TROOPERS HILL, BRISTOL

ECOLOGICAL MONITORING 2004

INTRODUCTION

This report describes the results of vegetation and photographic monitoring carried out in 2004 as a repeat of surveys carried out in 1994, 1996, 1998, 2000 and 2002. The purpose of the monitoring is to identify any changes in the vegetation of Troopers Hill; to monitor the success of management; and to identify any further priorities for management required to conserve and enhance the site's ecological interest.

There are two habitat types of major interest at the site - acidic grassland, (including partially bare areas that are of exceptional interest for invertebrates); and heath. Both habitat types are rare in both Bristol and the surrounding area. Particular attention in the monitoring has been paid to the heathland vegetation since through the 1980s and early 1990s it appeared that this was threatened and might require targeted management. Over the course of the monitoring programme the extent of heathland on the site has grown significantly.

METHODS AND RESULTS

The methodology followed that employed during previous visits. Photographs were taken from the locations mapped and described in the previous reports at the same time of year - in August, when the heather species are in flower.

The aim of the survey has been to record:

1) the extent of scrub encroachment onto areas of both grassland and heath; and

2) the size and health of the populations of the two heather species present - ling (*Calluna vulgaris*) and bell heather (*Erica cinerea*).

Patches of scrub and heath were mapped and identified with a letter and briefly described. The smaller patches of heath were measured, recording width and length of the patch at its widest and longest. The edges of each patch were defined as the furthermost branch tips. The height measurement was taken at the tallest point of the patch, at its natural height - i.e. without pulling shoots upwards. Fewer heather patches are measured now than in 1994 because patches have grown and merged, in particular, because may patches are now surrounded with seedlings and defining the edges of a patch has become impossible.

Photographs were taken from fixed points, showing as many of the features of interest as possible, including areas where scrub encroachment appeared to be a potential problem. Where possible photographs were framed so as to include a fixed reference point, such as a building. Features such as scrub encroachment referred to in the descriptions below are marked on the photographs.

Area Descriptions

The hill was affected by a widespread fire in 1995, which killed areas of both heather and scrub. Since then there were several smaller burns, one of which affected an area of broom in area G. There was little evidence of fires having affected vegetation between 2002 and 2004, probably as a consequence of wet weather.

A: This is an area of mixed bramble and hawthorn scrub, with patches of bracken. Following the 1995 fire the area was very open but subsequently re-growth, especially of bramble, has been strong. The scrub vegetation has continued to thicken since 2000 and has also spread slightly. Photograph 1 shows continued spread of bracken and bramble since 2002. Comparison of the 2004 photograph with the one taken ten years earlier shows two main trends:

i) an increase in heather species, obvious in the left and centre of the photograph; and ii) spread and filling-in of the scrub in the right-hand side of the photograph. It can be seen that open patches within the main areas of scrub have been lost and that scrub has spread into adjacent areas of grassland, for instance the large patch of bramble that has appeared to the right of the gate. It should be noted, however, that the grassy slopes visible at the top left of the 1984 photograph have not been lost, they are just obscured by scrub from the point where the photograph was taken.

The area can also be seen, more distantly, in the right-hand part of photograph 20, which shows that whilst the tops of the slope have remained scrub-free small clearings within the scrub have become overgrown.

B: This area, a dense patch of bramble, has been cut back on a rotation. Photograph 2 shows the area. The cleared area has regenerated as a sward of species-poor false oat-grass (*Arrhenatherum elatius*) dominated grassland with patches of rosebay willowherb (*Chamerion angustifolium*) and nettle (*Urtica dioica*). At the right of the photograph there is an area of shorter grassland that is more diverse, with additional plant species including black knapweed (*Centaurea nigra*).

C: The hedge here forms the edge of the site. It consists of a dense hedge of hawthorn, elder, goat willow and pedunculate oak, with small amounts of bramble. It has changed little over the last ten years.

North of D: The Japanese knotweed and ornamental dogwood, shown on photographs 3 and 4, increased substantially between 1994 and 1998 were then fairly stable between 1998 and 2000 and have again increased, but at a slower rate, since 2000. The habitat across which they have spread is species-poor false oat-grass dominated grassland and its loss is not significant in terms of the site's biodiversity, but further spread might become damaging. Photograph 4 also shows the growth of the trees in the background, and the appearance of a patch of tansy (*Tanacetum vulgare*). This plant is fairly widespread, but it does provide a nectar source for insects as well as being visually attractive.

