | 3% | | | 11% | | | 26% | | | 33% | | | 27% | | | |

***Table 16 – Dynamism (Cost of Works per Metre)***

| | Cost of works per metre | | | | | |
|---|---|---|---|---|---|---|
| | £120 | £50 | £25 | £8 | £4 | £0.5 |
| dynamism | | | | | | |
| 1 | 2802 | 472 | 1954 | 0 | 0 | 0 |
| 2 | 3571 | 1564 | 10783 | 821 | 400 | 0 |
| 3 | 1529 | 2217 | 18322 | 13131 | 2123 | 2396 |
| 4 | 0 | 306 | 4420 | 10809 | 27002 | 7880 |
| 5 | 0 | 0 | 165 | 167 | 7244 | 34774 |
| Total length | 7902 | 4559 | 35644 | 24928 | 36769 | 45050 |

## 4. Significant Results - Path Management

This section brings together all of the path characteristics and condition attributes described in section 3.0 and assesses the overall requirements for path management and their costs. It describes the length and scale of path repairs needed, as well as the approximate costs of undertaking differing levels of path repair needed.

### 4.1 Ownership

Tables 17 and 18 give an indication of the ownership of land on which upland path erosion is occurring in the Park. The figures below cannot be taken as being totally accurate as some paths that were surveyed are found on the march between two properties, in these circumstances an assumption has been made about ownership. The figures do however illustrate some interesting trends. Significant erosion issues occur on properties in the ownership of eight to ten organisations, individuals or families.

Just over 37% (by cost) of works are required on land owned and/or managed by the BBNPA and National Trust. Substantial levels of work are required on all of the landholdings identified in tables 17 and 18.

***Table 17 – Owners of Land Where Erosion Identified***

| Owner | BBNPA | Public / private | Public/ private | Private sector | Private sector | Private sector |
|---|---|---|---|---|---|---|
| Length | 50,607 | 3,333 | 3,588 | 10,687 | 5,697 | 7,371 |
| Cost £ | 443,733 | 56,311 | 112,725 | 189,293 | 89,845 | 96,498 |
| | | | | | | |
| Owner | Private sector | Charitable | NT | Private sector | Private sector | Total |
| Length | 25,187 | 20,163 | 21,101 | 1,289 | 5,827 | 154,850 |
| Cost £ | 594,143 | 332,708 | 465,661 | 7,626 | 47,878 | 2,436,421 |

***Table 18 – Owners of Land – Priority 1 and 2 Paths***

| Owner | BBNPA | Public/ private | Private sector | Private sector | Private sector | Charitable | NT | Private sector | Private sector | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Length pr 1 | 4567 | 614 | 1,746 | 715 | 9,659 | 3,065 | 3,875 | 400 | 176 | 24817 |
| Cost £ | 220,979 | 31,580 | 99,863 | 36,040 | 449,539 | 191,448 | 233,419 | 1,602 | 4,400 | 1,268,870 |

| Owner | BBNPA | Public private | Public private | Private sector | Private sector | Private sector | Charit-able | NT | Private sector | Private sector | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Length pr 2 | 6,170 | 440 | 79 | 1,646 | 1,367 | 2,687 | 1,304 | 5,176 | 1,631 | 884 | 21,384 |
| Cost £ | 114,824 | 34,700 | 1,980 | 41,140 | 26,495 | 87,853 | 35,096 | 146,390 | 197,08 | 31,787 | 539,973 |

### 4.2 Path accessibility

Over 51,000 metres (approximately 33%) of path that were surveyed were 45 minutes or more walk from the nearest vehicular access. Table 19 and figures 9 – 11 show the location of relevant path sections.

***Table 19 - Sections > 45mins Walk from Vehicular Access***

| Path | sns> 45mins walk | Length (m) |
|---|---|---|
| Twmpa - Cwm Cwnstab | 4 to 11 | 2378 |
| Llyn y Fan Fawr - Bwlch y Giedd | 1 to 4 | 433 |
| Blaen Llia - Craig cerrig gleisiad | 13 to 28 | 3500 |
| Beacons Way, central | 1 to 4 | 1459 |
| Cwm Cwnstab - Waun Fach | 1 to12 | 3544 |
| Chwarel y Fan - Bal Bach | 1 to 6 | 1479 |
| Carn Pica | 15 to 22 | 2217 |
| Craig y Fan | 15 to 18 | 2632 |
| Craig y Fan Ddu - n. escarp | 1 to13 | 2873 |
| Bwlch y Giedd - Fan Foel | 1 to 19 | 2762 |
| Fan y Big North escarp | 6 to 10 | 2739 |
| Graig Fan Ddu - Corn Du | 5 to 22 | 3735 |
| Hay Bluff CP - Offas Dyke | 9 to 19 | 3655 |
| Loxidge - Capel y Ffin (Offas Dyke) | 4 to 12 | 2332 |
| Llyn y Fan Fach - ridge | 14 to 26 | 2411 |
| MacNamara's road - Crickhowell | 1 to 28 | 9699 |
| Offas Dyke - Three Wells | 21 to 24 | 2010 |
| Trig point - Bal Bach | 19 to 20 | 1254 |
| | | |
| Total length > 45mins walk | | 51153 |

***Figure 9 – Paths >45mins Walk from Vehicular Access, Eastern area***

***Figure 10 – Paths >45mins Walk from Vehicular Access, Central area***

***Figure 11 – Paths >45mins Walk from Vehicular Access, Western area***

Assuming path workers work an 8 hour work day, a 45 minute walk to and from the work site represents 18.75% of the work day. At current costs of £100 - £125 per 8 hour day for contractor staff, costs of access to and from site can be significant especially since very often the bulk of the cost involved is for labour.

The total increase in cost for implementing work across all of the priority ranges would be £172,717, most of this (£143 368) would be expended undertaking works on sections with a Priority score of 1 or 2 assuming that access was on foot.

In terms of project management it will therefore be important to clarify where the nearest or most convenient access points to site are located, and to stipulate whether access must be on foot or could be by some other method (ATV for example). In most circumstances vehicular access across the upland environment would not be acceptable because repeated passes (that would be required) by a vehicle would probably cause further damage to the habitat.

***Table 20 - Cost of site access***

| Priority | 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|---|
| Metres | 9,074 | 10,591 | 5,589 | 11,419 | 14,480 | 51,153 |
| | | | | | | |
| Cost (£) | 504,136 | 260,491 | 67,535 | 61,050 | 27,945 | 921,157 |
| | | | | | | |
| Cost + 18.75% | 598,662 | 309,333 | 80,198 | 72,497 | 33,185 | 1,093,874 |
| | | | | | | |
| Difference | 94,526 | 48,842 | 12,663 | 11,447 | 5,240 | 172,717 |

## 4.3 Work Required

(For an explanation of the work described see detail in section 5)
The survey identified the type of work that would be required for each section to bring the path into a sustainable condition. The type of work required was translated into approximate costs, therefore if a section required stone pitching with stone being purchased from a local quarry and airlifted to site the cost would be in the region of £120 per metre. Table 21describes the type of work that is included in each cost bracket.

The type of work recommended for each path section is based on what has been found to work locally and other parts of the country within the parameters stated in the Guiding Principles section. The path surveyor was required to make a judgment based on experience as to the requirements of each section. In general the works reflect solutions that will be sustainable with current levels of visitors, assuming that the works are maintained into the future.

***Table 21- Type of Work Required***

| Cost/metre | Type of work required |
|---|---|
| £120/m | Stone pitching or slab path with purchase of materials and air lift of materials to site |
| £50/m | Aggregate path with materials purchased from quarry and air lifted to site |
| £25/m | Soil inversion path |
| £8/m | Major pre – emptive works, eg drainage improvements, defining path line, vegetation management and minor surface improvements all using on site |

| | |
|---|---|
| | materials |
| £4/m | Minor Pre - emptive works, eg drainage improvements, defining path line, vegetation management and minor surface improvements all using on site materials |
| £0.5/m | Annual monitoring of path condition |

Table 22 shows the total length of each type of treatment and the cost of undertaking that work across the whole Park (excluding management costs). Across the Park the survey has identified that 4,213 metres of path requires to be pitched and 3,688 metres requires to be slabbed and that the vast majority of this work is high priority (Table 23).

Not surprisingly most of the path sections that simply required monitoring were of low priority and comprised nearly 30% of the total path length that was surveyed.

A significant length of path was identified as requiring soil inversion type repairs, currently there are no local contractors skilled and experienced at undertaking this type of work.

Table 23 demonstrates that over 61 km could be improved and made more sustainable by undertaking either major or minor pre-emptive works at a cost of just under £350 000, however the majority of the path sections requiring this type of work were considered to be of moderate or low priority. The danger of not undertaking this type of work however would be that they further decline and then require higher cost solutions to repair them.

***Table 22 - Global Cost of Required Works***

| | Cost/metre | | | | | | |
|---|---|---|---|---|---|---|---|
| | £120 | £50 | £25 | £8 | £4 | £0.5 | Total |
| Metres | 7,901 | 4,559 | 35,643 | 24,928 | 36,769 | 45,049 | 154,848 |
| Cost £ | 948,120 | 227,950 | 891,241 | 199,423 | 147,076 | 22,525 | 2,436,335 |

***Table 23 – Cost of Work by Priority***

| | Priority | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | | Total | |
| Cost/metre | metres | cost | metres | cost | metres | cost | metres | cost | metres | cost | metres | Cost |
| £120/m | 6,870 | 824,508 | 815 | 97,836 | 74 | 8,976 | 140 | 16,896 | 0 | 0 | 7,902 | 948,216 |
| £50/m | 2,288 | 114,420 | 1,776 | 88,825 | 337 | 16,885 | 46 | 2,310 | 110 | 5,500 | 4,559 | 227,940 |
| £25/m | 13,302 | 332,727 | 12,544 | 313,605 | 6,417 | 160,428 | 667 | 16,693 | 2,711 | 67,775 | 35,643 | 891,241 |
| £8/m | 1,364 | 10,912 | 5,431 | 43,454 | 8,727 | 69,819 | 8,496 | 67,969 | 908 | 7,269 | 24,928 | 199,423 |
| £4/m | 736 | 2,944 | 523 | 2,094 | 3,594 | 14,379 | 13,680 | 54,723 | 18,234 | 72,936 | 36,769 | 147,076 |
| £0.5/m | 0 | 0 | 430 | 215 | 646 | 323 | 6,154 | 3,077 | 37,819 | 18,909 | 45,049 | 22,525 |

## 4.4 Cost of Works

The total cost of undertaking all of the works that have been identified as being required during the survey period is £2,609,139; this includes a figure to cover the cost of accessing remote sites but excludes management costs. If management costs are included at 15% then the total cost comes to £3 000 509; however for ease of calculation the figures in the following section do not include management costs.

BBNPA undertook a large scale survey of upland erosion in 1996 - 1997 which used a different methodology to that adopted on this occasion and the data are not therefore directly comparable. However it has been possible to compare cost estimates on 19 paths (approx. 76 Km) that were surveyed in 2006 with the equivalent paths in the 1997 survey (a further 3 were surveyed but had been repaired since 1997 so have not been included for comparison).

