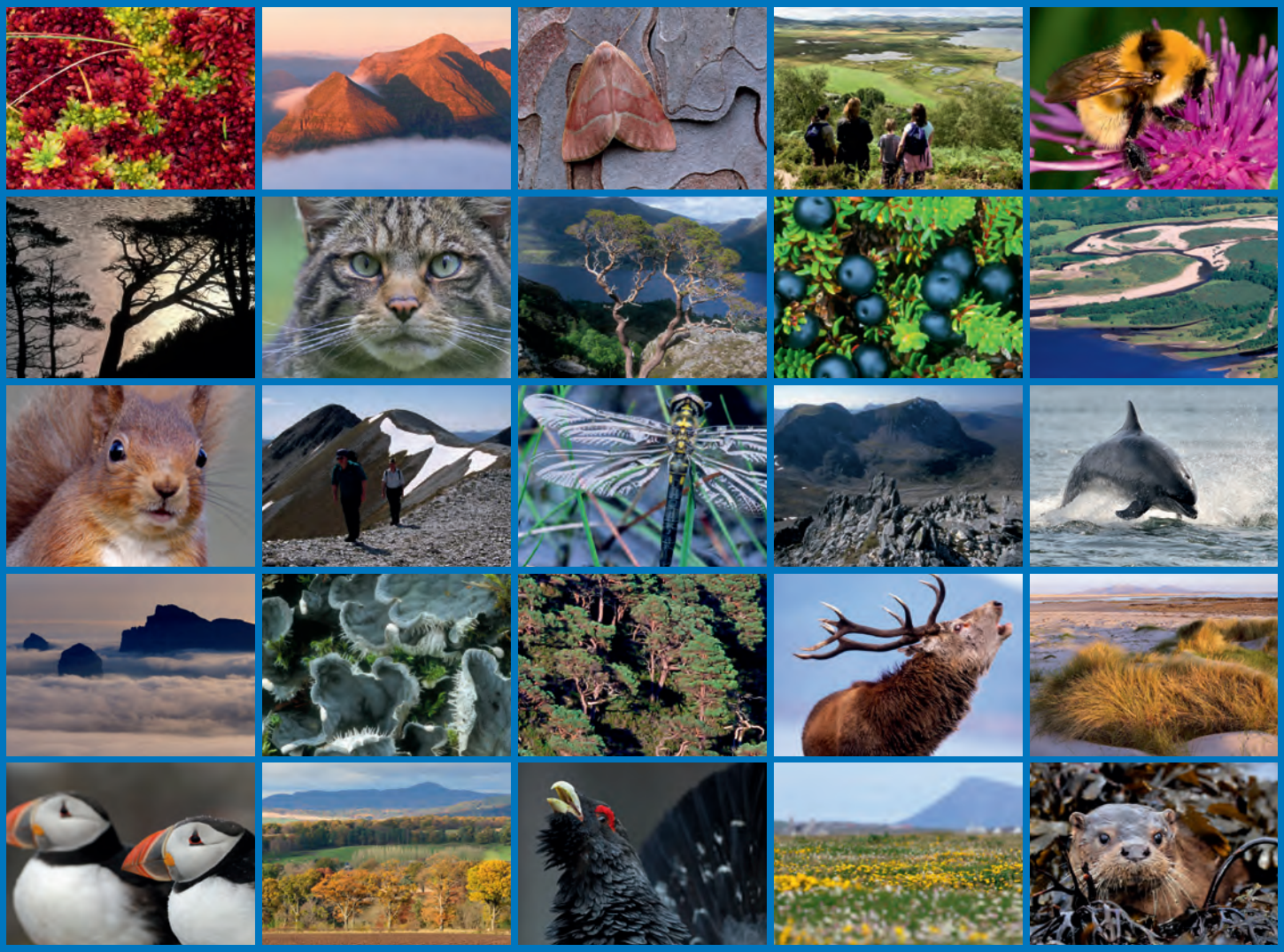
Scottish Natural Heritage
Commissioned Report No. 753

Site Condition Monitoring for Odonata on seven SSSIs



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COMMISSIONED REPORT

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Site Condition Monitoring for Odonata on seven SSSIs

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COMMISSIONED REPORT

Summary

Site Condition Monitoring for Odonata on seven SSSIs

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Site Condition Monitoring; Odonata; northern damselfly (*Coenagrion hastulatum*); white-faced darter (*Leucorrhinia dubia*); northern emerald (*Somatochlora arctica*).

