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TROOPERS HILL LOCAL NATURE RESERVE

PHOTOGRAPHIC MONITORING 2021

FOR

FRIENDS OF TROOPERS HILL

TROOPERS HILL LOCAL NATURE RESERVE

PHOTOGRAPHIC MONITORING 2021

1 INTRODUCTION

This is a report of the photographic and vegetation monitoring carried out at Troopers Hill during 2021, a repeat of similar exercises carried out in 1994, 1996, 1998, 2000, 2002, 2004, 2008, 2011 and 2016.

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. The monitoring does not provide information on the exact composition of different vegetation types but it does make a contribution to the understanding of major changes in the distribution of different habitats, particularly the balance between heath and grassland and the extent of scrub and tree cover.

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 heathland. Both vegetation types, which are Biodiversity Action Plan (BAP) priority habitats, are the best examples of their kind in Bristol and the surrounding area. The monitoring has placed particular emphasis on the heathland vegetation; through the 1980s and early 1990s it appeared that the heathland was threatened and might require targeted management. Over the course of the monitoring programme the extent of heathland on the site has grown significantly. Within the heath dominated areas there are scattered patches of both grassland and bare soil of importance for invertebrates, which may not be evident from the photographs.

There are other habitat types of some interest on and around the LNR. These include scrub, particularly broom scrub, and woodland, particularly birch woodland. Management of the site recognises the importance of these habitats, but the acidic grassland and heathland are the most valuable features on the site and are threatened in places by scrub and tree encroachment. The primary ecological aim of management has been conserving and enhancing the grassland and heathland, with their associated species.

Since the 2016 photographic monitoring a new management plan has been drawn up and there has been an increase in measures aiming to reverse scrub and tree encroachment.

2 METHODS

The methodology used in 2021 followed that employed in previous years as closely as possible. Photographs were taken from the locations mapped and described in the previous reports. The survey was carried out on 2nd September 2021, a similar date to the earlier surveys. The primary aims of the survey have been to record:

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

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

3) the general appearance of the hill.

Patches of scrub and heath were mapped and identified with a letter and briefly described. In early years patches of heath were measured, recording width and length of the patch at its widest and longest. By 2008, however, measurement of patches had become impractical because many have grown and merged and many patches are now surrounded with seedlings and defining the edges of a patch has become impossible.

Photographs were taken from the fixed points defined in the 1994 survey, with the aim of 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. Since 2016 some areas from which photographs were previously taken have become inaccessible due to scrub encroachment, although in 2021 some of these have been opened up. Identifying exterior landmarks such as buildings has also become more difficult due to tree growth in several instances.

In 2021, for the first time, what3words locations of the points from which photographs were taken were recorded. These are listed as an appendix.

3 RESULTS

The photographs are included below.

3.1 Area Descriptions

The hill was affected by a widespread fire in 1995, which killed areas of both heather and scrub. Since then there have been several smaller burns, one of which affected an area of broom in area G between 2000 and 2002. There is little evidence of any extensive fire having affected vegetation since 2002.

A: This is an area of mixed bramble and hawthorn scrub, with patches of bracken, shown on photograph 1. Following the 1995 fire the area was very open, with considerable areas of grassland and scattered scrub. Regrowth of woody species, initially bramble but now also hawthorn and oaks, has been strong. The south-eastern part of the area retains open habitats, where heath has become much more frequent since 2000. Since 2016 scrub has been cleared from some areas.

B: Photograph 2 from 1994 shows an extensive patch of bramble forming this area. Periodic clearance has resulted in this being replaced by a mix of tall grassland and tall herb vegetation. The edge of the bramble has been cut back again recently.

C: The hedge that forms the edge of the site has spread slightly over the period of monitoring but is otherwise unchanged.

North of D: Control of the Japanese knotweed here has been almost entirely successful, and the tall herb vegetation that has developed includes some species of

interest, such as tansy (*Tanacetum vulgare*) and the area is now of value for invertebrates, although bramble encroachment is increasing.

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 7 patch had grown slightly (to 3.4m x 2.5m x 0.9m tall). In 2011 it had further grown slightly (to 4.1m x 2.9m x 0.9m tall) but in 2016 it had shrunk (to 2.1m x 2.2m x 1.1m tall). In 2021 it was larger than in any previous year, at 8.5m x 11m x 1.4m tall.