It was estimated that to repair all 19 paths that were surveyed on both occasions would have cost in the region of £850 000 in 1997 and these costs had risen to just under £1.5 million in 2006 , an increase of just over 75%.

The difference in cost can largely be explained by a difference in proposed repair methods, inflationary costs and deterioration in path condition, which requires more substantial repairs to now be undertaken. It should also be noted that the 1996 – 1997 survey was undertaken by volunteers whereas the 2006 survey was undertaken entirely by the BBNPA Access Officer and although the original survey data are very useful the volunteers who collected it probably had relatively little practical experience of managing upland erosion.

The cost of repairing priority 1 and 2 path sections only would be £1 808 845 (£1,268,871 and £539,974 respectively). Figures 12 and 13 demonstrate that although the length of the lower priority paths exceeds that of the higher priority paths, the cost per metre of repairing high priority paths is considerably higher, for example on average it will cost £51 per metre to repair priority 1 path, £25 per metre for priority 2 path, but only £3 per metre for priority 5.

***Figure 12 – Priority by Path Length***

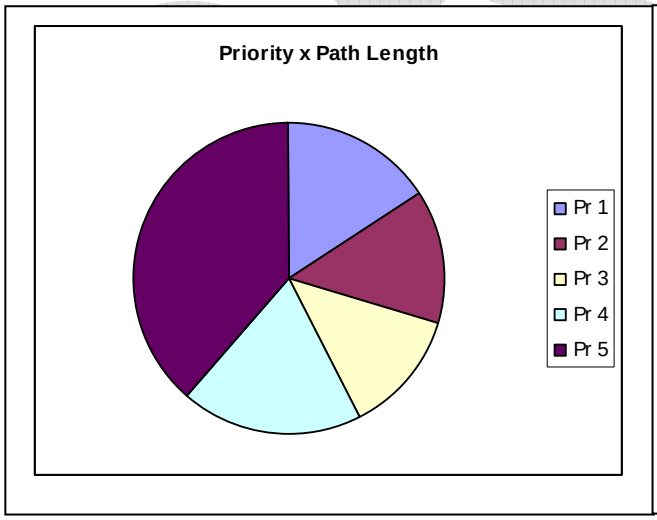
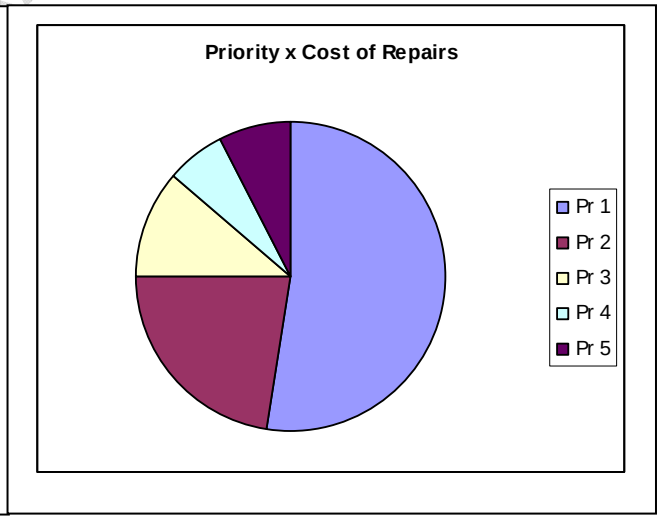



***Figure 13 – Priority by Cost of Repairs***




In terms of expenditure required across the park the following points are of interest:

- £1,284,553 expenditure has been identified as being required in the Eastern area of the Park, £877,996 in the Central area and £273,594 in the west,

- Offas Dyke path along the Hatterrall ridge requires an investment of approximately £190,000,
- the area around the summits of Pen y Gadair Fawr and Waun Fach which are both relatively inaccessible require approximately £261,000 to be spent on priority 1 and 2 sections of path alone
- Nearly £150,000 is required to repair priority 1 and 2 sections on the Carn Pica path
- £91,000 needs to be spent on the priority 1 and 2 sections on the path from Pen y Fan to the Gap road
- £105,000 needs to be spent on the priority 1 and 2 path from Llyn y Fan Fach – Sir Gaer
- Annex 4 contains details of the level of spend required across various owners. Interestingly spend required on BBNPA owned land is £443,733, on National Trust estate £465,661 and £594,143 on Glanusk Estate

## 4.5 Timescales

Timescale estimates to undertake the work identified are substantial. In order to calculate time scales it has been assumed that work will occur over a 29-week period of the year so that works are not undertaken through the winter months when poor weather is likely to have health and safety and productivity implications.

In total, it is estimated that a single team of four path workers would take between 8 and 13 years to complete all of the works excluding sub-soiling work, it is estimated that there is approximately a further 2.5 – 5years work for one machine and operator to undertake that work.

In order to shorten the timescale of implementing the works it would obviously be possible to employ more than one team at a time and it may be possible to extend the season for works on certain sites. It should be remembered that because path development is a dynamic process, many paths will continue to deteriorate before repairs are affected and this will have cost implications. In addition it may become evident that paths that were not surveyed on this occasion require action.

## 4.6 Access and Conservation

All of the path length that was surveyed was on the 'open hill', some were public rights of way and all crossed land mapped as Access Land under the CROW Act. The public since May 2005 have therefore had a legal right to walk on all of these paths. Nearly 80% of the surveyed path length was within areas designated as Site of Special Scientific Interest and the effects of path erosion are likely to be damaging to the SSSI features.

Although the CROW Act provides the NPA with a power to restrict access on access land for certain reasons, this does not apply to PROWs and in any case simply restricting access to eroded paths in most cases would not be sufficient to stop the process once started. Clearly the BBNPA's first statutory purpose would suggest that it should take action or encourage others to take action to protect them.

## 4.7 Recommendations from section 4

- Establish a working group with members drawn initially from the public and NGO sector to develop a business plan that will enable implementation of a project comprising elements such as skills and training and path works. Organisations should include the

Countryside Council for Wales (CCW), BBNPA, National Trust, Visit Wales, WAG Department of Enterprise, Innovation and Networks.

- Develop business plan that will identify options for project programmes that will vary in scale and identify a preferred option. The business plan should identify potential partners and funding opportunities that may come directly from partner organisations but also from external sources.

- Subsequent to producing a business plan establish a partnership of organisations drawn from public, private and NGO sector to steer the project forward and implement business plan. (Options for partnership management are discussed in section 7)

# 5. Review of Erosion Control Techniques

This section reviews the effectiveness of path repair and erosion control techniques that are available to practitioners, and examines their relevance to the BBNP context.

In the BBNP there are two main issues related to erosion control – poaching and puddling on relatively low gradients leading to a loss of surface vegetation from associated trampling (generally on peat soils), and loss of surface vegetation and materials and gullying on steeper slopes.

In the past 20 or so years throughout the UK the two main techniques for tackling these problems have been to stone pitch steeper slopes and use various aggregate path solutions on lower gradient paths. Other solutions such as stone slabbing and vegetation management have also been used but on a much smaller scale. Techniques are constantly evolving and being refined, many being adapted from applications in the field of civil engineering for example. The following sections have drawn from experience both within the BBNP and elsewhere in Wales, Scotland and England and although it covers a range of techniques does not claim to be definitive. Further detail of the techniques described below is contained in Annex 5.

## 5.1 Aggregate paths

The term Aggregate path has been used here generically to describe paths constructed using a variety of techniques but all of which result in an 'unbound' surface of some type of stone matrix rather than a sealed surface incorporating, for example, a bituminous wearing surface. Aggregate paths and tracks are usually found on reasonably level ground and slopes up to c. 8 ° although stable aggregate surfaces can exist on slopes of up to 10° and, with occasional random stepped risers, even up to 12°. The gradient on which aggregate paths can be used successfully will depend on a number of factors such as the chemical and mechanical properties of the aggregate material, drainage, frequency of maintenance, levels of use etc. Constructed aggregate paths on steeper slopes should always be consolidated and not loose. Problems can arise with lateral spread of aggregate material, rain wash and gullying even on shallow slopes as low as 3° with loose aggregates. Stabilising measures are essential on all unconsolidated aggregates on slopes over 5°. These will include installation of water bars, side and cross drainage, and edge stabilisation to prevent lateral spread. Aggregate paths may comprise various types of loose stone, laid in one, two or occasionally three layers, and compacted before use.

### Applications
Usual application is on relatively low gradients although on steep slopes it may be possible to realign a path onto a lower gradient. If geotextiles are incorporated into the construction it is feasible to create an aggregate path across most types of substrate.

### Benefits
Produces comfortable walking surface which when constructed by experienced path workers using suitable materials can blend into its surroundings. Cost of construction can vary but is usually cheaper than creating a stone slab path.

### Limitations
Requires regular maintenance and in general the steeper the path the more maintenance will be required. It is also essential to ensure that the associated drainage system is adequate and well maintained.

**Local Examples**
Llanthony circular walk, Foot of Fan y Big

**Observations**
This technique has been used relatively little in the Brecon Beacons National Park but where it has it appears to be successful. Within the Park aggregate material has been imported which although reflects the underlying geology appears as a grey coloured material. This can be toned down slightly by incorporating seed and fertiliser into the surface material.

## 5.2 Sub Soil Paths (Soil Inversion)

Creation of sub soil paths using mechanical excavators was pioneered on the West Highland Way in Scotland in the late 1980s and then trialled in the Three Peaks area in 1989. There has been extensive use of this technique since then on, for example, the Pennine Way, the Southern Upland Way and on various paths in the Lake District more recently. The technique used to construct a path may vary depending on site characteristics such as the peat depth, the level of erosion and the amount of damage that may already have occurred to the existing path.

In simple terms it requires a mechanical excavator to dig through the peat or organic soil layer and bring mineral subsoil to the surface, the mineral substrate is then used to form a walking surface. A number of factors will affect the success of an inverted subsoil path – these include the composition of the subsoil that the peat or organic soil overlays, the depth of the peat, ensuring that the sequence of operations is well planned, optimum use of the materials available, the type of machine used on site and probably most importantly, the skill and empathy of the machine operator.

In Scotland and on the Pennine Way many subsoil paths have been created across areas covered by up to 2 metres of peat but the technique has also been applied to peat of depths of up to 4-5 metres.

**Applications**
This technique can be used in most circumstances where the finished path line does not exceed c. 8° - 10°, where the existing path is steeper than 8° it may be possible to realign on to a lower gradient. On steeper gradients this technique may be suitable depending on site circumstances.

**Benefits**
This technique generally uses in situ material only and there is therefore no need to import foreign material to site. The technique is relatively cheap and provides a good walking surface after completion.

**Limitations**
Cannot be used to create steep paths (see above). This technique is also dependent on subsoil conditions and should be modified where sub soil contains high clay content. It is essential to use a skilled operator highly experienced in this technique and there are no local contractors experienced in this work.

**Local Examples**
Hay Bluff and Cwm Bwchel. The works at Cwm Bwchel were undertaken by a machine operator working for a company (MacLarty) based in Scotland that originally developed this technique and who specialise in this type of work. The operator has several years experience of this type of work and has an empathy for the upland landscape. All of the works were completed by machine including path profiling, turf transplantation and drainage works.