Background

This contract was to carry out Site Condition Monitoring (SCM) of Odonata assemblages at seven designated sites in Scotland. Abernethy SSSI had an additional survey as part of another contract for the northern damselfly, *Coenagrion hastulatum*, which is another notified feature; the results from both surveys have been included in this report. This contract repeated the various SCM undertaken for Odonata on these sites in 2002, 2003 and 2005.

Main findings

- Abernethy: four visits, 11 species recorded, proof of breeding for 10.
- Coille Dalavil: two visits, 10 species recorded, proof of breeding for six.
- Coille Mhor: two visits, eight species recorded, proof of breeding for four.
- Coulin: two visits, 10 species recorded, proof of breeding for seven.
- Glen Affric: three visits, 12 species recorded, proof of breeding for 10.
- Loch Bran: two visits, nine species recorded, proof of breeding for seven.
- Loch Maree: two visits, 11 species recorded, all breeding.
- All sites are in favourable-maintained condition.

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1. INTRODUCTION

1.1 Abernethy Forest

Abernethy SSSI (5796 ha) contains one of the largest areas of native pinewood in Britain, and it is part of a once continuous tract of woodland around the lower slopes of the Cairngorms. Abernethy Forest is part of the eastern group of pinewood types that include Glen Tanar, Rothiemurchus and Ballochbuie. Many native pinewood plants and animals occur here, and as such the site is of considerable national importance. The irregular glacial topography allows marked variations in drainage and consequently a variety of plant communities ranging from acid bog mosses, basin mires and dry heather-bearberry heath. The river Nethy bisects the upper forest, and this together with interspersed lochs and small lochans, add to the site's diversity of habitats.

Most of the forest has been managed to a greater or lesser degree. The more recently managed areas retain a high degree of structure and age variation, and there is also a shrub layer of juniper. There is a series of oligotrophic and mesotrophic valleys and mires that in places have originated long, aligned pools filled with *Sphagnum* spp. Drains were created in the lower forest (for commercial forestry) and are now been blocked, creating small lochans and mires.

The dragonfly assemblage includes rare species such as the northern damselfly (*Coenagrion hastulatum*), which is a notified feature in its own right, the white-faced darter (*Leucorrhinia dubia*) and the northern emerald (*Somatochlora arctica*), which breed in the forest mires and lochans.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.2 Coille Dalavil

Coille Dalavil is an upland glen at the southern end of the Sleat peninsula on Skye characterised by upland, mixed oak woodland on the slopes and mixed wetland habitats on the glen floor. The woodland and the wetlands support diverse lichen flora and dragonfly fauna, respectively.

There is an unusually intact example of a gradation from base-rich, floodplain mire to blanket bog at the western end of Loch a' Ghlinne. The floodplain mire is dominated by common reed, sharp-flowered rush and various sedges including the uncommon slender sedge *Carex lasiocarpa*. Towards the western end of the site, there is an area of blanket bog and raised mire which although partially cut in the past, is recovering, with little sign of recent damage.

Ten species of dragonfly have been recorded from the wetlands of Loch a' Ghlinne. These include the keeled skimmer (*Orthetrum coerulescens*), which is a mainly southern species, occurring only very locally in Scotland, and the beautiful demoiselle (*Caleopteryx virgo*), which reaches its most northerly locality in Britain at Dalavil.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.3 Coille Mhor

Coille Mhor SSSI is located in Lochalsh, less than 1 km northeast of Balmacara Square. The site is characterised by areas of oak and birch-dominated ancient and semi-natural broadleaf woodland separated by open ground. The SSSI also encompasses a notable oligotrophic loch, Achaidh na h-Inich, which provides the habitat for a significant assemblage of dragonfly species.