D: The large patch of ling seen in photograph 6 in 1994 had completely disappeared in 1996, presumably as a result of the fires of 1995. It had regenerated by 1998, although it was much smaller than it was in 1994. In 2000 it had recovered to its size

in 1994 and it has remained at a similar size in 2002 (3.25m x 2.3m x 0.8m tall). In 2004 the main patch had grown slightly (to 3.4m x 2.5m x 0.9m tall). Comparison of the photographs from 1994 and 2004 also show the appearance of several smaller plants of ling around what was previously an isolated patch.

E: Previously this was a patch of ling plants in an otherwise grassy sward but strong growth of ling has been noted since 1996. This growth remains strong and small seedlings continue to appear around the edges of the patch. It is now too large and diffuse to measure with any accuracy. The strength of this growth of heath species is clearly visible in photographs 7 and 8. Comparison of photograph 8 shows that since 1994 large patches of bare ground have been partially colonised by moss species, ling, common catsear (*Hypochaeris radicata*) and other plants.

F: The broom scrub here was severely affected by the 1995 fire and had not attained its previous size by 2000 but photographs 9, 10 and 11 show that the patch of broom scrub had regained its size by 2002. It continued to grow and spread slightly between 2002 and 2004. Oak, silver birch (*Betula pendula*) and holm oak (*Quercus ilex*) are beginning to encroach into the area and their continued growth would threaten the broom scrub and heath. Compared to 1994, the grass sward is now much more dense and bell heather, ling and golden-rod (*Solidago virgaurea*) have colonised the area but in a small patch (not visible on the photographs) a fire has opened up the grass sward and there is now more bare ground here than there was in 2002. In an area that is not shown in any photographs, bell heather is continuing to spread in small patches up the hill towards the chimney, where heath plants were entirely absent before 2002.

G: In 1994 this was a patch of ling, with several seedlings. Bell heather has since colonised the area but since 1998 broom has regenerated strongly and although plants of both ling and bell heather remain under the broom they are much reduced in both size and vigour. There has been little change in this area since 2002.

H: In 1994 this was a patch of goat willow and silver birch with a small plant of bell heather. There has been a strong growth of bell heather here since 1998 and the patch is now too poorly defined to measure, due to the spread of small plants around the main patch. There has been strong growth of both heath species, and especially bell heather, across the slope to the west.

I: This is an area of tall grassland with scattered plants of bell heather. There has been a steady increase in the number and size of bell heather plants since 1994. On photograph 21 in 2002 strong growth of grasses obscured heath plants here but in 2004 the vigorous growth of bell heather is obvious in the photograph. There had been a small fire in the area, probably in early 2004, but its effect was limited and bell heather regrowth was strong. Comparison with the 1994 photograph shows that goldenrod has spread strongly across the area. Scrub in the background of the picture has also spread.

J: This is an area with scattered plants of bell heather and ling on a south-west facing slope; up until 1998 bell heather only was present. The extent of both bell heather and ling has increased steadily and consistently in this area. In 1994 photographs 13 and 14 show a grassy sward with scattered small plants of bell heather. The corresponding photographs in 2002 and 2004 show heathland vegetation dominated by bell heather,

with scattered goldenrod (which was almost absent in 1994). There has been some spread of scrub and sapling trees around the edges of the area, especially in the bottom of the small gully in the centre right of photograph 13. Photograph 14, by contrast, shows that bramble encroachment across the area has been checked.

K: This is an area of broom scrub, which in 1994 had only small patches of bramble and saplings of oak. Since 1998 oak and bramble have grown up through the broom and are now shading out part of the area. This can be seen on photographs 13 and 14.

L: In previous years there was one plant of ling here, but the extent of heath here has increased, particularly since 1998. There are now many plants forming an extensive patch and the individual plant measured in previous years is now part of a much bigger patch of both ling and bell heather. The edges of the area are being threatened by spread of bramble and holm oak.

M: In 1994 this was an area of tall grassland with scattered small plants of ling. Bell heather has colonised the area since 1996 and bell heather has become much more abundant and vigorous. The spread of both bell heather and ling continued between 2000 and 2002. As with the previous area control of bramble and holm oak is required.