**Observations**
Finished path can look fairly 'raw' immediately after completion but past experience suggests that works should recover well within two years assuming they were well executed. After-care as described above will be required. Contractors may need to sub contract stone work items of contract to other contractors who specialise in that type of work. Although it may be counter intuitive it is often beneficial to use a reasonably large digger rather than a mini digger as the ground pressure is likely to be slightly less and the operations can be undertaken in 1 pass since a large digger will be more powerful and have a larger reach. Using a mini digger would inevitably require more tracking over existing vegetation.

**Cost**
£16 - £24 per metre depending on ground conditions (source MacLarty, Feb 2006)

## 5.3 Use of Geotextiles

The term geotextiles covers a wide range of materials largely designed for use in civil engineering works. In this report the term has been used to include materials which although not 'textiles', may be used to strengthen soils. The use of 'natural geo textiles' such as sheep's wool, is a long established practice and was used for example during the construction of the west highland railway in Scotland in the 19th century. In other countries incorporation of reeds and other material into soil embankments has enabled steep sided soil structures to be constructed.

Applications of geotextiles include separation of soil layers, filtration, reinforcement and erosion control. (Synthetic and non synthetic materials used for soil stabilisation are covered in the erosion control section below). In terms of upland erosion work the products most frequently used are non woven synthetic materials such as Terram, Lotrak or Typar which are mainly used as 'separators'; geogrids such as Tensar and Wyretex which provide structural reinforcement for paths over very soft ground, and a variety of materials such as terracoir designed to enhance plant growth on eroded slopes (see erosion control section).

**Applications**
Usual application is on areas overlain by peat with low gradients.

**Benefits**
Reduces volume of stone aggregate required in path construction and allows light weight path to be constructed. Especially beneficial if aggregate is not available locally and must be air lifted to site.

**Limitations**
Cannot be used on steep gradients (over c. 8°) and even on lower gradients care must be taken to ensure that surface material is not washed off exposing geotextile in path base

**Local Examples**
Hay Bluff and Foot of Fan y Big

**Observations**
It is important to ensure that the formation surface is smooth and free of boulders etc. Base depth should be no less than 200 mm and preferably path margins should be well defined with in situ or imported turf. Significant ground damage can occur if aggregate is imported other than by helicopter or barrow that is no wider than the new path width. Close supervision is likely to be required to ensure that the above conditions are met. Post construction maintenance, remedial

work and monitoring is required to ensure that geotextiles do not become exposed and if they do that the situation is dealt with.

If a path with a geotextile base fails then the result can be extremely unsightly and would require urgent attention.

**Cost**
Usually included as an integral part of path construction costs therefore add approximately £2 per metre to aggregate path costs.

### 5.4 Soil Stabilisation

Soil stabilisation is a technique developed in the civil engineering field to improve formation layers (generally of roads) so that they are structurally strengthened and behave as sub-base layers. In the context of upland paths this would minimise the need to import large volumes of aggregates to form the path base and surfacing layer.

**Applications**
This technique appears to be better suited to lowland situations and conservation considerations may prevent its use in upland contexts.

**Benefits**
Appears to reduce the volume of imports of quarried stone required and should potentially offer a cost saving

**Limitations**
Suitability of the soil: It is not suitable for use with high plasticity clays and organic soils or soils with high sulphate content.
The local ecology: Cement binders have a high pH and may be unsuitable in certain areas; for example acid heathlands, availability of water: sufficient water is required for the cementing reactions to occur without the material being too wet to compact.
Temperature and weather: The colder the temperature, the longer the cementing reactions take. This could delay the time before the route can be re-opened. Operations should be suspended during periods of rain and frost to prevent damage to the stabilised material.
Construction planning: A maximum duration of two hours between spreading cement binder and the final compaction of the material is recommended and care should be taken to plan the works efficiently.

**Local Examples**
None known.

**Observations**
Requires further investigation and discussion with organisations such as CCW and EA before possibly trialling this technique.

**Cost**
Unknown for this type of application.

## 5.5 Stone slab paths (natural quarried and dressed slabs)/ Causey paths

The method of laying stone-flag paths, known as 'causey' paths in the north of England, evolved during the Middle Ages and continued until the industrial revolution as a means of improving transport links for the packhorse trains across the boggy moors.

In the BBNP this technique has been used on Offas Dyke, and on a much smaller scale on the Black Mountain and in the central Beacons.

Aesthetically flags that have been dressed are less pleasing than natural slabs and flags that are laid proud of the surrounding ground are more visually intrusive. Long stretches of slab path can also be very hard on walkers' feet; however, experienced path workers should understand the aesthetic issues, not only to its appearance but also to the comfort of the user.

**Applications**
Technique is usually used on relatively low gradients c. < 8°. Can be used where ground conditions are poorly drained and on peat which has little structural strength.

**Benefits**
This technique provides an extremely durable solution and when well executed can be aesthetically acceptable.

**Limitations**
Slabs almost inevitably have to be air lifted to site which is expensive. Walking surface can be very hard on the feet if long lengths are used. Dressed slabs can be unsightly.

**Local Examples**
Offa's Dyke, Carmarthen Fans ridge.

**Observations**
Dressed slabs that have been used in the past in the BBNP provide a very 'urban' feel to the path and are considered by some to be unsightly. Quarried slabs obtained locally are much more aesthetically acceptable. Capital outlay for works is expensive but maintenance costs are relatively low. The path width is restricted to the width of the slabs. If adjacent ground is also comfortable to walk on (especially in dry conditions) then trampling of areas adjacent to the path is likely to continue which will hinder revegetation. Constructing a path two slabs wide would be visually intrusive.

**Cost**
Slabs will need to be imported to site and in order to avoid ground damage they are usually air lifted. Costs therefore vary on distance and altitude difference from road head to site. Average cost c. £120 per metre.

## 5.6 Stone Pitching

This is an ancient technique used for building paths and roads, which has seen a revival since the early 1980s, and is now being used on many paths in the Lake District, Snowdonia, Peak District, North York Moors, Yorkshire Dales and in Scotland. It requires a skill similar to that used when dry stone walling, using the local stone in the most effective way possible. Pitched paths are constructed entirely in stone, packing rocks into a prepared tray to create a rough cobbled surface with no mortar, plastic pipes or other man-made materials.

Pitching does provide a durable option for steep paths but they also require maintenance - it is important that a pitched path should be kept clear of loose stone and gravel that may roll onto the surface, drainage systems should be maintained and associated erosion control adjacent to the path needs to be constantly monitored and if a problem arises it should be dealt with promptly (e.g. blocking braids and short cut routes that may develop).

**Applications**
Technique is usually used on steeper gradients >10° -15° or where it is difficult to drain a path and a hard surface is required to prevent surface erosion, but can be used anywhere.

**Benefits**
This technique provides an extremely durable solution on steep slopes and when well executed can be aesthetically acceptable.

**Limitations**
Pitching can be extremely uncomfortable to walk on especially descending a slope and people are likely to walk off it if it is easy to do so e.g. on open grassy slopes with little cross gradient. Pitching in the Brecon Beacons almost inevitably requires the import of suitable stone and the local geology means that locally derived stone is not ideal for this type of technique. It is time consuming to install and to be successful requires skilled craftsmen experienced in this technique.

**Local Examples**
Steeper slopes in the central Beacons e.g. Cribyn, near summit of Pen y Fan

**Observations**
Stone pitching is rarely popular with walkers since it is frequently perceived to be uncomfortable to walk on and is hard underfoot, however it can work very well in short sections.

**Cost**
Contractor costs using imported quarried stone, air lifted to site – c. £120 per metre.
Volunteer costs using hillside stone air lifted to site – c. £? per metre

## 5.7 Realignment

One solution that is occasionally available is to realign the path either on a localised scale or on a much larger scale. The objective of realigning a path would be either to reduce the gradient which may also allow a technique other than pitching to be used, or it may be to avoid an existing line that is difficult or impossible to use because of drainage problems.

**Applications**
Technique is usually used where existing line is either too steep and conditions make it unlikely that a pitched path will be successful or where the existing line is exceptionally poorly drained at certain times of the year.

**Benefits**
This technique can provide a sustainable solution that would not be possible on an existing alignment. Will allow original path line to recover.

**Limitations**
Managers may be constrained by land ownership and by legal constraints (SSSI consents, planning permission etc). Realignment may not be a viable option where a well established path exists on a

strong desire line and the new line is perceived to be either steeper or longer than the original, for example. It will be essential to explain to users what the management is attempting to achieve and to ask for co operation.

**Local Examples**
Very minor realignment at Hay Bluff. Major success at Stac Pollaidh (north west Scotland), currently work being undertaken on Mount Keen in the eastern Cairngorms.

**Observations**
Realignment on a large scale can be quite controversial. This option should usually only be chosen where the existing alignment is unsustainable and the new alignment provides a route that will be used and is sustainable.

**Cost**
Calculate on a case by case basis.

## 5.8 Pre-emptive Management

As the term suggests, pre-emptive works (or management) aims to forestall gross damage or reduce the rate of deterioration on paths which may be in reasonable condition but where failure to act could allow progressive and possibly very rapid change, to gross damage. In that sense it may function either as a holding operation against future intensive capital repairs works, or in some cases it may succeed in avoiding the need for large scale works entirely.

Technically pre emptive management is likely to focus on surface maintenance (including vegetation management), drainage and definition works rather than on reconstructing the path line. It is therefore likely to be substantially cheaper than reconstruction and also less visually intrusive in its effects. This approach to erosion management will however incur a larger and more costly approach to path maintenance into the future than certain other techniques.

**Applications**
Pre emptive management can be undertaken on any non constructed path that is at risk of deteriorating if no work is undertaken. Clear guidance should be given about the scale of works that should be undertaken under this programme as it may be more efficient to let larger scale works to a contractor on a fixed price contract.

**Benefits**
This management method can prevent the need for large scale capital works at a later date at a relatively low cost.

**Limitations**
Pre-emptive management should be limited to relatively low key and small scale works. Requires the input of highly motivated and experienced path workers who may be in short supply.

**Local Examples**
National Trust undertakes pre-emptive works on some paths in the central Beacons (also a lot of planned maintenance).

**Observations**
Where appropriate pre-emptive path management has been adopted as the preferred management style on the National Trust for Scotland's Glencoe, Arran and Mar Lodge estates

over the past two -three years. This style of approach will require ongoing monitoring and maintenance.

**Cost**
Varies depending on scale between c. £4 - £8 per metre

### 5.9 **Cloching** (Repairing Pigeonhole Erosion Using Cloche Netting)

Pigeonholing generally occurs on grassy slopes as a result of large numbers of walkers following the same line up or down a hill, leaving a continuous line of circular steps devoid of vegetation. This is often an indicator that serious erosion may follow if left un-attended and can lead to major repair works in the future, as the pigeonholes will, through time, become larger until they join together to form a gully.

The NT in the Lake District has developed a simple technique to protect improvements until they are sufficiently established to withstand continuing trampling. The NT use willow supports with a fine wire mesh covering to keep stock and walkers off the repairs for one or two seasons.

**Benefits**
This management method can prevent the need for large scale capital works at a later date at a relatively low cost.

**Limitations**
Unlikely to be suitable on slopes where the substrate is peat. Requires path to be of adequate width to allow passage of walkers whilst cloche is in place.