Loch Achaidh na h-Inich represents a nationally scarce loch type supporting at least 37 species of emergent, submerged and floating plants, including the nationally scarce long-stalked pondweed *Potamogeton praelongus* and the six-stamened waterwort *Elatine hexandra*. Adding further to the loch's significance, there is an adjacent area of tall fen.

The loch and fen support an outstanding assemblage of nationally important dragonflies. Ten species have been recorded, including the nationally rare northern emerald.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.4 Coulin Pinewoods

Coulin Pinewoods SSSI consists of two discrete blocks of native Scots pinewood within Coulin Forest, which is located 5 km south of Kinlochewe in Wester Ross. The site is of national importance for pinewood, lichen and a dragonfly community.

Ten species of dragonfly and damselfly have been recorded, which is unusual for such a northerly location. Species found include the nationally rare northern emerald and the nationally scarce azure hawker (*Aeshna caerulea*) and the white-faced darter.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.5 Glen Affric

Glen Affric SSSI lies at the head of Strathglass, 6 km west of the village of Cannich and about 40 km from Inverness. The majority of the site lies on the southern shores of Loch Beinn a' Mheadhoin and Loch Affric, with two small outliers at Cougie and Coille Ruigh na Cuileige. It is notified for its native pinewood habitats and associated lichen, and bird assemblages. Its bogs and lochans support a very rich dragonfly assemblage, which is also a notified feature.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.6 Loch Bran

Loch Bran is found on the edge of a 200-m high escarpment above Loch Ness, approximately 2 km southeast of Foyers. It is a small, irregularly shaped, shallow loch of medium nutrient status.

The Loch supports 11 species of dragonfly including a nationally scarce species, the brilliant emerald (*Somatochlora metallica*), which is at the northern edge of its range.

The Loch is flanked on the south by native birch woodland and on the north by coniferous plantation. The shoreline consists of natural vegetation with areas of swamp, fen, bog and rough pasture. These habitats are not notified but they are important habitats for the dragonflies.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.7 Loch Maree

Loch Maree is a deep, linear loch, 22 km in length, located between the settlements of Kinlochewe and Poolewe in Wester Ross. It is an excellent example of a nutrient poor, freshwater loch.

Its islands support one of the best remaining fragments of native pinewood in Scotland. These woodlands are one of a group in Wester Ross that are genetically distinct from other pinewoods in Scotland and show affinities with those in Spain and southern France. They have a varied age structure and show good regeneration. There are small scale examples of bog woodland and mire in the wettest areas.

With 12 species recorded, the islands contain an outstanding assemblage of dragonflies. Of particular note are the northern emerald, the azure hawker and the white-faced darter.

The 2002 SCM considered this feature to be in favourable-maintained condition.

1.8 Species of particular importance

Azure hawker

This species is quite widespread in Sutherland, with roughly half of the Scottish records in the northwest Highlands. This species is under-recorded as are most Odonata, but locally it is quite well recorded although most sightings seem to be near roads or tracks where the adults are easy to spot when basking. The status of the population in Galloway is uncertain, with no sightings of adults or larvae in recent years or during the 2010-11 SCM.

This species is classified as Vulnerable (VU) on the 2008 Odonata Red Data List (Daguet *et al*., 2008) due to inferred decline.

Brilliant emerald

This species has a limited distribution in Scotland, from Strathnairn west of the A9 and Strathglass/Glen Affric. It is locally common on suitable lochs but is still likely to be under-recorded. There is a more widespread population in England but it is thought that the one in Scotland came from a continental European population rather than England.

This species is classified as Vulnerable (VU) on the 2008 Odonata Red Data List (Daguet *et al*., 2008) due to inferred decline.

