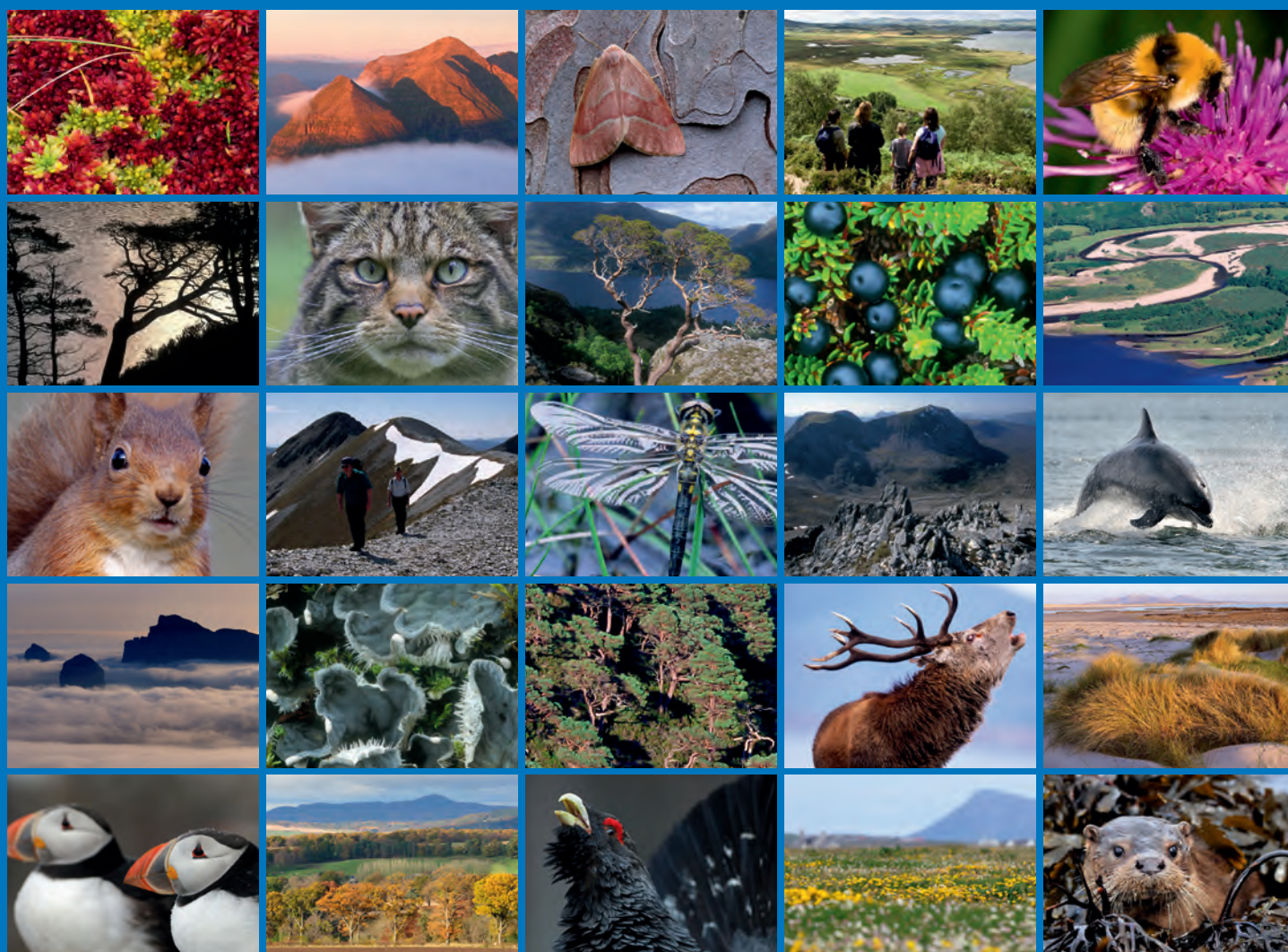


Scottish Natural Heritage
Commissioned Report No. 689

Survey of whorled Solomon's seal (*Polygonatum verticillatum*) in Den of Airlie SSSI, 2013





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COMMISSIONED REPORT

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**Survey of whorled Solomon's seal
(*Polygonatum verticillatum*) in
Den of Airlie SSSI, 2013**

For further information on this report please contact:

Rhona McInroy
Scottish Natural Heritage
Battleby
Redgorton
PERTH
PH1 3EW
Telephone: 01738 444177
E-mail: rhona.mcinroy@snh.gov.uk

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COMMISSIONED REPORT

Summary

Survey of whorled Solomon's seal (*Polygonatum verticillatum*) in Den of Airlie SSSI, 2013

Commissioned Report No. 689

Project No: 14546

Contractor: Martin Robinson

Year of publication: 2015

Keywords

Whorled Solomon's seal; *Polygonatum verticillatum*; Den of Airlie SSSI.