**Local Examples**
No local examples, elsewhere - National Trust estate, Lake District.

**Observations**
Requires trialling in BBNP context.

**Cost**
Approximately £4 per metre

### 5.10 Drainage Works

Adequate and appropriate drainage is essential to minimise path erosion. Drainage should be a consideration in all new path works and if a path has developed through use (rather than being constructed) improving drainage of the path line and/or ground immediately adjacent to it may be all that is required to prevent deterioration.

Poor drainage may lead to water logging of ground on low gradients or erosion of surface material on steeper gradients, the extent will depend on topography and vegetation cover of adjacent land and surface material. Due to nature conservation, aesthetic and financial considerations it is necessary to approach the drainage system on an upland path in a different way to a civil engineering project. In an upland setting for example although it may be acceptable to dig ditches to intercept surface flows it probably would not be acceptable to insert filter drains that would significantly affect the water table locally. It is necessary to design paths that are sustainable within these kinds of constraints.

**Applications**
Most paths will require some drainage but the system should be designed to fit individual contexts.

**Benefits**
Removes damaging action of water from path line.

**Limitations**
Conservation considerations will affect design of the drainage system. Topography can make lateral ditches very difficult to install. Ground conditions such as bed rock and boulders and vegetation (tree roots) can affect drainage systems

**Local Examples**
Cwm Bwchel, Storey Arms path etc

**Observations**
(See comments above) – Maintenance is essential and consideration of potential outfall erosion should affect design

**Cost**
Usually included as an integral part of the works

### 5.11 Path Definition

A major aim of upland path management is to ensure that paths remain as un-intrusive in the landscape as is possible. This does present something of a dilemma since if the path is not obvious to walkers they may walk on a different alignment altogether. The trick is to ensure that the path remains visible in the foreground whilst becoming less visible in the background.

Defining the alignment of a path may simply be ensuring that a newly repaired path (that has effectively been reconstructed) is well defined at its margins (and is dealt with in 5.14) or it may be that relatively low key works are undertaken to encourage walkers on to one relatively narrow line.

**Applications**
Path definition is a low impact pre-emptive solution that is particularly appropriate for paths on mineral soils or on rocky terrain.

**Benefits**
Low impact and can be a relatively cheap pre-emptive solution.

**Limitations**
Soils – this technique is not well suited to areas overlain by peat, nor is it always well suited to areas that have been grossly damaged and that are particularly poorly drained.

**Local Examples**
None, but extensively used in Scotland (e.g. parts of Coire Etchacan, Cairngorms).

**Observations**
Excellent solution to path erosion when used appropriately and provides a path that does not appear over engineered. Requires path workers with an empathy for the landscape and

sympathetic approach to their work to achieve best results. Can be difficult to accurately specify works.

**Cost**
Variable – will depend on the scale of the problem. Typical costs can vary between £4 - £8 per metre.

## 5.12 Landscaping

One of the main aims of undertaking work on upland paths is to prevent further deterioration of the path itself and to attempt to repair damage to the vegetation and geomorphology adjacent to the path. A variety of landscaping techniques can be used to achieve these aims and any path works should incorporate an element (often a large proportion of the works) of landscaping within the works. The techniques used will depend on the vegetation, geomorphology, SSSI restrictions and materials available for works. Ensuring that vegetation adjacent to the path recovers will in many cases tend to keep walkers confined to the path line itself especially if the dominant vegetation is dwarf shrub heath for example. If adjacent vegetation is naturally acid grass land it may be necessary to reshape the adjacent ground or 'plant' boulders to discourage trampling of the path margins.

**Applications**
The measures described above can be used on eroded ground in a number of situations; solutions will be tailored to the specific context. All path works should include an element of landscaping to ensure their success. The specific solution will depend on the scale of the problem, resources available and the suitability of techniques.

**Benefits**
Landscaping should be an integral part of path management. Landscaping will minimise soil loss, improve visual amenity, ensure that walkers remain on the path and ensure the success of the associated path works.

**Limitations**
Geomorphology, adjacent vegetation and conservation considerations can be limiting factors and will affect the choice of techniques.

**Local Examples**
Turfing – Cwm Bwchel path, turfs were generally obtained from within the damage zone.
Bunds – associated with pitching near the summit of Fan y Big
Seeding and fertilising – Craig y fan Ddu path, only partially successful due to drought following application.

**Observations**
Promoting conditions for re-vegetation is a part of a process. Depending on the level of intervention positive results can take some time to be achieved and success or otherwise should therefore be judged over a number of years.

**Cost**
Extremely variable – will depend on the scale of the problem. Costs are usually incorporated into associated path works.

## 5.13 Erosion Control (tackifiers, brashing, revetments etc)

Soil erosion (which is the direct or indirect result of recreational pressure in upland situations) can often be considered as the loss of soils on slopes, or as erosion of vegetation due to trampling by walkers avoiding (or attempting to avoid) water logged ground on low gradients. In either case the objective of any erosion control works should ideally be to minimise erosion by putting in place measures that will lead to increased vegetation cover by indigenous plants of exposed soils which will in turn minimise soil loss.

On slopes, depending on gradient, a number of techniques may be required to re-establish vegetation on eroded areas. It may be necessary to:

- re-grade areas that have been eroded (for example infilling gullies with soil, brash or a combination)
- use organic netting (e.g. Terracoir) to slow soil wash off during the re-colonisation phase
- Use soil tackifiers (e.g. Seed Aide) to slow soil wash off during the re-colonisation phase,
- Cover exposed soils with brashings to slow soil wash off and provide a positive microclimate to encourage re-colonisation,
- Roughen eroded areas (by randomly planting boulders for example) to discourage walkers from walking on them
- Construct revetments (retaining walls) to stabilise steep banks or to block gullies.

**Applications**
The measures described above can be used on eroded ground in a number of situations. The specific solution will depend on the scale of the problem, resources available and the suitability of techniques.

**Benefits**
Erosion control should be an integral part of path management. Controlling erosion will minimise soil loss and ensure the success of the associated path works.

**Limitations**
Resources available are generally the limiting factor although other issues such as delivering any materials required to site should also be considered.

**Local Examples**
Various examples in the central Beacons with associated path works. Examples of the effectiveness of using of terracoir, stone scatter, blocking gullies and providing hardened surfaces across wet areas can all be seen. There are no local examples of using takifiers but these have been used extensively and successfully in upland settings on Stac Pollaidh, the Cairngorms and the Lake District.

**Observations**
Promoting conditions for re-vegetation is a part of a process. Depending on the level of intervention, positive results can take some time to be achieved and success or otherwise should therefore be judged over a number of years.

**Cost**
Extremely variable – will depend on the scale of the problem. Costs are usually incorporated into associated path works.

## 5.14 Recommendations from section 5

- Continue to review techniques used to combat upland erosion in other parts of the UK and abroad and assess their suitability for use in the BBNP. Identification of techniques of relatively low cost that can be applied to steep slopes and to paths on peat would be particularly useful.

- Develop a programme to trial techniques that appear not to have been proven in this context to date and assess results.

# 6. Design, Construction, and Site Working Issues

Following the preceding review of specific construction methods (above) available to upland path managers the following sections are designed to make more general comments about issues that should be considered by managers during the planning, design and implementation phases of a works programme.

## 6.1 The Historical Context

In the past 20 years the majority of upland path work in the BBNP has taken place on the steeper slopes of the central Beacons, largely on the National Trust estate. There are notable exceptions such as the work undertaken on the Offas Dyke path in the Black Mountains, works on the Pencelli estate in the central Beacons, and some work on the ridge of the Carmarthen Fans. All of this work has been on paths that have developed as a result of use, none had been constructed at an earlier period for other uses (such as stalkers paths in Scotland).There has been very little work carried out on the paths surveyed in the BBNP area in the past, with no history of constructed stalker's paths upon which to base a style of work. Only 3% of the path length surveyed exhibited any sign of previous work or construction.

The nature of the landscape through which the paths pass is predominantly that of open acid grassland in the central Beacons. This type of vegetation and landscape provides relatively easy walking cross country and it is therefore important to make path surfaces inviting and comfortable to walk on to encourage walkers to use them and in order to prevent further braiding and erosion. Similarly the path width must be adequate to cope with anticipated user numbers in areas such as Storey Arms – Pen y Fan.

In the Black Mountains and Black Mountain erosion has occurred on broad ridges on fairly low gradients and the solution to date in these areas has largely been to lay slab paths. However this is not a traditional method of construction in the area and other solutions are available. Whilst slab paths have been partially successful additional attention to landscaping would greatly assist recovery of adjacent vegetation. Consideration should also be given to the aesthetics of this technique – it can appear very formal and 'urban' in an upland setting.

## 6.2 Design Considerations

A number of factors need to be taken into consideration when designing upland paths:

Value for money – what solution provides best VFM, the cost of the capital works, the adequacy of the works, longevity, ongoing maintenance liabilities all need to be considered to ensure that money is well spent and will not create a maintenance liability that cannot be serviced.

Topography, conservation and landscape – design will reflect techniques that are currently available that will be suitable for gradients, hydrology etc. In terms of landscape, path repairs should blend in as far as possible – colour of materials, the visual impact of works on highly visible locations (e.g. on open slopes) etc. should all be considered.

Materials – the materials used in the works should blend in as far as is possible with the landscape through which the path passes. Techniques can be used (such as soil inversion) that use on site materials. However this is not always possible and within and close to the BBNP there are relatively few sources of suitable materials such as aggregate stone, pitching stone, natural stone slabs.

Existing and new techniques: a relatively small number of the techniques discussed in section 5 have been utilised on any scale within the BBNP. In order to provide best value, and to provide the most appropriate solutions to individual problems, it is important that relevant staff remain aware of current techniques and new developments and are given the encouragement to trial, assess and implement them where appropriate. The current suite of techniques does not provide particularly satisfactory solutions to certain problems within the BBNP and some resources should be allocated to investigate new techniques to deal with these more effectively.

Appropriate use of mechanical plant - due to the nature of the terrain, construction methods, and site sensitivity it will neither be possible nor desirable to use mechanical plant on all sites. On some sites mechanical assistance will be limited to the use of powered carriers and ground winches and occasionally the use of chartered helicopters if it is necessary to import materials to site. The labour organisation will also influence the level of mechanisation – if volunteers are being used the work is likely to be less mechanised as they are less likely to have the skills required to operate plant.

However on a number of sites outputs are likely to be increased significantly with the use of plant especially if the repair technique to be used is sub soiling. Whatever the method of working it is important that where mechanical plant is utilised the operators are skilled and experienced in the type of work being undertaken and that they have an empathy with the work. It will be worth considering the impact that undertaking works with mechanical plant may have on recreational visitors – it may have a negative impact on their visit if they experience plant intensive works being undertaken in a 'wilderness' area for example. It is likely that the impact of this issue could be minimised by consideration of timing of works and explaining to the public the reason for doing the work.

Monitoring – in order to inform path management into the future it is essential that path condition is monitored. Fixed point monitoring at certain locations to provide a sample "snap-shot" of path condition every two years, and a repeat of the condition survey of the whole path network should be completed every five years.