N: This is a small valley, shown from various angles on photographs 16, 17 and 18. Throughout the monitoring scheme it has had good populations of both ling and bell heather growing around patches of bramble, oak and hawthorn. Japanese knotweed is present around some of the bramble patches. Both heather species have spread progressively since 1994, but there has also been growth of bramble patches and the oak trees and hawthorn bushes are becoming taller. Since 2000 there has been progressive spread of bramble at the edges of the area and this is shading out some of the heath. Comparison of photograph 17 in 1994 and 2004 show the appearance of bramble at the bottom left of the photograph; the appearance of an oak sapling in the right of the photograph; and the growth of several holm oak saplings on the edge of the main area of scrub. Holm oak saplings can also be seen in photograph 18.

O: At the start of the monitoring scheme this area consisted of a band of hawthorn scrub at the bottom of the hill and an area of tall grassland with patches of bramble and a considerable amount of broom on the slope above the hawthorn. The extent of hawthorn here has barely changed through the lifetime of the scheme but bramble has spread aggressively across the rest of the area, to the extent that tall grassland is now absent. Broom decreased between 1994 and 2002, but has spread slightly since then. A cherry sapling, which was absent in 1994, is prominent in the right of photograph 19. Holm oak has also colonised the area.

P: This is a predominantly grassy slope with scattered plants of bell heather. Comparison of photograph 20 from 1994 to 2004 shows that heather has become much more frequent (now at about 40% cover across the area), that there has been small scale spread in scrub and that the area of bare ground (a key invertebrate habitat) has remained much the same.

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R: In 1994 this area had a cover of bell heather of approximately 75%, with some hawthorn, bracken, bramble and broom in the north-eastern part of the area. In the fire

of 1995 the area of bracken and bramble was significantly reduced and the broom was destroyed. The cover of bell heather was significantly reduced. Since 1996 bell heather has spread and ling has colonised the area. The broom has regrown well. On the upper left of photograph 21 the change from scattered broom in a largely grassy sward to scattered broom amongst bramble scrub can be seen.

S: In 1994 this area of heathland had a cover of bell heather varying from 30% at the south-eastern end to 90% at the north-western end. The area was burnt in the 1995 fire and, although patches of bell heather remained, its cover was much reduced. Since then the cover of bell heather has increased throughout the area and now varies from 70% to 95%. The area is shown in photograph 22.

T: In 1994 there was one small plant of ling in this area. There has since been a significant increase in heath vegetation and in 2004 there were 8 clumps of ling (1 in 2002) and 30 plants of bell heather (12 in 1998 and 21 in 2002). Some of these plants can be seen in photograph 23 - in 1994 neither golden-rod nor the two heath species were visible in the photograph.

U: In 1994 there were three clumps of ling here. By 2002 this population had grown to 12 clumps (5 in 1998) and remained at this level in 2004. The area was colonised by bell heather between 1998 and 2000, now 1 large plant is present within the area, as in 2002. Part of the area can be seen on photograph 24, showing little change since 1994.

There are now scattered ling and bell heather plants on the slope between areas U and V. In 2004 heath species were absent from the opposite, north-west facing slope. In 2000 a single plant of bell heather was present here, increasing to 3 in both 2002 and 2004. In 2004 5 small plants of ling were also present here.

V: This is a small bowl in the south-facing slope of the gully, shown on photographs 25 and 26. In 1994 there were substantial patches of ling with one clump of bell heather. Both ling and bell heather increased here between 1994 and 2000 and this increase continued between 2002 and 2004. The bramble at the bottom of the slope, visible in the bottom left of photograph 25 and the bottom right of photograph 26, has also continued to spread. Several holm oak and pedunculate oak seedlings are visible in photograph 26.

W: This area is on the north-facing slope of the gully, opposite area V. In 1994 there were 3 moderate-sized patches and 1 very small patch of ling. The cover of ling increased significantly between 1994 and 1996 but then decreased between 1996 and 1998. Since 1998 it has increased again and this increase continued between 2002 and 2004. Holm oak seedlings are present at the top of the slope at the western end of the area.

X: There is scattered ling in a grassy sward on the slope of the gully here, with one patch of bell heather at the top of the gully slope. There has been little change in the vegetation of this area since 1994.

Y: In 1994 ling made up approximately 75% of the cover in this area. This proportion remained roughly the same in 1996 but it has since increased to 100%. Photograph 27 now shows a slope dominated by ling, as opposed to a grassy slope with scattered ling

in 1996. However, there has been some increase in bramble, visible in the bottom left corner of photograph 27 and spread of bracken, visible to the left of photograph 28. This spread largely occurred between 1996 and 1998, but it continued at a slower rate to 2004.