E: In 1994 this area, which is shown on photographs 7 and 8, was a patch of ling plants in an otherwise grassy. Strong spread of ling was then evident between 1996 and 2011 but by 2016 broom had become dominant over much of the area. Much of this scrub has been cleared since then and the 2021 photographs show some increase in the area of grassland and bare ground.

F: There have been dramatic changes in this area, which is shown on photographs 9, 10 and 11, since 1994 when it had open broom scrub. This disappeared following the 1995 fire and did not attain its previous size until 2002. The broom then spread slightly between 2002 and 2008 and more strongly between then and 2016. Since then parts of the area have been opened up by scrub clearance and the area of grassland with tall herbs has increased but both broom and bramble are spreading across part of the area.

G: In 1994 this was a patch of ling, with several seedlings but since 1998 broom has regenerated strongly and by 2016 was dominant. Part of the area has since been cleared but, as elsewhere, scrub is regenerating.

H: Broom has also spread across this area, which had open heathland between 1994 and 2011.

I: This area is shown on photograph 12. In 1994 this photograph shows a rather uniform expanse of open grass, with the then small plants of bell heather not visible. Since then both species of heather have progressively spread up the slope. Tree saplings are now threatening open habitats in this area.

J: This is another area where comparison with earlier photographs (numbers 13-15) shows enormous changes over the years. A previously rather open grassy slope now has large quantities of heath, and good amounts of several other plants. The lower edge of the slope and the small gullies running up the slope have seen substantial growth of trees, which now restrict several views that were previously open. Bramble, broom and other scrub were prominent in 2016 but since then there has been considerable scrub clearance and this has successfully reinstated open habitats in several places. Tree saplings, largely of oak, have become more frequent in the last five years.

K-N: This area was shown on photographs 16-18 but the locations used for 17 and 18 are not inaccessible. Compared with early photographs, which show a largely grass

covered slope, the spread of heathland is impressive. However, tree saplings and bramble are spreading and threaten the biodiversity interest of the area.

O: At the start of the monitoring scheme this area, which is shown on photograph 19, 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 scrub is now much denser, with most of the patches of tall grassland having disappeared and has spread up the slope. Broom decreased between 1994 and 2002 but had spread slightly by 2004 and has spread significantly since then. Clearance on the northern edge of the area has been successful in restoring some of the grassland.

P: This area continues to be of very high ecological value, supporting a mixture of heath, diverse grassland and the patches of bare ground that are important to invertebrates. Continued control of scrub and tree saplings across the area would be beneficial.

R: In 1994 this area, shown on photograph 20, 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. Broom and gorse encroachment was threatening the biodiversity interest of the area but has since been contained by management, although further clearance would be beneficial.

S: In 1994 this area of heathland, shown on photograph 21, 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%. Growth of scrub, dominated by gorse, along the ridge above the area was very strong and has been reduced by recent management works. Bramble encroachment is threatening other parts of the area.

T: The state of the western end of the gully, as shown on photograph 23, has varied according to the amount of management. In 1994 it was fairly open but then became rather overgrown, but was open again in 2000. It was very overgrown by 2016 but has since been opened up again. This is of relatively low significance in ecological terms, but it does reduce access to a feature of geological significance.

U: In 1994 there were three clumps of ling on the northern side of the gully here and heath cover remained low until 2000. Photograph 23 shows that the spread of heather across this area has continued and there is now a continuous sward in places. The spread of bell heather and ling across the slope between areas U and V, which were previously open grassland, has also continued and is shown on photograph 24. Scrub encroachment is beginning to be a problem in parts of the area.

V: This is a small bowl in the south-facing slope of the gully, shown on photograph 25. In 1994 there were substantial patches of ling with one clump of bell heather. Both ling and bell heather have increased progressively since and this trend has accelerated

since 2008. A patch of bramble at the bottom of the slope, visible in the bottom left of photograph 25 was cut back before 2004 and has not regenerated. Removal of the trees has had substantial benefits in opening up heath and grassland habitat, although several oak seedlings that are present and are visible on photograph 26 have grown since 2016.

W: This area is on the north-facing slope of the gully, opposite area V, and is shown on photograph 27. 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 heath cover is now complete over the upper slope, spread of bracken in the lower area was noted in 2016 and has increased since then.