Background

The whorled Solomon's-seal *Polygonatum verticillatum* (L.) All. is listed as Vulnerable in the Red Data List. It is a UK Bap Priority Species and is on the Scottish Biodiversity List, as well as being in Schedule 8 under the Wildlife & Countryside Act 1981. It is an arctic-alpine montane species of which the global range comprises the mountain areas of Europe and Asia. In Great Britain, on the western fringe of its range, it is confined to a comparatively small area of East-Central Scotland, where it is known from twelve sites, all in wooded ravines in Perthshire. At the Den of Airlie, the most easterly of these sites, it has been known in one area on the west bank since before 1848, although it is not certain that the single colony known today is the one that was originally found. There is some evidence that it has occurred also on the east bank near the castle, as referred to by Ingram & Noltie 1981.

Searches in recent years have never revealed any new sites, so the species is vulnerable to destruction either by physical means, e.g. landslip, or by extinction due to natural changes in the woodland structure. A second colony would provide some insurance for the species' survival in the Den. The contract was put in place to search the whole SSSI for further sites.

Main findings

No further colonies were found, though the steep and difficult nature of the ground does not preclude the possibility that further plants do exist somewhere on the site. Recommendations were made for further searching using rope access.

For further information on this project contact:

Rhona McInroy, Scottish Natural Heritage Battleby, Redgorton Perth PH1 3EW.

Tel: 01738 444177 or rhona.mcinroy@snh.gov.uk

For further information on the SNH Research & Technical Support Programme contact:

Knowledge & Information Unit, Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.

Tel: 01463 725000 or research@snh.gov.uk

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1. INTRODUCTION

1.1 Background

The whorled Solomon's seal *Polygonatum verticillatum* (L.) All. is listed as Vulnerable in the Red Data List. It is a UK Bap Priority Species and is on the Scottish Biodiversity List, as well as being in Schedule 8 under the Wildlife & Countryside Act 1981. It is an arctic-alpine montane species of which the global range comprises the mountain areas of Europe and Asia. In Great Britain, on the western fringe of its range, it is confined to a comparatively small area of East-Central Scotland, where it is known from twelve sites, all in wooded ravines in Perthshire. The Den of Airlie is the most easterly of these and has supported one documented colony, which has numbered >1,000 stems as recently as 1992, though later counts have been much smaller, and in 2007 there were 180-200 stems.

Searches in recent years have never revealed any new sites, so the species is vulnerable to destruction either by physical means, e.g. landslip, or by extinction due to natural changes in the woodland structure. A second colony would provide some insurance for the species' survival in the Den. The subject contract was put in place to search the whole SSSI for further sites.

1.2 History

The earliest mention of *Polygonatum verticillatum* in the Den of Airlie appears in Gardiner's Flora of Forfarshire (1848), who described its whereabouts as being "immediately opposite a purple beech in the Low Garden, on the other side of the stream".

Ratray (1858) mentioned a site at Airlie Castle, where it had been discovered by Dr Barty, parish minister of Bendochy but was "not abundant". This could refer to the above site, though specimens taken from both banks of the Isla, dated 1912, are noted in the Flora of Angus (Ingram and Noltie, 1981). This appears to be the only indication that there was ever a site on the east bank.

Mr Bob Bryan, who grew up in the castle, saw a couple of plants on the west bank in about 1951. He was present with Jeff Lunn (SNH) when he visited the known colony in 1986, but the site did not ring the right bells with him and he thought that his discovery might have been about 200 metres to the south.

In 1987 Phil Lusby searched the gully to the south of the extant site, which must have been the one at NO 293517. He also searched the next two gullies to the north of the site.

All subsequent records refer to the single extant site, which appears to have diminished considerably, in number if not extent.

1.3 Objective

The objective of the project was to search the whole SSSI for further colonies of *Polygonatum verticillatum*. If any additional ones were found they were to be GPS'd and very accurately mapped so that they could be easily re-found.

Other notable species were to be recorded incidentally.

2. METHOD

2.1 Dates of visits

The Den was surveyed over five days between 9 July and 29 August 2013. Including the use of volunteer assistants for safety reasons 11 man/days were spent on the survey. The volunteers were all competent botanists who were able to search for the plant rather than be there purely for safety back-up.

Visits were made as follows:

9 July Martin Robinson and Robin Payne

Area covered: from the known site of *Polygonatum verticillatum* southwards to the bridge on the west side of the Den. Coverage of this area was not completed on account of the stifling heat, resulting in a postponement of the survey until cooler weather made it more comfortable. Access from the B952 bridge.

16 August Martin Robinson and Mark Tulley

Area covered: from the confluence of the burns below the castle southwards to the bridge on the east side of the Den, and the remaining area on the west side not covered on 9 July was also done. Access from the castle.

19 August Martin Robinson and Les Tucker

Area covered: from the confluence of the burns below the castle upstream to the Slug of Auchrannie and beyond on the north side. Then half-way up the Den of Melgam on the north side. Access from the castle.

27 August Martin Robinson and Robin Payne

Area covered: from the Bridge of Lundies downstream to the burn confluence on the north side and back up on the south side.