Downy emerald (*Cordulia aenea*)

This species has a restricted distribution in the Highlands, from Drumnadrochit to Glen Affric and Strathglass, but it is likely to be under-recorded. It is locally common on suitable lochs. It favours water bodies with some overhanging broadleaf trees or shrubs that provide leaf litter as a larval habitat. Other Scottish populations are centered round Oban, Kintyre and Loch Lomond.

Keeled skimmer

This under-recorded but unmistakable species favours shallow runnels in upland areas. This habitat preference partially explains why it is under-recorded. Its distribution is concentrated on Argyll and the western Highlands, particularly Morven, Mull and Ardnamurchan. Its most inland site in Scotland is the Blackwood of Rannoch. A small population is found in Galloway.

Northern damselfly

This species favours fairly shallow water bodies that have consistent water levels and abundant emergent vegetation. There are over 60 known breeding sites for this species in Strathspey, Deeside and Perthshire. Single sites near Nairn, in Moray, and at Castle Fraser,

Aberdeenshire, have been discovered recently suggesting that the species is under-recorded. Despite the discovery of new sites, the northern damselfly is our rarest breeding species.

This species is classified as Endangered (EN) due to observed decline (Daguet *et al*., 2008).

Northern emerald

This species is widespread but under-recorded in the central and west Highlands. It prefers choked pools with some open water. Suitable breeding habitat can appear too dry when visited in the summer. This is the most common of the three emerald dragonflies found in Scotland.

The current status of this species is uncertain; it was classified as Vulnerable in 1987 though this has changed to Near Threatened (NT) in the 2008 Odonata Red Data List (Daguet *et al*., 2008), who proposed that (this species) "should be closely monitored throughout its range, and that particular attention should be paid to the effects of climate change and global warming on its distribution". It is a rare species occurring in just over 50 hectads (10 km squares), but is most certainly under-recorded.

White-faced darter

This is a bog pool specialist. It prefers deeper pools, but it can be found in shallower pools in areas of high population densities. It is the only darter on the wing from early June. The male's red and black coloration is unmistakable, plus the white "nose" of both sexes is only found on this species. This species is found from Wester Ross through Speyside to a few sites in Deeside and Perthshire. Its patchy distribution is probably due to under-recording.

This species is classified as Vulnerable (VU) on the 2008 Odonata Red Data List (Daguet *et al*., 2008) due to becoming extinct in many sites in the south of its range in England. In Scotland, several new sites have been found in the last five years and it is certainly under-recorded.

There is a lack of consistent recording and insufficient records to determine statistically robust population trends for all species above. For more information on the RDB status of these Odonata, see http://jncc.defra.gov.uk/pdf/pub08_speciesstatus11.pdf

2. METHODS

Surveying upland insect species is unpredictable due to changing weather conditions and very local systems. The techniques used have been developed in the field over a period of years and have most recently been used during the 2010-11 Odonata SCM undertaken for SNH. They follow the guidelines for Odonata in the JNCC Common Standards Monitoring http://www.jncc.gov.uk/pdf/CSM_terrestrial_freshwater_Inverts.pdf

The survey took place during the best weather conditions in late-May to August 2013. The two survey periods ensured that adults of both early (the large red damselfly, *Pyrrhosoma nymphula*) and late (the black darter, *Sympetrum danae*) species were on the wing to be observed.

For large sites there were three days of site visits (one and two days of either early or late periods). There were single early and late visits on medium-sized sites, and two half day visits on very small sites such as Loch Bran.

Prior to visiting the site, contact was made with the local SNH Officer to arrange access permissions and to look at site files if that was deemed appropriate. As all the surveyed sites were known to the surveyor, there was no need for familiarisation visits.

2.1 Habitat identification

A desk survey was undertaken to identify suitable sites. Through the NBN Gateway, records were used for a species list for 1-km or 10-km squares, the resolution depending on the available data. The status of Odonata features at the last available Site Condition Monitoring (SCM) was noted. Maps of suitable survey habitats were analysed and an order of surveys was devised.