X: Heath has spread over this area, in common with other parts of the gully, although patches of open ground remain frequent. Bell heather is more frequent than ling across this area. This is another area in which oak saplings are becoming more frequent.

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% and growth remains vigorous. Photograph 28 shows the spread of bracken in the area adjacent to the path from which bramble was cleared between 2004 and 2008, and some resurgence of bramble since 2016.

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. The coverage of ling has gradually increased to 100% on the lower slopes, where heath species were previously absent. Until 2004 the upper slopes had scattered bell heather and ling in a grassy sward dominated by wavy hair-grass (Deschampsia flexuosa). The heath became markedly more frequent in 2004 and is now dominant.

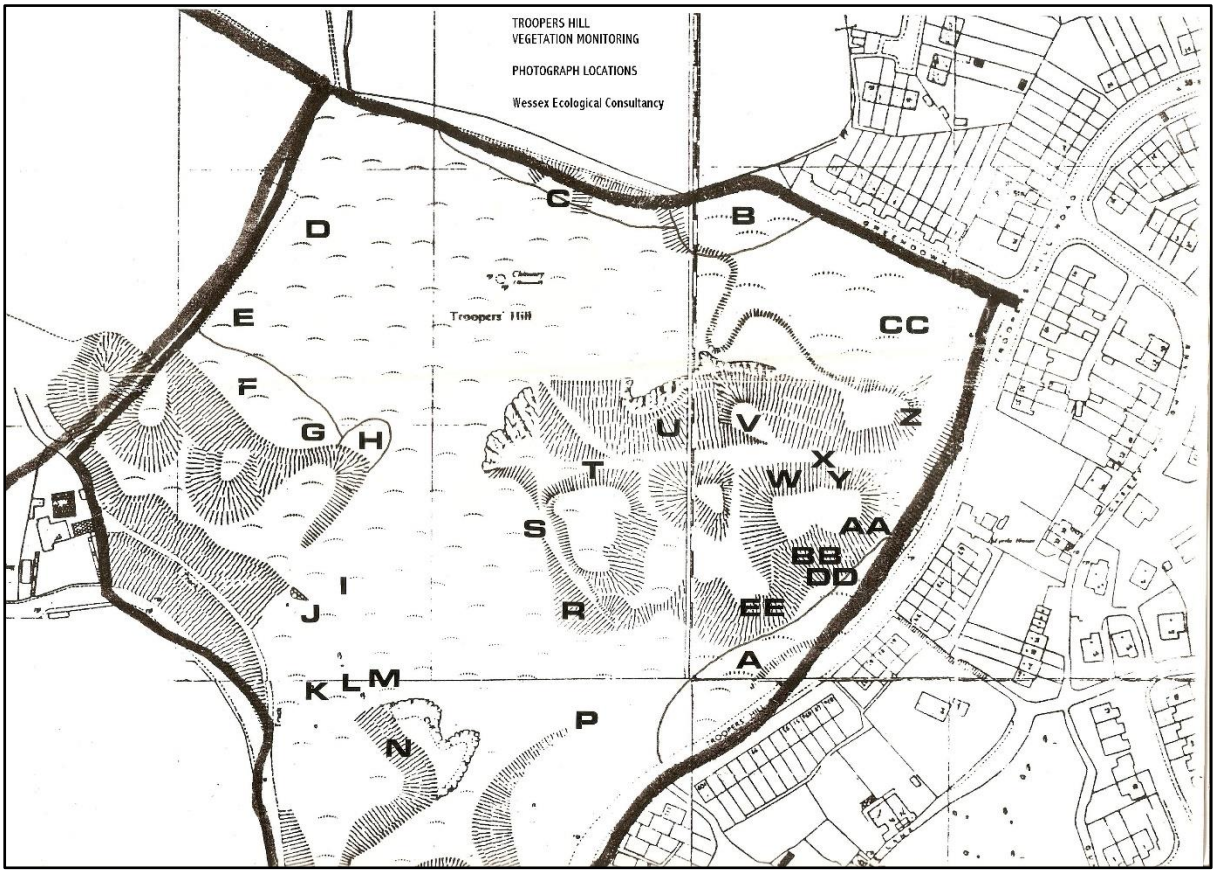
AA: Scrub growth has been vigorous in this part of the site but management since 2016 means that, unlike in that year, it now possible to take photographs 29 and 30. Scrub clearance has been successful but bramble is regenerating in places, and saplings of oak and bushes of cotoneaster and other species are spreading across parts of the area.