29 August Martin Robinson, Mark Tulley and Billy Bodles

Area covered: from the known site of *Polygonatum verticillatum* upstream, branching off up the Auchrannie Burn and back and then continuing north to the flat east-facing bulge at NO 291523. Access from the end of the Auchrannie track at NO 28515246.

The stretch from here on up to the Slug of Auchrannie and the end of the SSSI on the south side was not covered.

2.2 Method of searching

Two visits were made to the extant colony, so that everyone that needed to was able to see the plant and its habitat. It was stressed to all four volunteers that the precise habitat of the colony was not the only one in which the species might be found, though any such areas should be searched preferentially. Broadly speaking these would be steep gullies with unstable soil and rather little competition from other species, particularly dense grasses, nettles, ferns or *Luzula sylvatica*.

The intention was to contour the sides of the den looking up and down, far enough apart to be sure of covering as much ground as possible in one pass but close enough to each other to retain contact and ensure that no ground was missed in between. Very steep ground was

to be surveyed from below or above as appropriate but not entered, so that no risks with safety were taken. No ropes were used.

2.3 Recording

GPS tracks were recorded, but these were quite inaccurate, especially in the steeper parts of the Den. Nevertheless, from a compilation of all the tracks, and from annotations made on hand-held photocopied maps, it was possible to produce a map of the coverage achieved.

3. RESULTS

3.1 New sites

The existing known site, at NO 29285193, was surveyed on 9 July. There were about 150 plants straddling a mossy log lying downhill. The colony seems to have shrunk back into a core area of about 3 metres across by 2 metres down, with outliers up to 1 metre either side and downhill. Only one plant was in flower.

No detailed survey of the colony was undertaken, this not being part of the brief.

3.2 Coverage

All of the SSSI was covered apart from the right bank of the Isla from the western extremity of the SSSI downstream to the big right-hand bend just north of the castle.

Despite previously-formed ideas about how to cover the ground, what distance to stay apart from each other etc., in the event coverage was determined entirely by accessibility. It was very easy to get into trouble very quickly on the steep, unstable slopes that characterise much of the den, and so, as the search progressed and some tricky challenges were overcome, it was decided to take fewer risks with safety. The difficulties were compounded by fallen trees, including, in some areas, sycamores felled for conservation reasons.

The river water level remained low throughout the project and so some stretches were covered from the river bed, looking upwards. Cliffs and very steep slopes were sometimes viewable with binoculars from the opposite side of the Den, but the amount of ground visible was always severely limited by the tree canopy concealing it.

3.3 Other species

Eleven colonies of *Paris quadrifolia* (Herb Paris) were found, most extensively along the Auchrannie burn, and one colony of *Neottia nidus-avis* (Bird's-nest Orchid), along the north-western 'arm' of the Den. A colony of *Convallaria majalis* (Lily-of-the-valley) was found, maybe the known one and possibly not native, and also a tussock of *Carex pendula* (Pendulous Sedge), also possibly not native. Details of all these are given in the Appendix.

An otter's nursery holt was found in NO 2852, and a badger sett was found at the top of the opposite bank. The extent of this was not surveyed, but there was at least one active hole.

A Purple Hairstreak (*Neozephyrus quercus*) was seen over the oak canopy from above the cliff-top at NO 295514 on 16/08/2013.

4. DISCUSSION

The earliest records are worth considering. Gardiner's (1848) mention of it as being "immediately opposite a purple beech in the Low Garden, on the other side of the stream" may in fact refer to the only known extant site. The flattish area on the riverside below the stable block was once gardened to some extent, as is shown by photographs in the castle (Cameron Jolly pers. com.), and this may have been known as the Low Garden. It still shows the signs of quite recent management. Some large trees were certainly planted there and these may have included a copper beech, though no sign of one now remains. A point on the west bank opposite the northern end of this haugh would be less than 90 metres from the known colony, so perhaps the words "immediately opposite" are not appropriate, unless the garden extended a bit further north. If not actually the same site it is likely to have been close to it.

Bob Bryan's 1951 site, if 200 metres to the south of the extant colony, could still have been opposite the Low Garden, and so might conceivably have been the same site as Gardiner's. The gully that Phil Lusby searched in 1987 lies to the south of where Bob Bryan thought that he had found it, but, in passing from the extant site to this gully, Lusby would have searched suitable and accessible ground in all the area encompassing Bryan's site.

By their very nature the areas most likely to harbour other colonies of *Polygonatum verticillatum* are the least accessible. The steeper, more unstable slopes, where there is less competition from other plants, are more suitable for it than the gentler slopes, which tend to be more densely vegetated, either with *Luzula sylvatica* (Great Woodrush) on the upper slopes and especially above the flattening out of the slope, or with various mixtures of tall species including *Dryopteris filix-mas* (Male Fern), *Urtica dioica* (Sting-nettle), *Silene dioica* (Red Campion), *Stachys sylvatica* (Field Woundwort) and *Holcus mollis* (Creeping Soft-grass). The upper part of the Den of Melgam is swamped with species such as *Impatiens glandulifera* (Indian Balsam), *Petasites hybridus* (Butterbur) and *Angelica sylvestris* (Wild Angelica). Such areas are shown in yellow on the maps, though these are by no means complete and are a rough guide only.

