

Survey of potential whorled Solomon's seal (*Polygonatum verticillatum*) habitats Den of Airlie SSSI, 2014



COMMISSIONED REPORT

Commissioned Report No. 690

Survey of potential whorled Solomon's seal (*Polygonatum verticillatum*) habitats

Den of Airlie SSSI, 2014

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COMMISSIONED REPORT

Summary

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

Commissioned Report No. 690

Project No: 15459

Contractor: Colin Wells

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Keywords

Den of Airlie SSSI; whorled Solomon's seal; *Polygonatum verticillatum*; rope access survey.

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.

Searches in recent years have repeatedly failed to reveal any new sites, meaning that the survival of the species at The Den is precarious; the single population is vulnerable to destruction either by physical means, e.g. landslip, or by extinction due to natural changes in the woodland structure. Locating a one or more additional populations is therefore considered extremely important in order to provide some insurance for the species' survival in the Den. The current survey was commissioned to search for further sites in those parts of the SSSI hitherto unvisited due to reasons of inaccessibility by un-roped parties.

Main findings

No further colonies were found, despite a thorough search of the steep and difficult-to-access areas excluded from previous searches.

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Acknowledgements

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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 long supported one documented colony.

Because searches in recent years at The Den have failed to locate new populations, the survival of the species at the site remains vulnerable; it could easily be made extinct in a catastrophic physical event such as erosion due to high rainfall events, or more gradually by natural changes in the woodland structure. The location a second or more colonies would therefore provide a degree of 'insurance' for the species' survival in the Den.

In 2013 SNH commissioned Martin Robinson to survey The Den of Airlie with the intention of assessing whether any further colonies existed at the site. Robinson and a team of experienced botanical surveyors made a thorough systematic investigation of all the accessible parts of the complex river and ravine system but no further populations were located (Robinson, 2013).

However, there remained unexplored many steep, exposed, loose or otherwise dangerous parts of the SSSI that proved inaccessible to the Robinson team, who were constrained in their search areas due to a lack of rope access. It was therefore recommended that the remaining 'blanks on the map' be explored by such means if possible.

As a consequence in 2014, SNH commissioned the authors, who have experience of using rope access for botanical survey on upland cliffs, to undertake further survey of the SSSI, focusing on the less accessible parts of the site.

The main object of the exercise was to search for further colonies of *Polygonatum verticillatum* in those areas of the SSSI previously unvisited by botanists. These mostly comprised steep and potentially dangerous gully lines, cliffs and other hard-of-access openings in the woodland canopy.

Any other notable species were to be recorded incidentally.