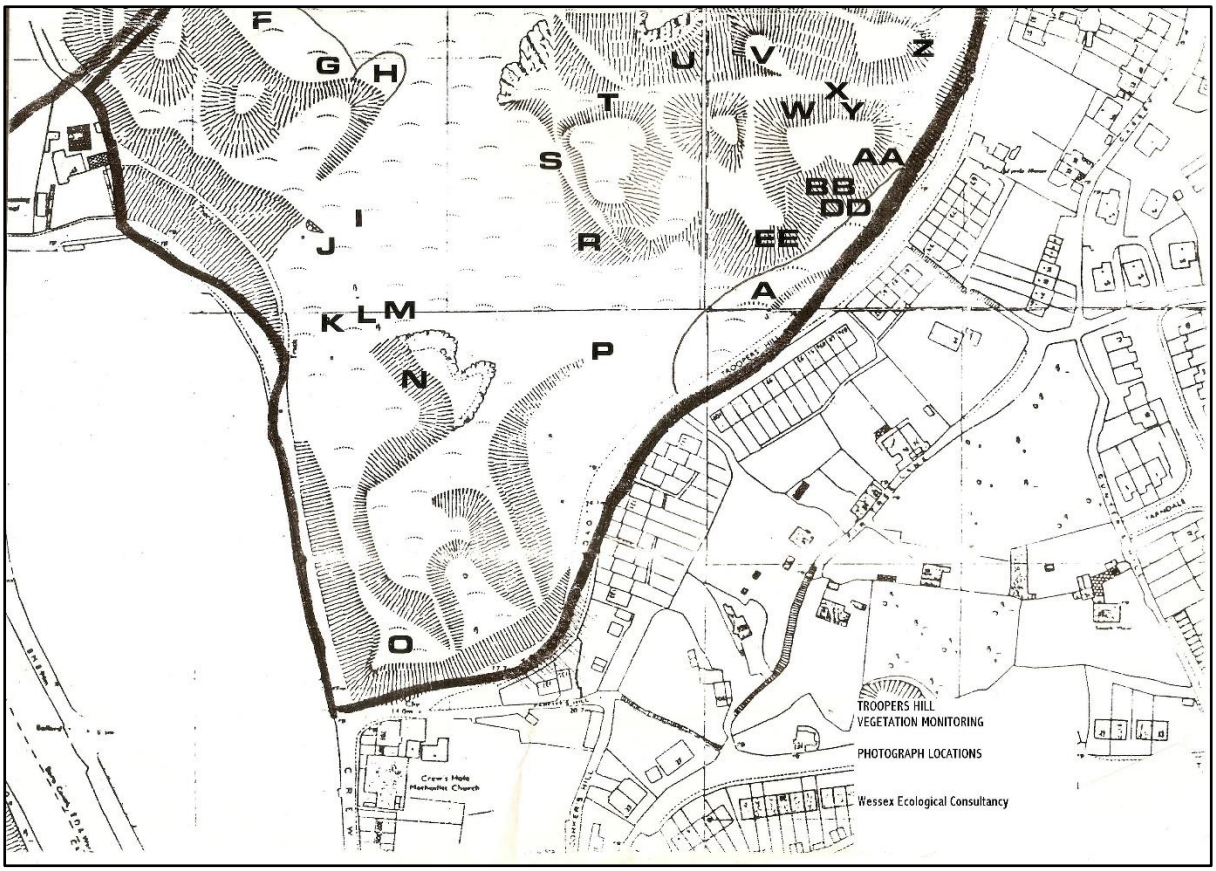
BB: This was originally an open slope with small amounts of bramble and ling. It has since been colonised by ling and associated species such as bell heather and goldenrod. Scrub encroachment has now become extensive and continues to threaten the open habitats in the area.

CC: This area, part of which is shown on photograph 31, had patches of ling around beds of bramble. In recent years ling has become much more frequent. Scrub clearance has opened up parts of the area but continued encroachment remains a problem.