In view of the above, the most promising areas for *Polygonatum* are the pink areas on the maps. Although these areas were not entered they were not completely unsurveyed, however. It was usually possible to look into the gullies from above, below, or from the sides, but there would always be dead ground within them or plant canopies concealing parts of them.

Thorough survey of the gullies would only be possible by roped access. Some of the best gullies are north and south of the known *Polygonatum* colony, and so these would be the best areas to search by this method. The ground northwards from the colony to the inflow of the Auchrannie Burn seems to be particularly suitable, being dissected by gullies and slumps. Covering all of the promising ground by roped access would take many weeks and cost many thousands of pounds, so effort would need to be concentrated in the most likely areas. It is very difficult to say where exactly these are, however, and it should be stressed that sites can vary from damp rock-faces virtually at the water's edge (Den of Riechip), to oak woodland on the dry upper slopes (Kinnaird Den), to flat ground above the ravine, with complete light exposure to the adjacent field (Milton Wood).

Another line of approach would be to cover as much as possible from the river, provided that the water level was low. Parts were done in this fashion, particularly the southern end of the site on the east side, from the road bridge up to about NO 2960 5128, which allowed a view of the 20-foot cliff lining this stretch. The southern bank of the Auchrannie Burn was done by this method, as was a short stretch of the northern shore of the 'NW arm' from about NO 28825259 upstream to NO 28535283. Dense obstructions of fallen trees put an end to this.

Part of the eastern end of the Den of Melgam was also done, but this was all unsuitable ground anyway, too densely vegetated.

The extant site of *Polygonatum* was visited on two dates fifty-one days apart: 9 July and 29 August. Photos were taken on both occasions (Figures 1, 2). These show that, although the colony was in peak condition at the first visit, it was still in perfectly good condition at the second. The shoots were less erect and were starting to show some yellowness, but neither of these features made the plants any less conspicuous. The yellowing might even increase its visibility, making it possible to carry out survey work even through September.

5. RECOMMENDATIONS

Certain areas were not properly searched on account of access problems. Some of these, especially the steep slopes with gullies, might repay more detailed searching, but this could only be done by rope access. There are serious cost and time implications involved in this method, and so the areas that are likely to be most suitable for *Polygonatum verticillatum* need to be prioritised. An attempt to do this is shown on Map 5, in which five areas are listed from 1 to 7, where 1 is the highest priority:

1. A series of suitable gullies to the north of the extant site. They have been looked at from above but could be explored further.
2. None of this has been searched and there is some suitable ground, much of which is very steep.
3. There are two suitable gullies, which have been looked into from above, but they could be explored further, as could the steep slopes to the west and east.
4. There is very steep, suitable ground below the castle, which has hardly been viewed at all so far, apart from the western bit above the R.Isla.
5. None of this has been searched and there is some suitable ground.
6. There are some suitable gullies along here, which have been looked down into from above but could be searched more thoroughly
7. The big gully at the N end has been done, but could be checked more thoroughly. The ground below the cliff may be suitable in places.

6. REFERENCES

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ANNEX 1: OTHER SPECIES

Neottia nidus-avis (Bird's-nest Orchid) Near-threatened (Cheffings & Farrell, 2005)

NO 28555264 2 spikes in edge of *Mercurialis perennis* (Dog's-mercury) stand
under beech

Paris quadrifolia (Herb Paris) Least Concern (Cheffings & Farrell, 2005)

South of castle, west side

NO 29275192 72 plants
NO 29335197 Large colony on river side

Auchrannie 'spur', north side

NO 28895215 40 plants, 1.5m x 1.5m
NO 28975220 30 plants
NO 29015219 <100 plants, 5 metres x 4 metres
NO 29035218 40 plants
NO 29085216 30 plants, with another 15 plants 20 metres further uphill.
4 more plants on same level, 8 metres further to west

NW 'arm', north of castle, east side

NO 29285228 Large colony extending along slope above path, with smaller
quantity of *Neottia ovata* (Common Twayblade)
NO 29295241 A small scatter

Den of Melgam, south side

NO 29575219 >50 plants, under canopy of *Dryopteris filix-mas* (Male Fern)
NO 29795244 300 plants in old sunken trackway, and others spreading up on
to bank on north side