Z: At the beginning of the monitoring scheme there were scattered clumps of ling on the south and south-east facing slopes of the gully here. At the bottom of the slope the coverage of ling has gradually increased to 100% and at the top of the slope, where heath species were previously absent, both bell heather and ling are now scattered in a grassy sward dominated by wavy hair-grass (*Deschampsia flexuosa*).

AA: This is a small gully that has supported dense ling throughout the life of the monitoring scheme. The vigour of the plants has increased progressively and there are several seedling plants around the edge of the main patch. The spread is most obvious at the top of the slope, and can be seen in photographs 30 and 31. There is some spread of cotoneaster into the area and adjacent tree and scrub growth is shading the area and threatening the heath.

BB: In 1994 ling was scattered across this slope and formed a dense patch only around the patch of bramble (visible in the bottom left of photograph 33). The area was affected by the fire of 1995 and since then the ling has spread quickly, and is now much more vigorous than it was in 1994, forming c60% of the vegetation cover. Bell heather colonised the area after 1996 and golden-rod is also more frequent. The bramble has also spread and several plants of broom are now present. A holm oak sapling (not visible in the photograph) is present at the bottom of the slope.

CC: This area, part of which is shown on photograph 32, has patches of ling around beds of bramble and other scrub and a small oak tree. Bramble has spread across the area, but at the expense of rank false oat-grass dominated grassland, rather than of the ling.

DD: There has consistently been a patch of ling and bell heather, in approximately equal quantities, here. The heath species continue to do well in this area. Small scale bramble encroachment was noted in 2002 and has accelerated, to the extent that it now poses a serious threat to the survival of this patch of heath. See photograph 34.

EE: This area is located directly above number 89 Troopers Hill Road. In 1994 it supported 2 clumps of ling and 1 clump of bell heather on the main slope and a clump of bell heather at the bottom of the slope. No heath species were found here in 1996 or 1998 following the fire in 1995, although the broom did re-grow. In 2000 3 plants of bell heather and 1 plant of ling were found. In 2002 many young plants of both species were present. In 2004 there were large patches of bell heather and smaller plants of ling, although the slope was predominantly grassy. The bramble patch, visible at the bottom left of photograph 35, is restricted to a patch of species-poor grassland and is not yet posing a threat to vegetation of interest. The photograph also shows small-scale growth of broom in the area, which is also not a problem at present.

Summary

The main trends in vegetation are similar to those that were noted in 2002:

- the cover of both ling and bell heather has continued to increase;
- grass growth across much of the site is stronger than it was in 1994, although perhaps not as vigorous as it was in 2002.
- some continued scrub encroachment.

The reasons for these changes are not known, but the most likely explanation is that recent years have seen a succession of wet years, in contrast to the early 1990's, when there were several successive dry summers. This climatic shift has had two main effects. The first is that fires are far less frequent. The early years of monitoring showed that a single severe fire, as happened in 1995, can significantly limit the extent of both heath and scrub vegetation, and that the vegetation can take 2-3 years to recover. A series of dry years, with several fires as a result, could lead to a substantial decline in heath species and scrub. Dry summers would also limit the vigour of grass growth, and on a free-draining site such as Troopers Hill, would lead to an increase in the proportion of bare ground on steep slopes.

Bare ground habitat on the site is extremely important for invertebrates. It was noted in 2002 that the main area of erosion, used by large numbers of *Andrena* solitary bees and their predators and parasites and shown on photograph 20, has remained at the same extent. It continued to occupy more-or-less the same area in 2004.

As in 2002 the population of golden-rod on the site remained high.

MANAGEMENT

There are four key habitat types on the site, as follows:

i) heathland;
ii) acidic grassland;
iii) bare slopes; and
iv) broom scrub

The diversity of habitat on the site is particularly important to the site's invertebrate fauna. Rock faces, tall grassland (generally dominated by false oat-grass), tall herb vegetation (such as areas dominated by rosebay willowherb, tansy or thistle species), bramble and hawthorn scrub and secondary woodland are all important in contributing to this diversity. However, these habitat types are all much more widespread in a county context than i) to iv) above and they should not be allowed to spread at the expense of these habitats.