Developing work programmes and funding packages – due to the dynamic nature of path development it is essential that adequate resources are secured to allow ongoing maintenance commitments to be met and that continued effort is put into developing relevant work programmes into the future if required.

## 6.3 Logistics

It would be desirable to have an annual work programme in which a mix of sites at different altitudes, varying technical challenges, and different geographic locations have been scheduled. Care should be taken to select a range of sites to provide a good mix of projects which can be undertaken and managed by available supervisory and labour staff Including volunteers and trainees if applicable) so that technical challenges as can be properly dealt with at any one time.

The weather, growing season and holiday season should be considered when implementing projects, it is particularly advantageous to undertake the works in the spring and late summer months in order to maximise the likelihood of vegetation management for example. The negative effects of undertaking works during holiday periods however is that visitor numbers will be higher and this could have health and safety implications.

The winter months provide weather difficulties, particularly high winds, rainfall, snow or frost, and can seriously affect the success of the works, can cause additional damage if ground conditions are

wet and pose additional safety risks. There may be low level or sheltered sites however that can be worked during the winter and if this is the case then working them then may be beneficial in providing continuity of employment opportunities. Providing some continuity in the work programme will affect directly employed labour and contractors and can have a significant effect on skills retention.

The number of concurrent projects that it would be possible to undertake would depend on the size of individual projects, number and role of supervisory staff, labour availability and obviously funding. It is likely that supervisory staff would also have a project development role and sufficient time should be allocated to both roles.

Experience elsewhere has shown that due to, the work involved in putting together a tendered, fully specified work contract, negotiating with landowners, and then carrying out the work, low value contracts cost disproportionately more in management time. At the other end of the scale high value contracts incur significant financial risk to the contractors, and result in a lower overall productivity due to monotony of work, compared to a team working on a variety of sites. It would therefore seem sensible to have regard to this when designing projects.

Most of the paths requiring works are either rights of way or cross CROW Access land or other land over which the public enjoy a right of access. Since the BBNPA has delegated agreements with the Highways Authorities to manage the row network the Authority can give notice to land owners that it intends to enter their land to undertake works. On access land the BBNPA is the Access Authority and can enter into agreements to improve access to access land. Whether a route is a row or on access land it would be good practice and courteous to discuss proposals with landowners, occupiers and graziers at an early stage to ensure that they do not interfere unduly with management of the land.

Many routes cross SSSIs and land with other conservation designations (e.g. scheduled ancient monuments). It is essential that proposals are discussed and amended if necessary and consents obtained from the relevant bodies to allow works to proceed as planned.

### 6.4 Maintenance

Maintenance is an essential element to keep the path network in good condition and safeguard the investment made in rebuilding it in the same way that the road system requires constant maintenance. The maintenance regime will depend on the specific nature of individual paths but typically should include visits four times a year. Maintenance requirements should be identified during the design phase of each path repair project. Assuming that c. 75 Km of path were repaired (priority 1, 2 and 3 sections and existing repaired sections) the estimated annual cost of maintenance is expected to cost between £45 000 and £55 000 assuming that contractors are used. Maintenance has been neglected on several routes already rebuilt due to the difficulties of programming regular work and difficulties in finding revenue funding - these issues need to be urgently addressed.

Certain grant giving organisations such as CCW require assurances that maintenance will be required following completion of capital works and in order to honour such conditions provision should be made to fund and undertake these obligations.

## 6.5 Health and Safety

Safe working on site is of paramount importance, particularly as sites are often remote and exposed, difficult to access in the event of an emergency, and are also open to the public, and undertaking works in these environments presents particular challenges.

Addressing the particular health and safety issues and ensuring that risks are reduced to acceptable levels will require careful planning and solutions to problems may have cost implications. If work is let by competitive tender mechanisms should be in place to ensure that the issue of health and safety management is included at the tendering stage to ensure that all contractors bid for work on the same basis.

## 6.6 Construction, Design and Management Regulations

Clarification is required as to whether contracts requiring more than 30 days work or a team of more than five personnel will come under the CDM regulations requiring detailed risk assessments, and site safety plans to be drawn up before work commences by a competent safety Planning Supervisor, and notification of the contract to the Health and Safety Executive (HSE). In other parts of the country HSE have advised that path work contracts should be subject to these regulations although the local advice has been that these regulations do not apply.

## 6.7 Labour Organisation

Throughout the UK a number of methods of labour organisation such as employing: contractors, directly employed path workers, 'training schemes' and volunteers have been used to implement path repair programmes. Unfortunately little research appears to have been undertaken into the comparative benefits of each method of working. Anecdotal and experiential observations would suggest that it is likely that employing contractor labour may be beneficial in certain circumstances whereas direct labour may be better suited to other situations.

Whichever method or combination is used, in order to achieve maximum benefits it is essential that expertise and management is in place that produces the product that is required at an agreed cost.

Training schemes and involving volunteers tend to produce lower outputs in terms of path construction but have other useful outputs such as increasing skills levels and involving people who may not otherwise have any involvement with the BBNP. It should be noted that many upland erosion projects such as soil inversion works are unlikely to be suitable for involving volunteers and trainees but there are other projects that would be suitable. Volunteers should not be viewed as cheap labour as there will be a cost involved in managing them and the volunteers should get something positive out of the experience and publicly funded organisations should have regard to the 'Volunteers Charter?)##check title.

At present, mountain footpath construction work in the area is undertaken either by directly employed NT staff, by volunteers or by contractor, there is only one specialist contractor working in the area. There are three options for creating and taking on a pool of labour with the right skills to carry out the level of footpath construction work required for the programme over a 5 year period.

6.7.1 Existing Contractor Pool

Although there is currently only one locally based contract footpath team carrying out mountain footpath construction work in south Wales there are other companies based in the north of England and Scotland who are prepared to tender for work in the Brecon Beacons. These companies based outside the area do however tend to have higher operating costs because of subsistence costs and may also be less flexible due to commitments in other geographical areas. The resulting relatively low level of competition and significant travel costs for teams to come and work in the Brecon Beacons is likely to drive prices up.

6.7.2 New Locally Based Contractors

It would be possible to train and establish a number of locally based contracting teams, in or adjacent to the BBNP area. This would require a training programme to 'tool- up' and skill around 10 - 15 local staff, drawn from existing unemployed, and existing landscape, forestry or countryside contractors to carry out the work. There will be a high input of training required to bring contractors up to the standard, although this would bring benefits of common working through standardised approaches to work and common practice on health and safety, tendering, and estimation and so on. A similar scheme was established for implementing the management of a mountain path network in Ross and Cromarty, where a total of 27 trainees have completed a 6 month training course and more than 75% of footpath contract work let goes to contractors based in the area. More than 80% of trainees completing training remained in footpath employment for at least six months after completion of training.

This option has a number of attractions – it would retain income within the local area, promote an entrepreneurial culture, contribute to transferable skills that may be used in other areas of work and remove some employer obligations from the commissioning organisations. However in order to make this an attractive proposition to potential candidates it will be necessary to demonstrate that the training programme will be followed by work opportunities whether these are with another employer or by setting up as contractors.

The likely costs of training (to include registration on s/NVQ programme) would be around £80 - £100,000 (based on the experience of the Lake District NPA). This would produce a pool of 10 to 15 locally skilled people in the Brecon Beacons area and the cost represents 2.6 – 3.3% of total project costs of £3m.

6.7.3 Directly Employed Footpath Teams

Rather than putting work out to competitive tender to a pool of footpath contractors, it would be possible to employ a direct labour team within one of the organisation managing the footpath work. This approach is used in other upland parts of England and Wales where footpath work is predominantly carried out by direct labour teams working for the National Park Authorities and also the National Trust. The teams could either be on full year contracts, working on path construction for all 12 months, or on seasonal contracts between 4-8 months for example.

A similar level of training input would be required, as for option 2, to establish the skills base for the direct labour teams with a total project addition of around 3.5% to cost. This figure may possibly be higher if it is necessary to train seasonal workers each year if they do not return to further contracts. Staff would need to be based within the area, and the opportunity of security of employment may attract many existing footpath contract workers to apply for these posts. Experience in other areas has shown that there can be additional costs where public sector rates of pay, travel and subsistence, working conditions, etc are higher than those currently being paid in the path industry. This cost may be off set by savings on some of the management costs that would otherwise be incurred in producing tendering and specification documents for example.

6.7.4 Supervision

A detailed specification and Bill of Quantities describing the works will form an essential part of any tender document used to let work for a path repair contract. It is also an essential document to produce and use even if direct labour teams are used, to ensure a consistent, planned and appropriate style and scale of construction and to allow meaningful assessment and reporting of the works. Experience elsewhere has shown that path solutions or decisions reached solely by a path construction team may be inappropriate in their design and scale of construction. Specifications should be produced by individuals with extensive experience and/or training in this specific field of work. Contract documents should however allow some flexibility to allow variation (when agreed by the supervisor) if unforeseen circumstances arise.

All contracts and teams will require visits by a path manager/ site supervisor and the frequency will depend on the individual site, the competence of the team and how conscientious they are, but should occur at least fortnightly, but preferably weekly, to keep careful control on construction and discuss the best solutions and next sections to be worked. This amount of supervision is essential to ensure consistent standards of construction and design across the path network, volunteers and trainees are likely to require more intense supervision.

## 6.8 Remote Working

Most path sites in the BBNP area are within 1 - 1.25 hours walk-in time from the nearest road, and can be accessed on foot, on a daily basis by a path construction team (table 19 and figure 9). However, for sites more that 1-1.25 hours walk-in, the walk becomes both physically punishing and demoralising for the path team, and cost inefficient due to 25%+ of the working day being spent walking to and from site. Although in other parts of the UK contractors have occasionally chosen to provide on-site accommodation for the path construction team, this is unlikely to be desirable or practical in the BBNP. However it will be important to take account of potential difficulties when operating on a relatively remote site – weather conditions may make work difficult, some form of shelter would be desirable, health and safety management will be affected and productivity may decrease etc.

## 6.9 Standards

There are two main strands to the issue of ensuring that path repair works are undertaken to a standard that is acceptable to the general public and commissioning clients.

Firstly there needs to be agreement amongst key stakeholders such as BBNPA, NT, major landowners affected by upland erosion, and user groups, on a set of principles such as those in section 1.4 above. If this is achievable then it should then be possible consider developing certain specific standards for work. The Path Industry Skills Group (which has now become the Upland Path Advisory Group) in Scotland have developed a set of standards for upland path repair work that it would be possible to adapt to the particular context of the Brecon Beacons. This set of standards was developed by practitioners with many years experience and experience has demonstrated that for most organisations they provide an adequate basis on which to specify works.

The second strand relating to the issue of standards is that of skills. Experience elsewhere in the UK has identified inadequate skills and knowledge at management and operational levels as being an issue that needs to be addressed early on in upland erosion projects to ensure that the standards aspired to in the Guiding Principles are achieved. In the Lake District and in Western Ross specific training courses were developed and contractors and individuals were encouraged to

participate. One of the advantages to the client was that it enabled them to use the training as a mechanism to ensure that contractors working within the field were fully aware of standards that were expected of them.

## 6.10 Training

Upland path construction requires a range of technical and organisational skills. The work is much more than simply labouring and, the physical context within which it is undertaken mean that better results are usually achieved when work is undertaken by those with the required skills but also with empathy for the landscape.