2.2 Species Survey

Early visit – Larval Sampling

Though weather is not a key consideration for larval sampling, it is best to do it when it is not too cold, windy or wet. Larval sampling took place when the minimum temperature was 15^{o}C, the wind speed was below force 4 and there had not been significant rainfall for three days. Larvae of most species start emerging by mid-May/June; the ones caught during sampling were in the final development stages and hence most straightforward to identify due to their large size.

Larval sampling was undertaken by “guddling”, which involves using a colander as a net and sweep it through emergent vegetation along the pool's edge or bottom. This is the tried and trusted Scottish larval sampling technique and is the most useful when dealing with pools with lots of *Sphagnum* spp. that tend to choke pond nets.

There is a hierarchy of survey actions:

1. Observe any adult activity.
2. Observe the edges of the pool and marginal vegetation for signs of emerging adults or exuviae (the cast larval skin left behind after adult emergence).
3. Identify any exuviae and emergent adults.
4. Mark the site of emergent adults to avoid damaging them during the survey.
5. Start larval sampling, until a larva is found or a maximum of 20 dips.
6. Record all Odonata species as adult or larva seen or captured and any other readily identifiable species.

Late Visit – Adult Surveying

This took place during the best weather conditions between late June and August; late July is the peak flight period for most Odonata species. Temperatures over 17^{o}C, very little wind and cloud cover under 50% are ideal conditions. Strong wind and cloud cover are the two key factors inhibiting adult flight; the weather forecast was closely studied to ensure the best days for survey were chosen.

The pools surveyed for larvae were revisited for adult survey. Suitable points were identified to allow a view over potential basking/perching sites and breeding pools. Ten minute watches with 5 min breaks took place at various sites between 10:00 and 16:00 h, longer if the weather was good.

2.3 British Dragonfly Society 'Proof of Breeding' Criteria

This was used to indicate the breeding status of the species recorded following Taylor (2003):

1. **Confirmed breeding**: exuviae or larvae present or teneral (newly emerged) adjacent to suitable water body. However only the presence of an exuvia constitutes absolute proof that at least one specimen has completed a cycle from egg to adult at the site.

2. **Probable breeding:** pair copulating, female ovipositing or regular presence of both sexes at suitable water body (normally annual presence or a repeated period consistent with the species' life-cycle length).

3. **Possible breeding:** female seen at a water body suitable for the species where at least one male has been observed to be engaged in some form of reproductive behaviour, such as territoriality or pursuing females.

3. RESULTS

3.1 Abernethy Forest

There were four visits to this SSSI in June, July and August. The northern damselfly was recorded at the first eight sites below before or during the 2002 SCM (Smith & Smith, 1996; Edgar, 2002). This species was found at six of the original eight ponds, and at an additional site. The site names follow Edgar (2002). In total 19 sites were visited in 2013.

Abernethy Dell Woods NJ009185 - Two peaty pools lying in a heathery area with some Scots pine regeneration and larger pines on dryer knolls nearby. These ponds were in poor condition, seemed to have dried out this year. They were visited on 29 June.

Pond 1.5 km north of Ryvoan Bothy NJ009131 - This is a pond of around 15 m in diameter, lying next to a track. It is now completely overgrown with sedges and has very little water. Only the black darter was seen.

Caravan pond NH966193 - This site is a deep lochan approximately 40 m in diameter formed by the RSPB by damming the outflow of a burn. Northern damselfly breeding, two larvae (28 June), three males and a tandem pair (6 July).

Alden lodge pond NH954191 - This pond was created by the RSPB. No northern damselflies seen on 28 June or 6 July.

East Croftmore NH959195 - A very boggy area with little open water. Northern damselfly breeding, seven larvae (28 June), four adults and four larvae (6 July).

Ridge pool NH966182 - This is a lochan in a forest bog. Ten northern damselfly adults seen on 28 June.

Mid-Garten wood marsh NH962183 - An area of bog approximately 120 x 40 m created by the RSPB in the late 1980s by damming a forest drain. One male northern damselfly seen on 28 June.