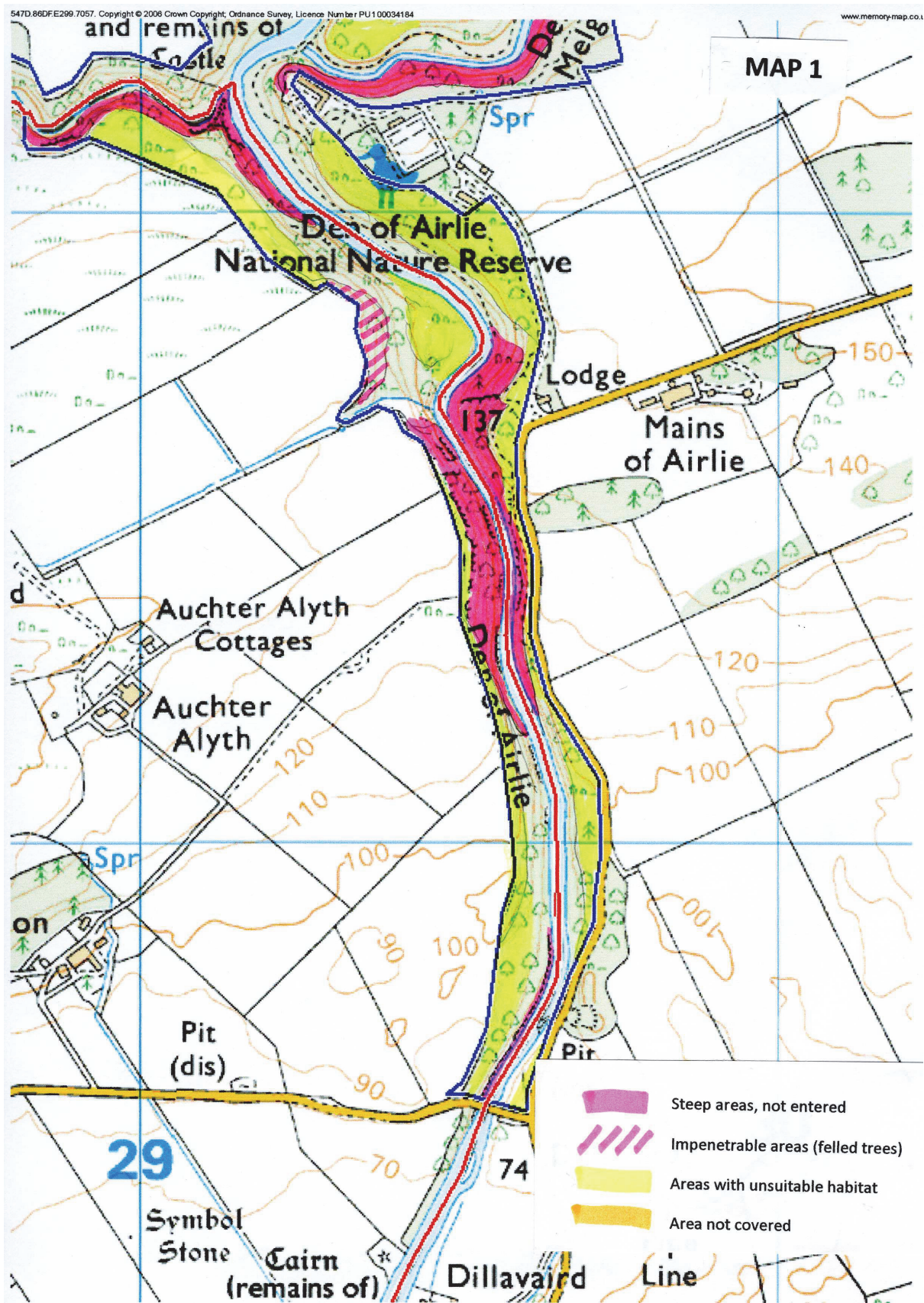
Carex pendula (Pendulous sedge) Least Concern (Cheffings & Farrell, 2005)