Within the Brecon Beacons National Park area there are very few such individuals (most individuals who were trained up through the EAGGF scheme for example are either otherwise employed or have left the area) and only one contractor who has experience of constructing hand built upland paths. There are only a handful of contractors in the UK (largely based in Scotland) with skill and experience of constructing sub soil paths in a mountain environment.

In terms of deriving maximum economic benefit from an upland path programme it would be beneficial to develop those skills locally. It is more likely that contractors would nurture those skills if they (and individuals) were confident that there was a high likelihood of a programme of works being developed over a number of years.

A footpath qualification at SVQ Level II (Landscapes and Ecosystems contextualised for the path industry) is available and the Lake District National Park recently ran courses for trainees and practitioners to encourage them to achieve this award. (Since this is a VQ administered by the Scottish Qualifications Authority the National Trust for Scotland provided a service to assess candidates).

## 6.11 Funding Opportunities

The scale of the problem identified by the path survey indicates that considerable funds will be required to tackle the problem in a strategic, sustained, way. Past experience would suggest that the best way to achieve this outcome would be to assemble a dedicated funding package. It does seem unlikely however, that sufficient funds could be obtained from a single source to cover all of the works identified and also that in order to meet funders requirements it is likely that other project elements would need to be added to the upland erosion project.

A degree of balance will be required to ensure that on the one hand adequate funding is obtained to undertake works in a strategic way and to required standards but that on the other hand works do not become funding led especially if this means that the full benefits are not received (eg producing skilled work force and economic benefit within the local area).

There are a number of grant giving organisations such as the National Lottery distributors including Heritage Lottery Fund, Aggregates Levy Fund, Land fill tax credits fund and CCW grant programme that may provide funding for this project (or elements of it). The Heritage Lottery Fund has stated that it's grant giving programmes are under increasing pressure because it is receiving increasing numbers of applications whilst the amount of money that it has available is not increasing (and indeed may decrease depending on whether money is diverted to the 2012 Olympics project). It may also be possible to access smaller grants from charitable trusts with grant giving programmes.

The BBNPA may have difficulty in accessing some of these funds since it is a special purpose Local

Authority and it has been suggested that the HLF may take the view that the proposed projects form part of its core work. BBNPA as a serial applicant to HLF is also only allowed to submit 1 bid per year to HLF and there are currently other projects in a 'queue' waiting to be submitted (HLF may take c.2 years to make a decision on each bid, especially if they are large and submitted through the two part process). Delivery mechanisms are discussed below in Chapter 7, however the ability of an organisation to access particular pots of money may influence the delivery mechanism that is eventually chosen.

### 6.12 Recommendations from Section 6

- Path design – an increased emphasis should be placed on the design stage and practitioners with relevant experience should be employed to develop projects.

- Adequate lead in time should be built into a works programme to enable greatest benefit to be derived from it and to allow works to be undertaken during the most advantageous season.

- Provision for maintenance requirements into the future should be identified during the project design stage. Adequate resources should be sourced to secure the longevity of the resource

- Clarification from the HSE is required as to whether CDM regulations apply to this type of work.

- Further investigation should be undertaken as to the efficacy of various labour organisation methods in various contexts.

- A fully costed training programme should be developed and included in the business Plan. Initially a training package should be developed for approximately 10 field workers.

- Training in the form of visits to observe best practice in terms of organisational management and field techniques across the UK should be organised for c. 2 – 4 path managers operating in the BBNP

- A funding package should be assembled from a variety of sources. Either significant staff resources from partner organisations should be devoted to this or expertise brought in on a consultancy basis. The complexity of assembling a multi sourced funding package should not be under estimated and the latter option may therefore be preferred because otherwise resources will be diverted away from other BBNPA functions.

## 7. Programme Delivery

The survey work that has been undertaken as part of this study identifies that a significant resource will be required to tackle the issue of upland erosion repair work across the Park. At present the BBNPA has spent little or nothing over the past 3 years as no resources have been made available for this area of work. The National Trust has spent approximately £300,000 over the past three years which includes significant volunteer time. Private land owners have, as far as is known, spent nothing on upland erosion repair since tackling it is not seen as providing any direct benefit to landowners.

The BBNPA clearly has a role to play as a large land owner and because of its statutory purposes. Similarly the National Trust as a large land owner of the most visited hills in the BBNP and because of its charitable objectives has a similar role on its own estate. However it is unlikely that either organisation could fund the scale of work identified consistently over a 5 – 10 year period for example.

Approximately 12 land owners (including BBNPA and NT) own land crossed by paths surveyed as part of this project. Response to correspondence asking for views on perception of upland erosion as a management problem, whether management of it was a priority, and who should be responsible for funding and undertaking the work consistently suggested that although erosion was perceived as a problem, landowners should not be expected to pay for repair works since damage was caused by third parties. All respondents felt that funding for repair work should come from 'the public purse' or from sources such as the Lottery distributors etc. Most respondents expressed an interest in principle to being involved in a partnership if one was established depending on commitment required etc.

In other parts of the UK upland erosion has been tackled at the instigation almost exclusively of the public or voluntary sector. The majority of funding may come from: Local Authority (and/or NPA), statutory bodies such as CCW, Lottery funding, European funding, funding from charitable organisations such as the National Trust and BMC etc, and some from private sponsorship.

It is clear that the existing delivery of upland erosion management in the area is insufficient to cope with the scale, complexity and dispersal of work required. Existing levels of recreational use have led to a damaged and declining quality of path resource across the Park, and although this is managed in some areas under public or National Trust ownership, there are only one or two routes receiving the level of management required. Those organisations currently carrying out path work are concerned with levels of maintenance required in the long term, and that budgets relating to path management are under potential threat.

Implementing a large scale implementation project would bring a number of benefits to the area, it would improve the path resource and thereby improve the visitor experience, it would provide opportunities for training and involvement of local and interest communities and it would bring direct economic benefits during the implementation phase and indirect economic benefits in the longer term (via increased visitor numbers).

The points above illustrate the inability of existing mechanisms to cope with the problem in a proactive way and, indeed; currently it is not even possible to approach the issue on a reactive basis in most circumstances. This section considers how repair work could best be organised and looks at a number of options for programme delivery.

## 7.1 Capital or Revenue Funding? (Project based approach or core work?)

Within the BBNP the National Trust and BBNPA have had some involvement in a project based approach to the issue of upland erosion. The BBNPA ran a project funded by EAGGF between 1997 - 2000 to employ part time staff with an agricultural back ground to repair eroded paths. Both the NT and NPA were involved in works part funded by the Adfywio programme during 2003. However the BBNPA project clearly illustrates the problems inherent in accessing capital funding only.

The NPA currently employ no field staff directly involved in this area of work and have let no contract work for the past three years. Although the BBNPA employ estate and warden staff, they spend relatively little or none of their time on upland erosion work. The NT employs two dedicated staff and has an annual programme of volunteer works. Capital works that have been completed on the NT estate are subject to routine maintenance whereas works previously completed on behalf of BBNPA generally are not, because there is no funding available for dedicated staff.

Organisations such as BBNPA, CCW (and consequently NT if they are dependent on funding via these types of organisations) find it very difficult to make medium to long term funding commitments of a revenue nature because they themselves are subject to short term budgeting processes and long term financial commitments may be either risky or forbidden.

As a result most expenditure spent tackling upland erosion tends to be spent on capital works because the organisations find that financial policy and the impact of priorities of sponsoring organisations such as WAG, makes it difficult to commit to longer term funding.

The scale of the works required (as demonstrated by the path survey) would suggest that initially a project based approach to reduce the level of erosion will be required. (The resources required are large and drawing exclusively on funding and staff from existing resources is probably not a realistic option.) However following an intensive initial phase undertaking capital works it is essential to recognise the maintenance requirements that will be a legacy of such works.

A result of current budgetary policy is that it is almost impossible to secure maintenance commitments for assets that may have involved substantial public commitment however.

One solution may be the creation of an endowment or annuity fund to meet long term maintenance liabilities. This solution however is unlikely to be available within the public sector because of financial regulations.

Andrew Thin argued in the Scottish Highlands and Islands Countryside access strategy that: ‘regular maintenance may not be the most cost effective approach and that infrequent restoration may be cheaper than frequent maintenance. However if the cost of monitoring is low (through the use of volunteers) then economically maintenance becomes more attractive.’ Whilst this argument may hold some truth in simple financial terms, it is suggested that it requires much more investigation to prove itself in terms of sustainable use of resources and energy.

The following table (Table 24) summarises the effectiveness and weaknesses of four approaches to path management ranging from non intervention to an integrated capital and revenue system of working.

***Table 24 - Management Options***

| | **No Intervention** | **Short Term/Large Scale Capital Investment** | **Pre-emptive and Maintenance Programming Only** | **Integrated Approach to Footpath Management** |
|---|---|---|---|---|
| **Effectiveness** | No overly intrusive works | Intensive and systematic approach to erosion control | Low impact and responsive approach to erosion control<br><br>Long term approach possible | Addresses the most intensive immediate problems in a systematic approach – reducing longer term costs<br>Allows for pre-emptive approach on the most sensitive areas, substantially reducing impact and future costs<br>Integrated revenue and capital based approach to project funding<br>Provides a long term approach to the solution without neglecting the short term need for action |
| **Weaknesses** | The problem accelerates to the point that there is no *Sustainable* solution | Overbuild may actually degrade heritage value on most sensitive land<br><br>High initial cost that may end up duplicated in the future without effective pre-emptive and maintenance programming | Danger of 'Scratching the Surface' with the current scale of problem<br>Real danger of putting off larger problems – requiring much larger capital investment in the future | Requires capital to be raised in the early years of project<br><br>Requires new sources of revenue funding for long term management – with the hill-users likely to be targeted for fund-raising |
| **Costs** | None | Very high short term cost. May well have to repeat the process at a later date without maintenance and pre-emptive work programming | Low cost/ongoing approach - though this type of funding has proven very difficult to attract into the sector<br>Insufficient to deal with immediate problems, including development | Initial Intermediate to High, moving to Low Long Term cost<br><br>Requires revenue to be raised direct from the user |
| **Summary** | Ignores what is a serious problem, to the permanent degradation of our mountain heritage | Short term high cost approach, unlikely to prove a long term solution<br><br>Likely to result in 'overbuilt' paths in highly sensitive environments | Aesthetically appropriate works, and at a low cost<br><br>Unable to make an impact on the most serious erosion problems that are so obvious on many of our mountains | Integrated approach allows effective long term solution to upland path erosion<br><br>The user will contribute substantially to long term costs of path work |

## 7.2 Management Structures - Options

The following section suggests some structures that could be used to implement a programme of works as recommended in chapter 6. The current level of upland erosion would suggest that the existing method of managing erosion across the Park is not working in so far as the issue is not being tackled on a scale that is making significant inroads. Nevertheless the option of simply maintaining the status quo is also considered below. A SWOT analysis has been undertaken for each of the options and these are contained in Annex 6.

A number of the methods would require partnership working although in a variety of formats.