Mullingarroch farm marsh NH953181 - A 300 x 50 m area of bog that was dammed and flooded by the RSPB in the 1980s. Two male northern damselflies seen on 29 June.

Leucorrhinia pool NH982175 - A deep, *Sphagnum*-covered pool formed through old peat cuttings. Breeding evidence of white-faced darter on 28 June.

Gate House Wood centered around NH980172 - This is an extensive area of forest bog of varying degrees of wetness. Breeding evidence of white-faced darter and northern emerald on 6 July.

Loch Mallachie-Loch Garten ditch/drain NH967173 - A deep ditch linking the two lochs, containing some emergent vegetation such as *Potamogeton* spp. Three male northern damselflies found on 28 June.

Inchtomach/river Nethy NJ020153 - This is a marshy area on both sides of the river Nethy. It includes a series of small burns and ditches running into the river Nethy. Not surveyed, due to lack of suitable habitat.

Clais an Eich Wood lochan NJ014137 - A sheltered lochan with the edge of a plantation running along the south side and Scots pine regeneration to the east and northeast. The nearby Rynettin Lochans were surveyed instead.

Tulloch Moor Lochans NH961163 - A series of lochans surrounded by birch trees. Visited on 29 June, four species recorded.

Tulloch Moor Peat Cuttings NH959168 - A series of pools formed as a result of peat cutting. Breeding evidence of white-faced darter and northern emerald on 29 June.

Pylon line – Garten wood NH953184 - An area of heather and grassy tussocks and wetter, marshy ground with small drains and burns. The four-spotted chaser (*Libellula quadrimaculata*) was seen on 29 June.

Table 1 summarises the findings for the site.

Table 1. Species recorded at Abernethy Forest SSSI; b denotes evidence for breeding, and q a questionable record.

Species	2002 SCM	All Abernethy Sites 2013	Species on the NBN 2013
Azure hawker			• q
Black darter	•	• b	•
Blue-tailed damselfly (*Ischnura elegans*)		• b	•
Common blue damselfly (*Enallagma cyathigerum*)	•	• b	•
Common darter (*Sympetrum striolatum*)			•
Common hawker (*Aeshna juncea*)	•	• b	•
Downy emerald			• q
Emerald damselfly (*Lestes sponsa*)	•	• b	•
Four-spotted chaser	•	• b	•
Golden-ringed dragonfly (*Cordulegaster boltonii*)	•	•	•
Large red damselfly	•	• b	•
Northern damselfly	•	• b	•
Northern emerald	•	• b	•
White-faced darter	•	• b	•

3.2 Coille Dalavil

This site was visited twice, in July and October. The number of species found was the same as the 2003 SCM, but breeding was confirmed for two additional species: the keeled skimmer and the black darter (Table 2).

Table 2. Species recorded at Coille Dalavil SSSI; b denotes evidence for breeding.

Species	2003 SCM	2013 All Coille Dalavil Sites	Species on the NBN
Beautiful demoiselle	•	•	•
Black darter	•	• b	
Blue-tailed damselfly	• b	• b	•
Common blue damselfly	•	•	•
Common darter	• b	• b	•

Common hawker	• b	• b	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly	• b	• b	•
Keeled skimmer	•	• b	•
Large red damselfly	• b	• b	•

3.3 Coille Mhor

This site was visited twice, in August and October. One fewer species was found than the 2003 SCM and five fewer species with proof of breeding (Table 3).

Table 3. Species recorded at Coille Mhor SSSI; b denotes evidence for breeding.

Species	2002 SCM	2013 All Coille Mhor Sites	Species on the NBN
Black darter	• b	•	•
Blue-tailed damselfly	• b		•
Common blue damselfly	• b	•	•
Common darter	• b	•	•
Common hawker	• b		•
Emerald damselfly	• b	•	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly	•	• b	•
Large red damselfly	• b	• b	•
Northern emerald	• b	• b	•

3.4 Coulin Pinewoods

This site was visited in late July and late August. One fewer species was found than the 2003 SCM but breeding was confirmed for three additional species: the emerald damselfly, the common blue damselfly and common darter (Table 4).