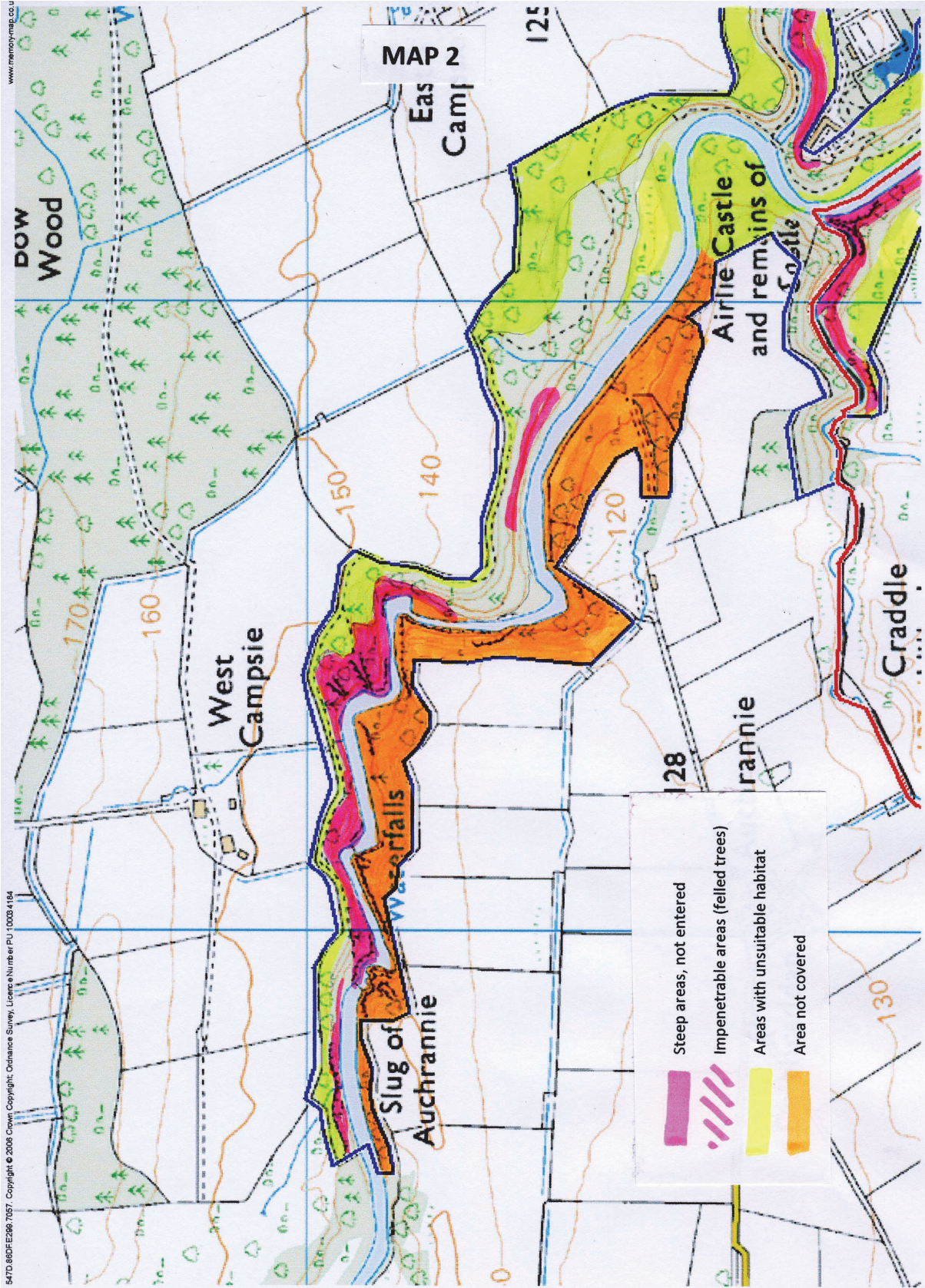
NO 28935254 A single tussock

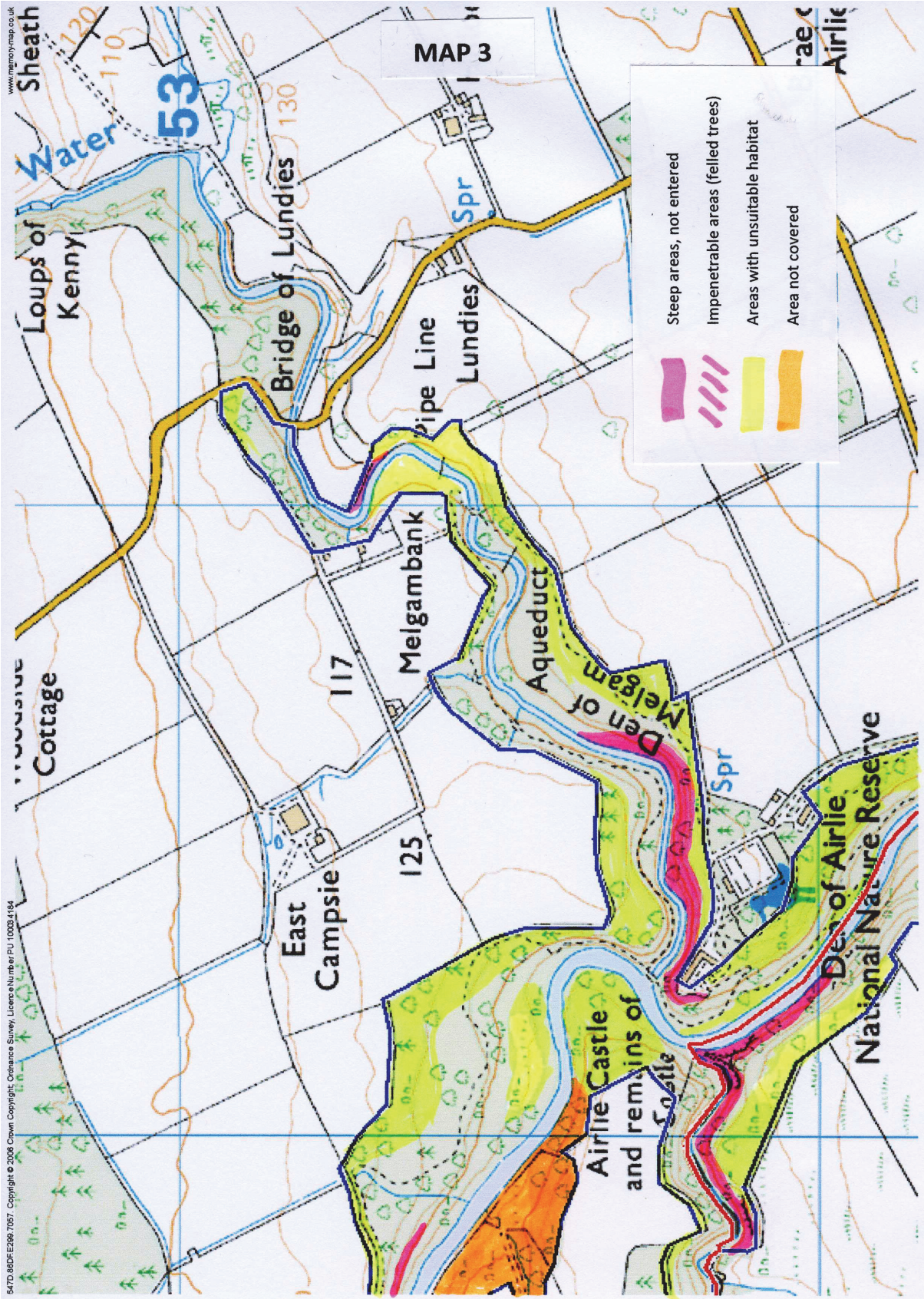
Convallaria majalis (Lily-of-the-valley) Least Concern (Cheffings & Farrell, 2005)