### 7.2.1 Option 1: Maintain the Status Quo

Currently the NT spend approximately £100 000 per year on managing upland erosion within the Park, The NPA have not spent anything on this issue over the past three years and no other land owner has been involved in repair works. The NPA occasionally receive one off funding packages from the Welsh Assembly Government for example for this type of work but the sporadic nature of this funding makes it very difficult to develop a co-ordinated approach to the issue that embraces the issues of economic benefit to the local economy, training and skills development and development of a longer term partnership approach. The survey of paths suggests that the current cost of repairing erosion in the Park would be c.£3 million and a realistic timescale for implementation so as to derive maximum benefits would be in the region of five - six years with an ongoing maintenance commitment costing c. £45 000 - £55 000 per annum.

Historically the NPA and NT are the only organisations who have committed resources to tackling upland erosion in the Park and the NPA have managed upland erosion in an ad hoc manner, partly driven by funding opportunities. The issue of upland erosion has not been addressed in a strategic and coordinated way in the past by the NPA either because the issue has not been properly understood or simply because adequate and sustained funding has not been available and serious commitment from senior managers has not been forthcoming.

Most of the work programmes delivered by the NPA have been short term in nature and this has had a negative effect on delivery in a large number of ways. (For example skills shortages locally, inadequate strategic evaluation of sites, inefficiency in timing of works, etc.)

This option does not provide good coverage across the entire NP and does not achieve maximum benefits from investment, nor does it encourage investment on a strategic basis. However it does generally allow the scale of funds that have been received in the past to be spent without significant additional management costs and relatively small resources have been used developing speculative proposals that may not have been successful.

### 7.2.2 Option 2: National Trust/ NPA partnership

The NT and NPA have collaborated in the past on the successful submission of a funding bid to Adfywio to undertake upland erosion work in the Central Beacons. Whilst the funding bid was successful, due to the scale and timing of the bid which provided funds for 1 financial year only, this was more a case of opportunistic application rather than part of a strategic approach. The short time scales involved did not allow development of management structures or agreements to view the project in a more strategic way. That is not to say that this need be the case in future especially if there is a willingness within both organisations to work more closely together on this type of project and if a longer term funding package could be secured.

The National Trust estate covers a significant but relatively small part of the NP – it includes the iconic peaks of Pen y Fan and Corn Du and Crybin (which all are suffering from severe erosion

problems) and part of the Sugar Loaf and the Skirrid in the south east of the Park. The NPA owns a significant estate across the Park and there is developing erosion at a number of locations. However the NPA, through its statutory purposes, also has a role to play across the whole Park in terms of landscape protection and access provision.

In the Lake District (LD) the NPA/NT/English Nature partnership works well but NT own a much larger estate in that National Park and both organisations have worked closely on this issue for a significant length of time with support from senior managers. The NT in the Lake District have also employed a number of path work teams for a considerable period of time whereas in the BBNP the NT employ two full time staff augmented by volunteers in the summer.

The NPA in the LD have delegated responsibility for the public rights of way network similar to the situation in the BBNP. Some of the work currently being undertaken in the LD is on routes that do not appear on the definitive map.

In the BBNP there is also severe erosion on properties owned by neither the NPA nor the NT. Inevitably proposing works on third party's land would involve extensive discussions and negotiations with those owners. Most of the land that is suffering from erosion in the BBNP is on common land.

Both NT and BBNPA would bring complimentary attributes to a partnership designed to tackle upland erosion. Both organisations employ one or two members of staff with extensive hands on and management experience of this issue and the NT have systems in place to contribute significant volunteer effort on a seasonal and project focussed way. Both organisations can draw on relevant specialist staff for advice on specific issues. The NPA has a Park wide remit and also has responsibility for prow management where some of the issues occur.

There are a number of potential benefits to this option as mentioned above, however it would not provide consistent coverage across the entire NP and would not achieve maximum benefits from investment, nor does it encourage investment on a strategic basis. It may also restrict funding sources available to undertake works on a third party's property. There would need to be clarity about roles and responsibilities and resource contributions especially during the initial stages of such a partnership especially when a potentially large amount of speculative work would be required in developing funding proposals and bids.

### 7.2.3 Option 3: Develop a Larger Partnership

A partnership could bring together all interested parties to agree policy, set targets, find the resources and oversee the implementation of long term path construction and management in the area.

Its constituent members could include public agencies such as, CCW, BBNPA, WDA, WTB; representatives of landowners and managers, farming and other tenants, graziers, NT, FE and others; beneficiaries such as path users, Brecon Beacons Park Society, local community representatives and others

Details of the administration of such a partnership would need to be agreed by the partners and experience of the Cross Border Demonstration Project that has recently illustrated that adequate time should be allocated to this part of the process.

There appears to be no suitable existing partnership of relevant organisations currently within the area and in any case adding additional significant new roles to an existing partnership may result in effort on path work being diluted as it would not be it's primary focus.

In addition to the creation of the Partnership, staff would need to be identified to manage the project either from within existing partner organisations or as new employees who could be employed by one of the partner organisations.

Similarly a decision would be required as to whether direct labour, contractors or a combination of the two should be employed to undertake the works.

There are a number of potential benefits to this option it would provide consistent coverage across the entire NP and could achieve maximum benefits from investment, and encourage investment on a strategic basis. It may also appear attractive to potential funders because of its community involvement. Similar to option 3, there would need to be clarity about roles and responsibilities and resource contributions especially during the initial stages of such a partnership especially when a potentially large amount of speculative work would be required in developing funding proposals and bids. Providing the Secretariat to this type of partnership would also have resource implications to the organisation supplying this service.

On the negative side, although it would appear to be beneficial to include a variety of interests within the partnership, if it were too large it may become unwieldy and difficult to manage. There may be a tendency for the employing organisation to direct staff onto other work and priorities may be affected. There are also various issues that would need to be clarified such as which organisation's procurement policies should be adopted etc.

7.2.4 Option 4: Management of a Partnership by Creation of an Independent Charitable Trust or Company Limited by Guarantee

There are a number of examples in Scotland of dedicated charitable companies or Trusts being established to raise and hold funds and implement large and small scale access projects. The usual model employed is that a charitable company or Trust would have a Board comprising members representing and nominated by the partner organisations (that would be the same as in option 3 above). The Trust or company is used to develop projects, funding proposals, to implement works (directly or through project managing contractors) and would service the Partnership that would be The Board.

There are a number of advantages to this approach – this type of organisation may be eligible to certain funding opportunities not open to partner organisations, they can be extremely focussed on delivering and developing specific projects, they can be more dynamic than Local Authorities for example because they need not be constrained to the same degree by certain regulations, they allow partners to externalise costs associated with work undertaken by the charitable company. During the initial stages of the development of such an organisation costs could be minimised assuming that one of the public sector partners were prepared to provide the Secretariat support – there would be no need to directly employ any staff. Indeed it would only be prudent to consider employing staff if sufficient external funding was raised.

Disadvantages to this approach may include that costs will be incurred in establishing a Trust, it may be difficult for partners to agree to Articles of Association and, that if the company is very much focussed on delivery of projects at the completion there may be no long term role for such a Trust and it may be desirable to wind it up in such circumstances. A clear exit strategy to cover this eventuality and it would therefore need to be developed to clarify with which of the partners long term maintenance liabilities should reside for example.

7.2.5 Option 5: Management of a Partnership by an Existing Trust or Company Limited by Guarantee

A different approach to option 4 could be to encourage an existing Trust or charitable company to manage a partnership and implementation of projects. There are two organisations that already exist in the area which may be able to take on the partnership management function and create a dedicated unit to undertake practical works in BBNP area.

The National Trust, as has been mentioned already manages upland erosion repairs on their own estate but their charitable constitution appears to prevent them from taking on this function for activities on other land. The Brecon Beacons Park Society was established to advance the enhancement, protection and conservation of the countryside and other amenities of the Brecon Beacons National Park for the benefits of the public, and, to advance the education of the public to achieve the above. Although The Park Society was instrumental in developing the Beacons Way the organisation has not been heavily implemented large scale projects.

The addition of a footpath management unit into one of this organisation might enable it to draw on existing skills and experience already gained in footpath management in other areas. There may also be cost benefits by reducing the administrative burden by working with an existing organisation and company. Such operations have been shown to be cost effective in implementation and provide a dedication to specific work programmes and targets set.

However if this option were adopted it is likely that it would be necessary to amend the constitution of the Society, it would affect the focus of the Society's work and assuming that a large scale project were developed would require them to employ staff to manage it.

7.2.6 Option 5a: Management of a Partnership by an existing Trust or company limited by guarantee or by creation of such a Trust with grant giving function.

A similar model to options 4 and 5would allow partners to create a fundraising, fund-holding and grant-making organisation that did not directly implement projects. Organisations would apply to the Trust for grant aid to implement projects that met the Trust's charitable objects. This model would require secretariat support that could in the initial stages be provided by one of the public sector partners. In order to raise funds it would also require either partner staff or external consultants to develop bids. It would also need to develop mechanisms to audit works undertaken by organisations that it had funded.

Potentially this approach could keep overheads low, but there may be issues of quality and financial control.

## 7.3 Examples of good practice

There are many examples of good practice around the UK in implementing upland erosion programmes and due to constraints of resources I have focussed on 2 geographical areas although good practice is not exclusive to those areas.

Not surprisingly considering their topography Scotland and the Lake District have developed fairly sophisticated management systems and a good range of practical solutions to tackle various erosion problems. (See Annex 7 for further detail). In both instances there is good dialogue between practitioners and managers from a variety of organisations – in Scotland this is facilitated by Upland Path Advisory Group (UPAG) (Secretariat provided by SNH) and in the LDNP by liason meetings between NPA and NT staff. In Scotland the 'industry' developed an SVQ level 2

Landscapes and ecosystems contextualised for the path industry and a number of path workers have undertaken training in LD and Scotland and achieved the award.

In Scotland upland erosion work is delivered in a number of ways – by charitable Trusts limited by guarantee such as UDAT, TFT etc, by the NTS, sometimes by Local Authorities or landowners (usually grant aided by SNH). In the Lake District work is delivered by the NT and NPA and is steered by a partnership comprising EN, LDNPA and the NT.

In Scotland The Footpath Trust and Upper Deeside Access Trust were both established largely in order to increase the resources available for this type of work, to target them more effectively and to provide a focussed approach to erosion and access management that was not available prior to their establishment. TFT implemented a c. £3.75 million programme of upland footpath repairs over a 5 year period, developed and ran 3 6 month training courses and contextualised a SVQ level 2 qualification to upland erosion work, and in addition developed 2 extensive low ground path networks at a cost of approximately £500 000. The Trust employed 4.5 members of staff to run the training programmes, contract manage works, liaise with land owners, develop funding programmes etc

TFT was governed by a board of directors who were drawn from the partner organisations (SNH, Highland Council, Local Enterprise Company, Large land owners, user groups etc). Funding was secured from a number of sources such as European Objective 1, HLF, partner organisations, Aggregates Levy fund and landfill tax credits, Scottish Mountaineering Council etc.

In the Lake District an informal partnership has existed between the NT and LDNPA for a number of years in order to provide some co-ordination to upland path works. However more recently this partnership with the inclusion of EN was successful with an HLF bid that has allowed implementation of a significant programme of work. Details of this partnership are contained at Annex 7.