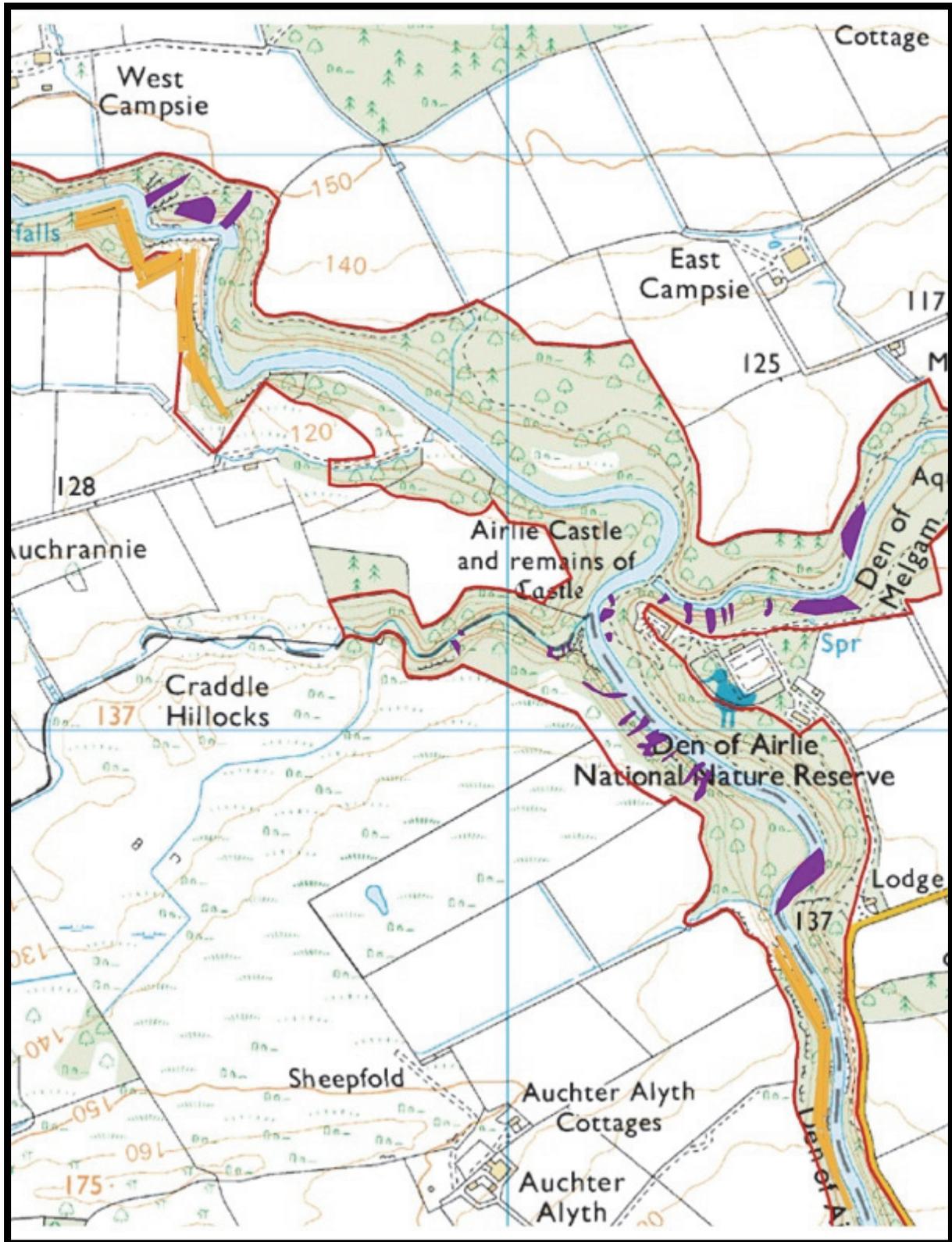


Figure 1. Potential *P. verticillatum* habitats identified and surveyed using rope access (purple) or surveyed through binoculars (orange) in 2014 (Map reproduced under Ordnance Survey licence 100017908).

2. METHODS

2.1 Dates of survey and weather conditions

Following a familiarisation visit to the extant colony on 3rd July with Rhona McInroy and Joules Galley of SNH, target areas within the Den were surveyed between 6th-13 July 2014 by Colin Wells and Ruth Maier.

For most of the period of the survey, the weather conditions were generally benign, with slack winds, much sun and very high humidity and temperatures. The early part of the survey was, however, plagued by prolonged thunderstorms, necessitating rapid retreats from gullies exposed to runoff on a couple of occasions. Most days reached around 20°C maximum air temperature or above. The period generally proved to be around 2.1°C above the 1981-2000 average for July for the east of Scotland together with 85% of average rainfall for the region (Met Office, 2014).

2.2 Areas of search

As with the most recent searches (Robinson, 2013) it was not assumed that the precise habitat of the known colony was necessarily likely to be the only one in which the species might be found.

Nevertheless, given the limitations of time and resources, the intention was to preferentially focus on similar areas (i.e. areas comprising steep gullies with unstable soil and rather little competition from other species, particularly dense grasses, nettles, ferns or woodrush).

With this in mind, Robinson produced a map of zones within the Den that he considered most likely to harbour new populations, ranked in order by what his team considered the most promising to the least promising locations (Annex 1). This data formed the basis for the current survey, and most effort was subsequently focused on these target areas.

2.3 Rope access techniques

To gain access to the most precipitous, exposed or unstable ground, rope access techniques were employed. An 80 metre long, 11 mm diameter rope proved sufficient to reach the base of the steep banks of the river in all cases, by using stout trees as anchor points part way down the more accessible upper parts of the slopes.

Standard aid climbing equipment was used, comprising harness, helmet, abseiling devices and slings, plus ascendeurs and étriers for re-ascending steep ground.

In areas requiring rope access, a belay point was located which enabled the surveyor to reach the full length of the gully, slope or cliffs. A controlled descent was then made by abseil, stopping where necessary to make records, take photographs etc. The use of a Petzl 'Shunt' autolock device allowed the surveyor to lock off the rope and free both hands for recording even on vertical ground, before releasing the lock to continuing abseil descent. Meanwhile another surveyor remained in the vicinity at the top of the slopes as safety back-up.