Table 4. Species recorded at Coulin Pinewoods SSSI; b denotes evidence for breeding.

Species	2003 SCM	All Coulin Pinewood Sites 2013	Species on the NBN
Azure hawker			•
Black darter	•	• b	•
Blue-tailed damselfly	•		•
Common blue damselfly	•	• b	•
Common darter	•	•	•
Common hawker	• b	• b	•
Emerald damselfly	• b	•	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly	•	•	•

Keeled Skimmer	•		•
Large red damselfly	•	• b	•
Northern emerald	This record was from outwith the SSSI boundary	• b	•
White-faced darter	• b	• b	•

3.5 Glen Affric

This site was visited three times in July and August. The same number of species, though slightly different assemblages, was recorded on both SCM surveys and two more species were recorded breeding on site in 2013: the southern hawker (*Aeshna cyanea*) and the blue-tailed damselfly. The downy emerald was recorded at three sites (Table 5).

Table 5. Species recorded at Glen Affric SSSI; b denotes evidence for breeding.

Species	2002 SCM	All Glen Affric Sites 2013	Species on the NBN
Azure hawker	•		•
Black darter	• b	• b	•
Blue-tailed damselfly		• b	•
Brilliant emerald	•		•
Common blue damselfly	• b	•	•
Common darter	• b	•	•
Common hawker	• b	• b	•
Downy esmerald	• b	• b	•
Emerald damselfly	•	• b	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly	•	• b	•
Large red damselfly	• b	• b	•
Northern emerald			•
Southern hawker		• b	•
White-faced darter	• b	• b	•

3.6 Loch Bran

This site was visited twice in July and August. All the species previously recorded were present, except the common hawker; one adult was seen just outside the SSSI boundary. Proof of breeding was not recorded for the brilliant emerald and the golden-ringed dragonfly (Table 6).

Table 6. Species recorded at Loch Bran SSSI; b denotes evidence for breeding.

Species	2002 SCM	All Sites	Species on the NBN
Black darter	• b	• b	•
Blue-tailed damselfly	• b	• b	•
Brilliant emerald	• b	•	•
Common blue damselfly	• b	• b	•

Common darter	• b	• b	•
Common hawker	• b		•
Emerald damselfly	• b	• b	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly	• b	•	•
Large red damselfly	• b	• b	•

3.7 Loch Maree

This site has been visited twice, in early July and mid-August courtesy of the SNH boat and reserve staff. The 2002 SCM was carried out outwith the SSSI boundary and these species were not included in the results. In 2013 two more species were found and breeding of three additional species was confirmed; the common hawker, northern emerald and white-faced darter. However the azure hawker was not found.

Table 7. Species recorded at Loch Maree SSSI; b denotes evidence for breeding; q a questionable record.

Species	2002 SCM	All Sites	Species on the NBN
Azure damselfly			• q
Azure hawker	• b		•
Black darter	• b	• b	•
Blue-tailed damselfly	• b	• b	•
Common blue damselfly	•	• b	•
Common darter	• b	• b	•
Common hawker		• b	•
Emerald damselfly	• b	• b	•
Four-spotted chaser	• b	• b	•
Golden-ringed dragonfly		•	•
Keeled skimmer			•
Large red damselfly	• b	• b	•
Northern emerald		• b	•
White-faced darter	•	• b	•

4. DISCUSSION

4.1 Abernethy Forest

Eleven species have been previously recorded at this site and breeding proved for ten of them. The northern damselfly has been recorded at seven sites, with larvae found at two. An additional site at Loch Mallachie was found this year. It should be noted that the area of pools to the east of the River Nethy could not be accessed until the capercaillie counts were completed in July, so early visits for pre-emergence larval sampling were not possible. However, I do not feel this affected greatly the species detection.