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 but have not spread as rapidly as in some areas. There has been considerable management work here since 2016 but encroachment remains a problem.

EE: This area is located directly above number 89 Troopers Hill Road. In 1994 it supported two clumps of ling and one 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 three plants of bell heather and one plant of ling were found. In 2002 many young plants of both species were present. In 2004 and 2008 there were large patches of bell heather and smaller plants of ling, although the slope was predominantly grassy, but in the latter year the broom had grown and spread. Continued spread of broom was noted in 2008 and 2016 and the survival of heath here is now under threat.





The major changes they reveal are similar to those that were identified in 2016 and are summarised below:

Increased Heath Cover

Most photographs reveal a large increase in the cover of heath, dominated either by ling or bell heather or a combination of both. Almost all of the areas dominated by heath were dominated in the 1990s by very sparse acidic grassland. Both habitats are priorities for conservation. In botanical terms the trend has been almost entirely positive as the few plant species previously present in the acidic grassland generally persist in the heath-dominated areas and several additional species are now also present. There are also parts of the reserve that are poorly covered by the photographic monitoring, for instance around the chimney, and remain dominated by grassland. The only concern about this trend is possible impacts it might have on insect populations. The increased structural diversity and nectar supply is doubtless good for many species but there has been some loss of patches of bare ground, which are vital for the most important insect group on the site, solitary bees. The photographic monitoring probably exaggerates the extent to which bare ground has been lost, since considerable amounts remain within heath-dominated areas but are not obvious on the photographs. The only way to assess whether this trend is causing problems will be continued insect monitoring.

The main reason for this trend is probably the marked decline in fires in recent years although climate change and a shift towards damper summers may also have favoured heath over dry grassland.

Tree and Scrub Encroachment

Tree and scrub encroachment has been an ongoing issue in several parts of the reserve, particularly since 2000. It has probably been enabled by the reduction in fires and possibly also by damper summers and, over a longer period, the improvement in air quality.

Small quantities of both trees and scrub are an important part of the reserve's biodiversity: species such as broom and gorse are relatively rare in Bristol and support a specialist invertebrate fauna; trees, especially oak and silver birch, also support invertebrates of note and are also of value for fungi; and species including sallow and hawthorn are a vital nectar source for insects, including many of the bee species for which the reserve is important. However, tree and scrub encroachment is threatening the reserve's more important habitats. It has already led to the loss of some areas and is threatening others, as can be seen by the frequency of oak seedlings in several of the photographs.

The only means of containing and reducing this encroachment at present is physical removal of areas of woody vegetation. This is labour-intensive and has to be repeated as further growth occurs. There are also parts of the reserve, notably the slopes above the nursery, that are extremely difficult to access safely. However, several photographs show the impact of increased effort in recent years. The only alternatives to the methods currently employed are the use of vehicles, which may become practical as smaller remote-controlled options become available and browsing by goats.

Increase in Goldenrod

The increase in goldenrod (*Solidago virgaurea*) has been commented on in previous reports but has been particularly obvious since 2016. Goldenrod is uncommon in Bristol and the surrounding area and is included in the Red List of English Vascular Plants as Near Threatened; it has become extinct in several counties in south-eastern England. It is also visually attractive and supports a specialist insect fauna.

The reasons for its increase probably include the reduction in fires and maybe climatic change. It may be that 2021 was a particularly good year for this species, possibly due to wet weather in the early summer. Goldenrod has very conspicuous flowers and is therefore visible in photographs; it is possible that other less conspicuous herb species have also become more frequent but that this is not evident in the photographs. Quantitative survey data would be required to prove this, but it is my opinion that this is the case: other species including mouse-ear hawkweed (*Pilosella officinarum*), hawkweed (*Hieracium subaudum*) and wood sage (*Teucrium scorodonium*) also seem to be more frequent. Photographs from the 1990s often show a grass-dominated sward with few, if any, herbs although in those showing wider views the sward cannot be assessed in any detail. An increase in the herb component of the sward is positive in biodiversity terms, as some of the plants themselves are uncommon and they

increase habitat for invertebrates, including as nectar sources. The only possible adverse effect would be if the availability of bare ground was reduced.