NO 29615074 A patch 5m x 3m

ANNEX 2: MAPS

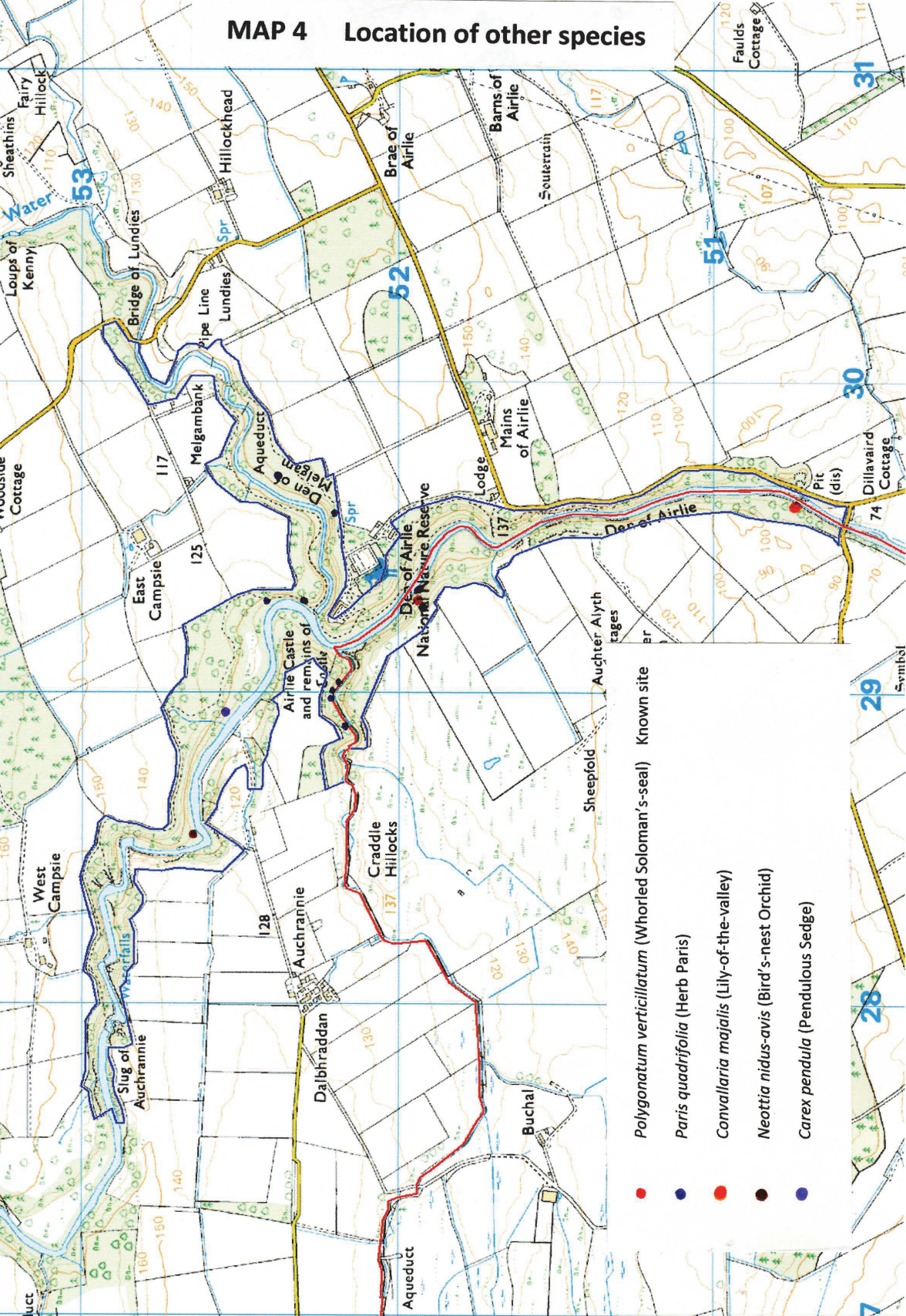




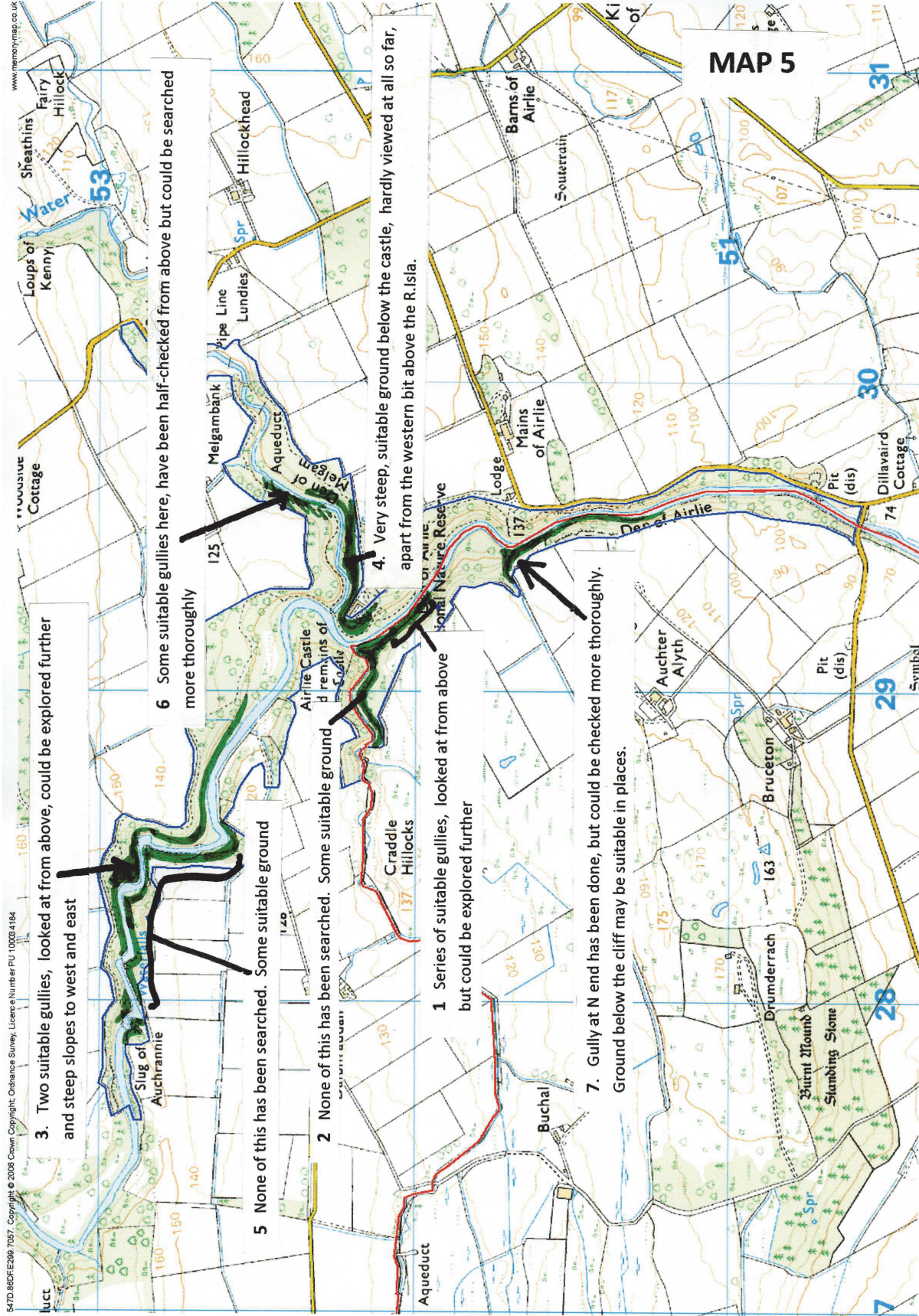


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MAP 4 Location of other species



- *Polygonatum verticillatum* (Whorled Solomon's-seal) Known site
- *Paris quadrifolia* (Herb Paris)
- *Convallaria majalis* (Lily-of-the-valley)
- *Neottia nidus-avis* (Bird's-nest Orchid)
- *Carex pendula* (Pendulous Sedge)



ANNEX 3: PHOTOGRAPHS



Figure.1 Polygonatum verticillatum site on 9 July (Martin Robinson)



Figure 2. Polygonatum verticillatum site on 29 August (Mark Tulley)

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Policy and Advice Directorate, Great Glen House,
Leachkin Road, Inverness IV3 8NW
T: 01463 725000

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