Site management should aim to produce an approximately 60:40 mix of acidic grassland to heath in areas where they currently exist and no part of these habitats should be lost to scrub. The proportion of heath is currently lower than this but it has been increasing in recent years. The area of bare or partially bare ground on slopes should remain at the 2002 level as a minimum. The proportion of bare soil fluctuates with rainfall and was higher in the drier years of the mid-1990s. There is no need at

present to attempt to increase the availability of bare ground, and this would be difficult, but if bare patches shrink further then appropriate measures such as small-scale turf removal should be considered. No measures should be undertaken to reduce the extent of bare ground. In places broom scrub is being lost to encroachment by other scrub species and this should be reduced, with the aim of approximately doubling the extent of broom scrub on the site from its current level.

Holm Oak

A new trend, the appearance of holm oak saplings, was noted in 2004. This non-native species is a particular problem since it is evergreen and therefore casts dense shade throughout the year. A brief search of surrounding areas was carried out and the only holm oak tree found was in Crewes Hole. The area should be searched again in winter when the evergreen holm oaks will be much easier to spot. The saplings on Troopers Hill are probably the result of jays taking and burying acorns from this tree. It is strongly recommended that the tree in Crewes Hole should be felled, and its stump treated, in order to prevent further colonisation of Troopers Hill.

Holm oak was noted in the following areas: F, L, M, N, O, V, W and BB. It is possible that further plants might be found in the winter when they are more obvious. It is recommended that all saplings and seedlings should be removed as a matter of priority.

Other Management

The site has relatively few management needs and a combination of trampling and very poor soils prevents large scale scrub encroachment.

Litter removal and path maintenance require ongoing management effort.

Locally there is a small problem caused by encroachment of scrub, especially bramble, onto the edges of interesting areas of vegetation. The following areas have been identified as being in need of management (in addition to holm oak removal):

A Fell sycamore trees, cut back bramble and hawthorn along edges.
D Remove, or control, Japanese knotweed by spraying.
F Fell silver birch, pedunculate oak and hawthorn saplings.
L Cut back bramble.
N Cut back hawthorn, bramble and pedunculate oak.
O Fell cherry and some hawthorn and pedunculate oak.
V Remove oak seedlings, to leave just semi-mature pedunculate oak tree.
AA Remove encroaching cotoneaster.
DD Cut back and remove bramble encroaching across area.

Invertebrate Records

Casual records of invertebrates have been made during the surveys. The following table provides the data from the monitoring visits. P = recorded as present but not counted; the total is given if the species was counted and a dash indicates that the species was not recorded in that year. A indicates that the species was noted as being abundant.

	94	96	98	00	02	04
Butterflies						
Grayling	P	6	-	-	-	-
Small heath	P	-	-	-	30+	50+
Meadow brown	-	-	-	10+	15+	10+
Gatekeeper	-	-	-	5+	-	4
Common blue	-	-	-	4	10+	20+
Small copper	P	-	-	4	1	3
Brown argus	-	-	-	3	-	1
Clouded yellow	-	P	-	-	-	-
Speckled wood	-	-	-	1	4	4
Painted lady	-	P	-	-	-	-
Silver-washed fritillary	-	-	-	-	-	1
Large white	-	-	-	-	1	6
Small white	-	-	-	-	-	6
Moths						
Silver y	-	P	-	10+	-	-
Square spot rustic	-	-	-	-	1	-
Knotgrass (larva)	-	-	-	-	1	-
Vapourer	-	-	-	2	-	1
Rush veneer	-	P	-	100+	1	-
Agriphila tristella	-	P	-	10+	10+	3
Agriphila straminella	-	P	-	10+	10+	-
Agriphila inquinitella	-	P	-	-	-	-
Orthoptera						
Mottled grasshopper	A	-	P	P	P	P
Field grasshopper	P	-	P	P	P	P
Meadow grasshopper	P	-	P	P	P	P
Common green grasshopper	-	-	-	-	P	P
Woodland grasshopper	-	-	-	-	-	P
Dark bush cricket	P	-	P	P	P	P
Long-winged conehead	-	-	-	-	2+	10+

Grayling was again absent but numbers of other grassland butterflies were good. The silver-washed fritillary was probably a wanderer from a breeding colony in the woodlands to the east. Long-winged conehead was recorded for the first time on the site in 2002; larger numbers were seen in 2002. This was a very rare insect nationally, but it has spread rapidly in recent years. The records of woodland grasshopper, mostly along the western side of the hill, are of greater significance. This species is nationally scarce and was unknown in the Bristol region until it was found at Goblin Combe in the late 1990's. There is some evidence that its national distribution is increasing. Its preferred habitat of heath or tall grassland close to scrub is plentiful at Troopers Hill.