Where it was safe to do so, (e.g. at the bottom of the slopes) the descending surveyor could untie from the rope and search level ground at the base of the cliffs quickly, unencumbered by climbing equipment.

In other areas, where the terrain was not deemed to be especially dangerous, conventional un-rope search was possible. A pair of studded Walsh fell-running shoes were worn in order to ensure maximum traction on often loose substrates.

2.4 Recording

Target notes and boundaries of areas mapped were recorded using a combination of an Apple iPhone equipped with iGIS mobile GIS application software and a Garmin 401 Foretrex wrist-mounted GPS with built-in atmospheric barometer.

3. RESULTS

3.1 New and known sites

As was the case with the 2013 survey, no new sites for *Polygonatum verticillatum* were found.

The existing known site, at NO 2928 5193, initially visited on 3rd July for familiarisation purposes, was revisited on 9th July, exactly a year after a similar visit made in 2013 and, as then, counts of individuals and comparative photographs were taken.

There appeared to be about 100 shoots; three plants bore fruits and two carried remains of flowers. This compares to 150 counted in 2013, but only one was noted as being in flower that year.



Figure 2. Extant *P. verticillatum* population 9th July 2013 (Martin Robinson)



Figure 3. Extant *P. verticillatum* population 9th July 2014

This suggests a dynamic population which may vary in number, amount of reproductive structures and extent from year to year; comparison of photographs taken from close to the same position shows the plants to the east of the 'mossy log' are much less dense in 2014 than in 2013, but those to the west of the log appear more dense than in 2013.

However, it may also suggest continuing slow decline, for as Robinson noted: '[the] one documented colony ... has numbered >1,000 stems as recently as 1992, though later counts have been much smaller, and in 2007 there were 180-200 stems.'



Figure 4. Fruit on *P. verticillatum*, July 2014

3.2 Coverage

Most of the priority areas identified by Robinson were explored physically (see Annex 1, 2), apart from the steep ground at the base of the east facing slopes in the south of the site (That area of Robinson's Zone 7 south of a prominent 'Big Gully' – which was descended) and also the north-facing cliffs of Robinson's Zone 5. These lower-priority areas, however, were scanned thoroughly from close quarters with binoculars from the opposite bank or river edge and no clear openings in the dense woodland canopy or ground flora could be discerned, suggesting that occurrence of *Polygonatum* was extremely unlikely in these places. (These areas are marked in orange on the Annex 2 map.)

3.3 Other notable species

As well as noting the continuing presence of several populations of *Paris quadrifolia* (Herb Paris) and the colony of *Convallaria majalis* (Lily-of-the-valley) found by Robinson, a new tussock of *Carex pendula* (Pendulous Sedge) was also noted in the north-west of the site at NO 28991 52578. Robinson speculated that this plant might not be native at the site, (presumably on the basis of only one population being found) but the presence of more might perhaps suggest otherwise. The plant is certainly mentioned as being recorded nearby as long ago as the mid-nineteenth century (Gardiner, 1848; 217).