4 MANAGEMENT

A management plan for the LNR was approved in 2019. The current monitoring exercise has not revealed any requirement for changes to the management plan. It provides further evidence of importance of management activities identified as priorities in the management plan, particularly for continued control of scrub and tree encroachment in the south-western and south-eastern parts of the site.

During the summer of 2021 the extent of different vegetation types was mapped onto a Geographical Information System (GIS) as part of a survey of Sites of Nature Conservation Interest carried out on behalf of Bristol City Council. It would be useful to be able to repeat this survey every five years since it provides the most accurate information to date on the extent of vegetation types across the LNR. Comparison of future surveys against the existing baseline would be a valuable tool in informing future management decisions.

Location	What3Words code
1	grass.acted.then
2	shop.backup.tricky
3	ships.bills.went
4	moment.tree.factories
5	penny.motel.intervals
6	buzz.search.truly
7	watch.museum.back
8	laptop.facing.foods
9	sooner.ships.editor
10	robe.rents.asks
11	stored.stow.garden
12	bars.marked.effort
13	folds.reef.dive
14	exists.flag.truck
15	bounty.ticket.ashes
16	chat.lawn.thigh
19	stole.puns.carry
20	handle.clap.rush
21	gives.useful.shift
22	avoid.churn.navy
23	encounter.clubs.flown
24	today.state.vibe
25	fancy.remedy.hung
26	flap.cracks.humid
27	plots.late.shelf
28	plots.late.shelf (same as 27)
29	figure.obey.gained
30	chins.jazzy.jazz
31	costs.cups.popped
32	cups.copper.rots
33	richer.drips.packet
34	wasp.roofs.scans
35	unless.sting.teeth
36	jolly.transit.tennis

2021 PHOTOGRAPHS (PART 1)

Photograph 1: The effects of scrub clearance since 2016 can be seen, particularly on the skyline to the right of the chimney but also lower down the hill. Both goldenrod and heather species are more prominent than in that year. The 1994 photograph shows open grassland across the lower slopes and scattered scrub interspersed with grassland across the upper slopes, which are now scrub dominated.

Photograph 2: The vegetation here is broadly unchanged since 2016. In that year a belt of recently cleared bramble was obvious; this is now largely grassland although bramble is again encroaching on the edge of the area. In 1994 bramble cover was much more extensive, with large patches extending to the front of the houses.

Photograph 3: This area has changed very little since 2016. The growth of trees over the last thirty years is striking: in 1994 the view across to the playing fields was virtually open.

Photograph 4: As in 2016 this photograph shows extensive bramble across an area that had species-poor rough grassland during the 1990s, as well as extensive tree growth in the background.

Photograph 5: This shows recovery of a patch of ling in the background, which was present in 1994 but was slow to recover from fires,

Photograph 6: The vegetation here has changed relatively little since 2016, apart from the grass being taller. In 1994 there was a large patch of ling, which was lost in a fire, rather than the smaller scattered plants visible here.

Photograph 7: The broom in this area has been partially cleared since 2016 and the cover of ling and goldenrod have increased. The area was very different in 1994, when it was dominated by sparse grassland with only small very small and scattered plants of ling and broom was entirely absent.

Photograph 8: There has been some clearance of broom in this area since 2016 and the cover of heath has increased. In 1994 the slope was largely covered in short grassland and the areas that now have short grassland were largely bare.

Photograph 9: In 2016 this area had scattered broom, which has since been cleared and replaced by tall herb growth dominated by goldenrod; in 1994 broom was confined to the bottom of the slope and most of the area was covered in sparse grassland.

Photograph 10: This area was, as now, dominated by dense broom in 2016. In 1994 broom was frequent, but patches of bare ground were visible.

Photograph 11: Broom has been cleared from this slope since 2016 and although regrowth of both broom and bramble is evident there are also large areas of grassland and patches of bare ground, which were previously obscured by broom. In 1994 the slope was covered in sparse grassland with patches of bare ground and an extremely small number of broom and ling seedlings. The herb component in the sward is probably greater now than it was then.

Photograph 12: The vegetation has changed little since 2016 apart from further encroachment by tree saplings. The scrub in the background has become denser. In 1994 the foreground had sparse grassland without heath or goldenrod and there was very little scrub in the background.