Both of the examples above illustrate the potential benefits of focussed partnership working and

## 7.4 Recommendations from section 7

- An integrated approach to footpath management should be developed and included in the business plan. This approach should include revenue and capital works, short and long term objectives and pre-emptive and ameliorative works.

- In the short term NT and BBNPA should continue to implement upland erosion projects on an opportunistic basis as is currently the case.

- In the short and mid term the working Group identified in 7.2.4 above should develop option 4 above - creation of an independent charitable Trust or company limited by guarantee and use this mechanism to implement the business plan.

- The Working Group should identify potential partners to form a partnership and to create an independent charitable Trust or company limited by guarantee at an appropriate time.

## 8.0 Conclusions

The research undertaken as part of this project demonstrates a significant deterioration in path condition and erosion problems since 1997 across the entire Park and a large increase in cost for repairing damage at the current position. There are a few relatively localised exceptions (eg the routes from Storey Arms and Pont ar Daff to Pen y Fan) where routes have been repaired and are now reasonably stable and which demonstrate that it is possible to successfully physically address the problem.

A positive note can be drawn from the fact that upland erosion is an issue that is raised in a number of other strategies and plans and there seems to be consensus that it needs to be managed and the negative impacts reduced. The political and financial reality in the past few years however is that it has not been possible to adopt a coherent approach to the matter largely because any funding that has been available has had conditions attached that have usually meant that there has been a requirement that resources have had to be spent in individual financial years with no indication of forward funding.

The lack of consistency in funding has had a negative effect on skills and potential economic benefits within the area – contractors or organisations such as BBNPA are provided with little incentive to train their work force to undertake this type of work because they are unlikely to recoup costs and it is therefore necessary to invite contractors from outside the area to tender for works due to the local skills shortage. Lack of effective local competition may also increase costs to the client (although there is no specific evidence to prove that this is currently the case).

The financial cost of repairing the erosion damage identified by the path survey is large and the logistics involved in implementing a programme of works that generates greatest local benefit in terms of repair work, economic benefit, social inclusion and training will be extremely complex. It appears unlikely that the current structures available for resourcing and managing implementation programmes will be adequate to tackle the scale of problem that now exists nor will they be able to manage the issue across the Park into the future.

Good practice across the UK would suggest that relatively large scale upland erosion management programmes can be managed and implemented in a variety of ways and by a variety of management structures. It has been recommended that in the context of the situation in the Brecon Beacons National Park an independent charitable Trust should be established to act as an organisation to raise funds and to implement works. It is considered that this model would be the most dynamic and effective method of addressing the issue, generating local income and improving skills in the locality. It is proposed that the Trust should comprise a Board drawn from partner organisations such as the BBNPA, National Trust, local land owners, Visit Wales, WAG (The Department for Enterprise, Innovation, and Networks), Local Access Forum etc. and that the Board should direct the work of the Trust.

Attracting sufficient funding to permit project implementation on a large scale is likely to continue to be challenging not least because the resources of one of the potential major funding sources (Heritage Lottery Fund) is under extreme pressure due to its commitments to the 2012 Olympics.

Nevertheless there are other opportunities available and it has been recommended that assistance should be sought from experienced external funding consultants or officers from partner organisations to help assemble a co-ordinated funding package to support the work of the Trust.

This document provides a good basis for action, it has audited the scale of the problem and provided global estimates for the cost of repair; it has identified issues around the skills and training requirements to allow the development of a large scale project; practical repair techniques which could be employed to address the problem have been identified and evaluated, and a way forward in terms of project implementation have been proposed. It is clear that the way forward will be challenging but experience elsewhere in the UK would suggest that with political support very positive achievements can be realised.

### 8.1 SMART Objectives that the Strategy should achieve

| Objective | Key Targets | Means of measurement | Timescale | Organisations involved | Lead Organisation/ Officer | Resource |
|---|---|---|---|---|---|---|
| Repair high priority path sections that are also highly dynamic | Repair 12,250 metres of Priority 1, dynamic score 1 path | Contracts completed | By December 2013 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £650 000 |
| Repair high priority path sections that are also highly dynamic | Repair 12,250 metres of Priority 1, dynamic score 1 path | Contracts completed | By December 2018 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £650 000 |
| Repair high priority path sections that are also highly dynamic | Repair 10,000 metres of Priority 2, dynamic score 2 path | Contracts completed | By December 2013 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers | BBNPA / Access Officer | £275 000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Assoc, Contractors | | |
| Repair high priority path sections that are also highly dynamic | Repair 10,000 metres of Priority 2, dynamic score 2 path | Contracts completed | By December 2018 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £275 000 |
| Undertake pre-emptive works on path | Repair 25 000 metres of path at cost of £8 metre | Contracts completed | By December 2013 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £200 000 |
| Undertake pre-emptive works on path | Repair 36 000 metres of path at cost of £4 metre | Contracts completed | By December 2013 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £150 000 |
| Maintain upland path network | Undertake annual maintenance (as per contract schedule) on 50 000 metres of path (average) | Contracts completed | Annually June 2010 - December 2013 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £75 000 (total) |
| Maintain upland path network | Undertake annual maintenance (as | Contracts completed | Annually June 2013 - December 2018 | BBNPA, CCW, Visit Wales, WAG, Coleg | BBNPA / Access Officer | £200 000 (total) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | per contract schedule) on 150 000 metres of path (average) | | | Powys, Park Society, Ramblers Assoc, Contractors | | |
| Maintain upland path network | Undertake annual maintenance (as per contract schedule) on 200 000 metres of path (average) | Contracts completed | Annually June 2018 - December 2023 | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Contractors | BBNPA / Access Officer | £250 000 (total) |
| Survey paths every 3 years | Repeat 2006 survey with some additions (Complete survey of 170 km of upland paths) | Produce path survey report | By October 30th 2009 | BBNPA | Access Officer | Staff time |
| Compare path data every 3 years | Analyse changes between 2006 and 2009 survey data | Produce path survey report | By December 30th 2009 | BBNPA | Access Officer | Staff time |

## 8.2 Summary of Recommendations

The recommendations made at the end of each chapter are summarised below and presented as SMART objectives. Certain recommendations that were made earlier in the report are not listed individually below since they will be incorporated within other recommendations. Clearly certain of the recommendations below can be further subdivided and no doubt will be when detail of delivery responsibility etc has been confirmed.

| Recommendation | Key Action | Organisations involved | Key Targets | Timescale | Lead Organisation/ Officer | Resource |
|---|---|---|---|---|---|---|
| Adopt Guiding Principles | Present to BBNPA | BBNPA | secure acceptance as policy | By June 30th 2007 | Head of Countryside | Staff time |
| Adapt and adopt standards | Present to BBNPA | BBNPA | secure acceptance as policy | By June 30th 2007 | Head of Countryside | Staff time |
| Adopt Upland Erosion Strategy | Present to BBNPA | BBNPA | secure acceptance as policy | By June 30th 2007 | Head of Countryside | Staff time |
| | | | | | | |
| Survey additional paths | Undertake surveys | BBNPA | Complete 4 path surveys, enter data on spread sheet | By September 30th 07 | Access Officer | Staff time |
| Survey paths every 3 years | Repeat 2006 survey | BBNPA | Complete survey of 170 km of upland paths | By September 30th 09 | Access Officer | Staff time |
| Survey paths every 3 years | Repeat 2006 survey | BBNPA | Produce path survey report | By Dec 09 | Access Officer | Staff time |
| Compare path data every 3 years | Repeat 2006 survey | BBNPA | Produce path survey report | By Dec 09 | Access Officer | Staff time |
| | | | | | | |
| Establish working group to develop and implement business plan | Establish working group, terms of reference | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc | Hold first meeting of group | June 30th 2007 | Head of Countryside/ Access Officer | Staff time + £200 |
| | | | | | | |
| Develop business plan | Conduct research, | BBNPA, CCW, Visit Wales, | Complete business plan | March 31st 2008 | Access Officer | Staff time, £2500 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | consult with stake holders, Write plan | WAG, Coleg Powys, Park Society, Ramblers Assoc | | | | consultancy fees |
| | | | | | | |
| Clarify whether CDM regulations apply to this type of work | Correspond with relevant HSE staff | BBNPA, HSE | Obtain written clarification as to whether CDM Regs apply to upland path work | By June 30th 07 | Access Officer | Staff time |
| Investigate further the efficacy of various labour organisation methods | Research, gathering evidence from elsewhere in UK | BBNPA, UDAT, NTS, other NPAs | Produce report | By 31st Dec 07 | Access Officer | Staff time |
| Develop a fully costed training programme | Develop a fully costed training programme | Coleg Powys, LDNPA, BBNPA, NT | Include report within business plan | 31st March 2008 | Access Officer | Staff time, £1000 (consultancy) |
| Path managers to undertake visits to observe best practice in terms of organisational management and field techniques across the UK | Fact finding visits to 4 organisations | BBNPA, NT, LDNPA, UDAT, NTS, SNPA | Undertake visits and produce report | By 31st Dec 07 | Access Officer | Staff time + £500 |
| Assemble a funding package from a variety of sources to allow works to be undertaken | Develop funding package | BBNPA, NT, CCW, Coleg Powys, WAG | Secure £2 million funding over a 5 year period | To be in place by July 08 | External Funding manager | Staff time, £5000 (consultancy fees) |
| | | | | | | |
| The working Group should establish an independent charitable Trust or company limited by guarantee | Establish an independent charitable Trust or company limited by guarantee | BBNPA, CCW, Visit Wales, WAG, Coleg Powys, Park Society, Ramblers Assoc, Landowners rep, commoners rep | Establish an independent charitable Trust or company limited by guarantee | March 08 | Head of Countryside | Staff time +£5000 professional fees |

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www.fixthefells.co.uk/ (Lake District National Park Authority)

www.frizington.fsnet.co.uk/articles%20index.htm (Cumbrian footpath workers web site)

Acronyms

| | |
|---|---|
| ATV | All-terrain vehicle |
| BBNP | Brecon Beacons National Park |
| BBNPA | Brecon Beacons National Park Authroity |
| BMC | British Mountaineering Council |
| BUFT | British Upland Footpath Trust |
| CDM | The Construction (Design and Management) Regulations 1994 |
| EAGGF | European Agricultural Guidance and Guarantee Fund |
| FE | Forest Enterprise (Forestry Commission) |
| TFT | The Footpath Trust |
| ITE | Institute for Terrestrial Ecology (Centre for Ecology and Hydrology) |
| LDNPA | Lake District National Park Authority |
| NGO | Non-governmental organisation |
| NPA | National Park Authroity |
| NTS | National Trust for Scotland |
| SNPA | Snowdonia National Park Authority |
| SSSI | Sites of Special Scientific Interest |
| SVQ | Scottish Vocational Qualification |
| SWOT | Strengths, weaknesses, opportunities, threats (strategic planning tool) |
| UDAT | Upper Deeside Access Trust |
| VQ | Vocational Qualification |
| WAG | Welsh Assembly Government |
| WDA | Welsh Development Agency |
| WTB | Wales Tourist Board |
| NT | National Trust |
| WTS | Walking Tourism Strategy |

**List of Annexes**

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