Figure 5. Gully investigated N of known population



Figure 6. *C. pendula* tussock

4. DISCUSSION

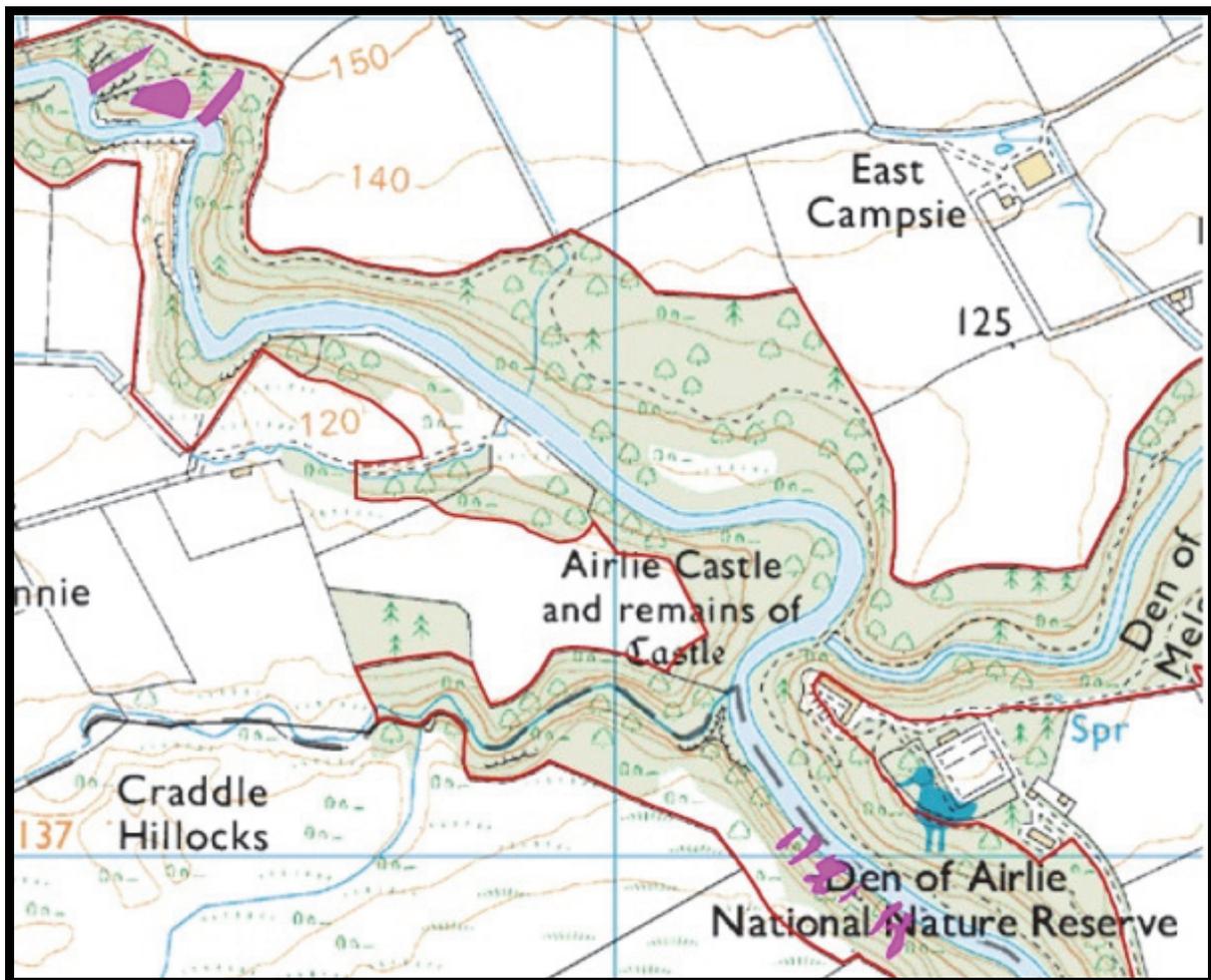


Figure 7. Location of terrain most similar to that of extant whorled Solomon's seal population. 2014 (Map reproduced under Ordnance Survey licence 100017908).

Robinson's surmise that the most promising terrain lay in gully lines to the immediate north and south of the extant population proved to be correct, with some good stretches of ground similar to the known population site here, comprising occasional openings in the canopy allowing light to filter through and sufficient ground litter (mainly from beech) to discourage more competitive woodrushes, ferns or grasses. Another area of the site containing similar terrain occurred at the northern part of the site, towards the mouth of the Slug of Auchrannie. (These areas are outlined below in pink in Fig 7. and the approximate centralised grid references are tabulated in Annex 4.)

Elsewhere, most of the steep ground was found to be choked by dense vegetation, mainly *Luzula* and *Dryopteris* (e.g. see photo below typical of the south bank of the Melgam Burn). On many of the slopes the most promising-looking ground, initially identified from a distance through binoculars, revealed itself at close quarters to be caused by quite recent landslide activity or fallen trees which was now being rapidly recolonised by *Luzula* (e.g. see photo taken above Auchrannie Burn below).

Despite assiduous searching and much expenditure of energy (one gully was defended by a series of heavily vegetated overhangs which needed to be passed in order to gain access – DVD Photo: 1753) they proved to be bereft of the target species.

We are confident that if *Polygonatum verticillatum* had been present in these areas it would have been located.

This leaves only the most unpromising and densely-vegetated ground left physically unsearched where it would seem very unlikely to find colonies of the plant (i.e. those areas marked in orange on Map 2, Annex 2). Although absence of evidence is, of course, by no means evidence of absence, the most reasonable conclusion is that the known colony is likely to represent the sole surviving population of the plant in The Den.