Photograph 13: Broom has been cleared from this slope since 2016, opening up the heath. Goldenrod was much less apparent five years ago than it is now; there has also been an increase in the number of oak seedlings, which will require removal if open habitats are to be maintained.

Photograph 14: There has been some scrub clearance along the edge of the tree line and this has allowed heath to spread. The trees have grown and the background is disappearing from view. In 1994 the nursery and nearby housing were clearly visible; heath species were only present in very small quantity and goldenrod was absent.

Photograph 15: Broom has been removed from part of this slope since 2016 and the cover of heath and grassland has increased. Tree growth has increased further.

Photograph 16: In 1994 the large oak that dominates this photograph was a small sapling and the slope here was largely open. The surrounding saplings are now noticeably larger than 2016; steep ground here makes management works difficult.

Photograph 19: Broom has been cleared from the foreground of this area since 2016 and tall grassland with goldenrod is now present, but is being invaded by bramble. The scene was very different in 1994, when sparse grassland was dominant.

Photograph 20a: The foreground of this picture has changed relatively little since 2016 apart from an increase in goldenrod, and some reduction in broom due to habitat management. In the background evidence of scrub removal can be seen

Photograph 20b: The image at 20a is from the same point used in 2016. This image copies the 1994 photograph more accurately than does 20a. In 1994 heath species were confined to small quantities on the middle slopes, and the furthest slopes were much more open.

Photograph 21: Scrub has spread across the slopes in the background since 1994 and once again goldenrod is a much more prominent feature than it was in earlier years.

Photograph 22: This area has been prioritised in recent management works and the effects of removal of gorse scrub are evident here, in particular the absence of seedlings in the foreground. The increase in goldenrod is again striking. In 1994 the slopes to the right were largely bare and ling and bell heather were restricted to small areas.

Photograph 23: Tree removal since 2016 has opened up the rock face here but there has been some increase in tree growth on the lower edge of the slope to the right.

Photograph 24: Heath species and goldenrod have increased their cover on this slope since 2016. The change since 1994, when sparse grassland was dominant, is much more marked.

Photograph 25: Scrub has spread across part of the slope here since 2016. In 1994 the habitats were much more open.

Photograph 26: Apart from the usual increase in goldenrod this area is generally little changed since 2016, but the heather has become leggier and the oak saplings have become larger, if not more frequent. In 1994 a semi-mature oak was present and heath species were infrequent in a largely grassy sward.

Photograph 27: There has been some spread of bracken in the lower part of the slope since 2016 but otherwise this area is little changed. In 1994 it was one of the more heath-dominated areas, but grassland was more obvious at the top of the slope.

Photograph 28: The 2021 image fails to show as much of the slope to the left as is visible in the 2016 photograph. Allowing for this, there has been little apparent change here in the last five years. In 1994 the slope to the right had heath but the slope to the left was largely grass-dominated.

Photograph 29: In 2016 access to the location for this photograph was impossible. Scrub clearance since then has made it accessible again, so this image is comparable to those taken in earlier years but different to the 2016 image. In 1994 the dominant vegetation was sparse grassland. Heath has since grown significantly but a patch of bramble is also visible.

Photograph 30: This image is also more faithful to those taken in earlier years than was the 2016 photograph. It shows increased growth of heath species and colonisation by turkey oak saplings. The scrub at the bottom of the slope has spread slightly but is relatively little changed.

Photograph 31: The 2016 photograph here showed, compared to earlier years, increased growth of heath and broom. The heath remains but evidence of broom clearance in recent years can be seen.

Photograph 32: Continued scrub encroachment is obvious in this area.

Photograph 33: This is another image where the 2021 photograph was taken from a location closer to that used in earlier years than was possible in 2016. Bramble and scrub have spread across the slopes since the 1990s.

Photograph 34: Bramble and other scrub have taken over the small area of heath that was previously present here. (This photograph was taken in December as the buildings in the background, used to locate the site, were obscured by tree leaves in September.)

Photograph 35: Tree and scrub encroachment has changed the appearance of this area significantly since the 1990s.

Photograph 36: The amount of heath on the lower parts of this slope have increased since the 1990s. There has been significant scrub control here, which has been largely successful, but one of the remaining patches is visible in this photograph. (This picture was taken in December, as the September copy was corrupt.)