Figure 8. Recent landslip on steep south bank of Auchrannie Burn 329080 752145



Figure 9. South bank of Melgam Burn: ground typically choked by dense Luzula with recent landslips

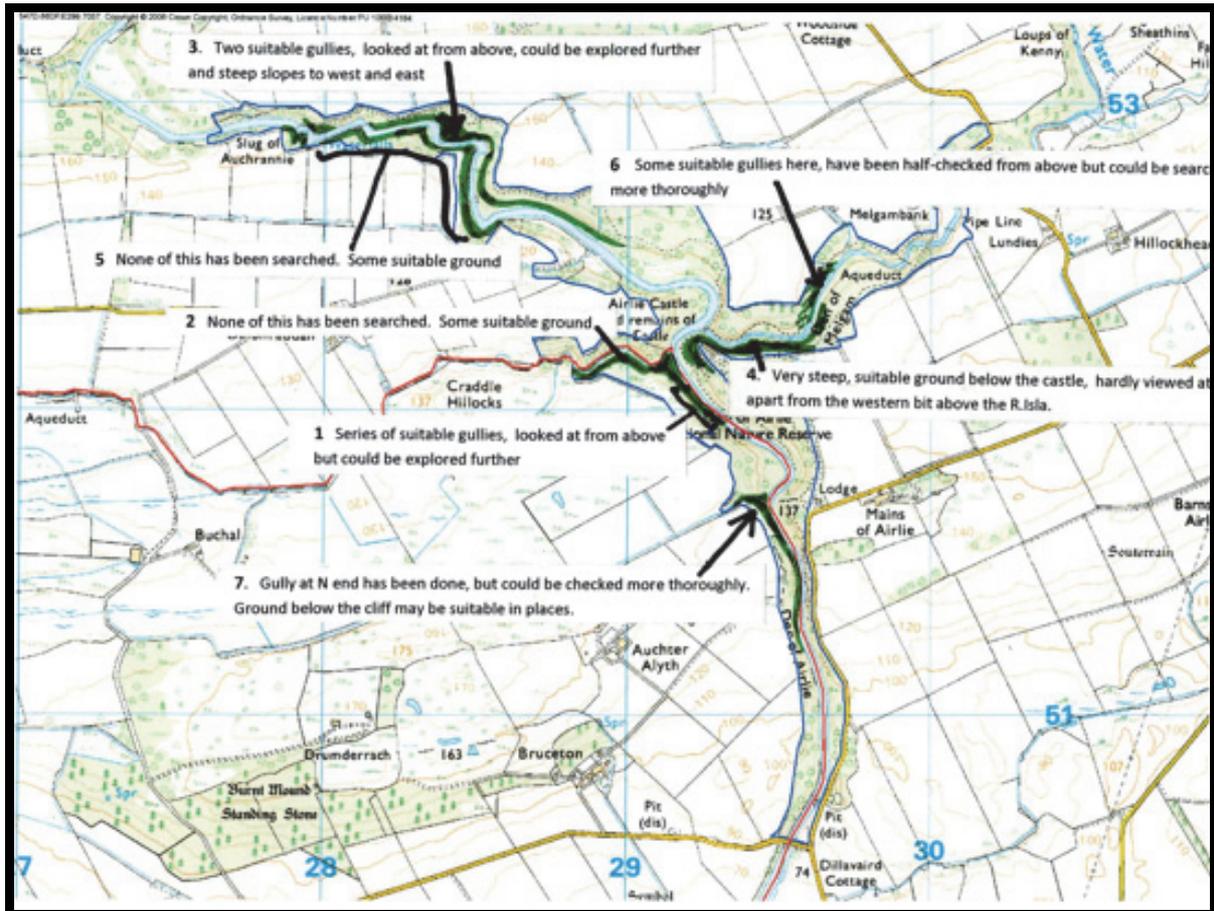
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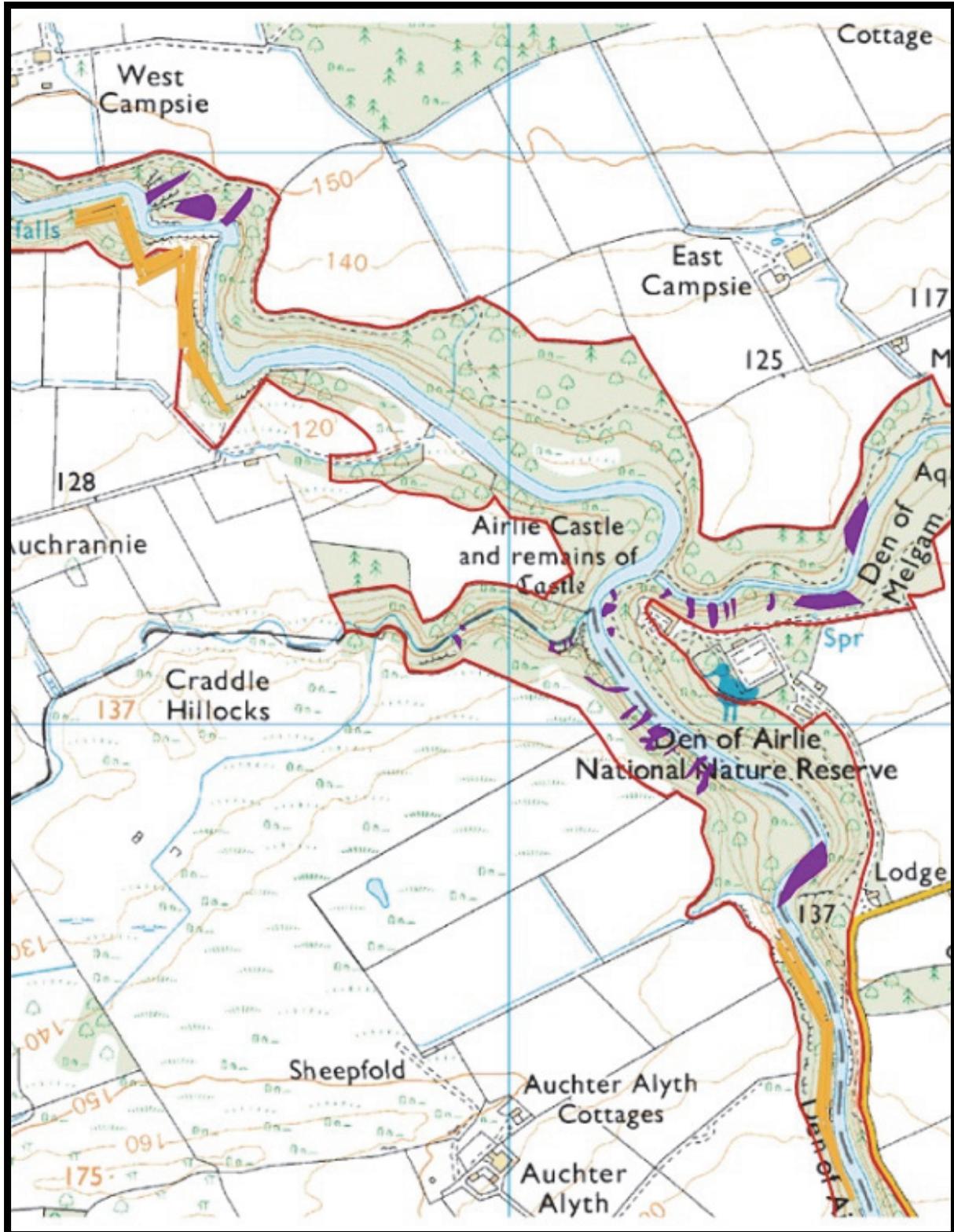
Robinson, M. 2015. *Survey of Whorled Solomon's Seal in Den of Airlie SSSI, 2013*. Scottish Natural Heritage Commissioned Report No. 689.

ANNEX 1: ROBINSON'S (2013) PRIORITY SEARCH ZONES



Reproduced from Robinson, 2013

ANNEX 2: POTENTIAL P.VERTICILLATUM HABITATS IDENTIFIED AND SURVEYED USING ROPE ACCESS (PURPLE) OR SURVEYED THROUGH BINOCULARS (ORANGE) IN 2014



ANNEX 3: INCIDENTAL SPECIES

Carex pendula at NO 28991 52578 (See attached spreadsheet on DVD for complete details).

ANNEX 4: APPROX LOCATIONS OF MOST-SIMILAR LOOKING HABITAT TO THAT OF KNOWN POPULATION

GRID REF	PHOTO (ON DVD)
329300 751915	1758
329286 751951	1731
329271 751980	1730
329249 751968	1724
329257 751993	1726
329222 751981	1725
329235 752009	1753-4
328433 752976	1776

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