Edgar (2002) commented that: *"Aeshna caerulea* was never relocated after the initial record and Betty and Bob Smith found no suitable sites in their searches in the 1990's". There are other old records from Loch Brandy in Angus and from Deeside; it is unlikely we will ever know whether these were mis-identifications or evidence of a relict population.

Edgar (2002) also reported that Stewart Taylor (Abernethy former manager) has known the SSSI for over 25 years and has never seen the blue-tailed damselfly there, and although many sites were checked for the presence of common darter no larvae, adults or exuviae were seen. Both species have now been recorded since the last SCM.

The downy emerald record is questionable, as the distribution of this species is not thought to go further east than the A9. There is no definitive proof of this species being sighted in Speyside.

Therefore 12 species seems to be the current maximum of the Odonata fauna in this SSSI. An additional species, the azure damselfly, has been recorded in Speyside and is likely to colonise the lower altitude sites in due course.

The findings of the 2002 and 2013 SCM were consistent, with only the blue-tailed damselfly being added to the 2013 species list. Recording 11 of the 12 known species on such a large site in relatively few visits was a good result. The species not recorded, the common darter, can be elusive and localised, possibly due to the altitude of the area.

There is a very extensive forest bog habitat within the woodland, which is very good for the white-faced darter and northern emerald. There were reasonable numbers of northern damselflies on some pools with deep water. However, it was impossible to sample its larvae as the *Sphagnum* mat was too thin to safely walk on. A review of distribution data is required to determine the status of this species nationally, although on this SSSI it seems to be in a favourable condition.

The site is in good condition overall and the clearance work by the RSPB on the smaller pools near Loch Garten to maintain open water should continue. The new pool created next to the well-known white-faced darter pool near Loch Garten and boardwalk is a step in the right direction. Further work on restoring drained bogs will also create further suitable habitat.

Although the number of sites for the northern damselfly is increasing, there is an urgent need to collate the survey results and resurvey historical sites to determine population trends in line with the Red Data Book recommendations. If the European beaver (*Castor fiber*) is re-introduced to this area, it will maintain a constant water level required by this species and it will create suitable ponds for this and other Odonata.

4.2 Coille Dalavil

The target species, keeled-skimmer and beautiful demoiselle, were found and breeding proved for the former. This site is a very good habitat for both species. The emerald damselfly was not found; it has been recorded in adjacent 10-km squares but not this one perhaps because of its isolated nature and lack of suitable “stepping stone” wetlands; or perhaps it just has not been recorded.

Finding the keeled-skimmer at all breeding stages and a larva in a very shallow runnel was very fortunate, considering how elusive this species is. I suspect that its peak activity is in June, thus why it has been missed previously. Now that adults have been found on two locations, more targeted monitoring can take place by local volunteers. Surveys on the loch by boat would help to fill in recording gaps.

The numbers of beautiful demoiselles were excellent, and the fact that they were found in all suitable habitat surveyed shows how widespread the population is. Although Sleat is the best surveyed and most northerly UK site for this species, there have been unconfirmed sightings near Brae. Although this species is easily identified while in flight, it is still likely to be under-recorded as its favoured habitat of densely vegetated burns is not often frequented.

There seem to be plans to upgrade the path through Coille Dalavil. Although this may remove some potential dragonfly breeding habitat, it is a tiny amount when compared to the whole site. Highlighting the areas where keeled-skimmer and beautiful demoiselle have been seen and describing their habitats, would inform visitors about some of the special species on the site and hopefully generate more records.

4.3 Coille Mhor

Larvae of the target species - northern emerald - were found. The site has been intensively monitored from 2006-2011 and this study indicated the site is in good condition. This site is average in terms of Odonata fauna and does not include the white-faced darter - a species recorded nearby - so it is questionable to have Odonata as a notified feature.

The poor weather on both visits affected the species on the wing. After a fairly settled June, the weather in the west was very changeable from mid-July onwards making it difficult to get the right window for adult observation. That said there were sightings of most species recorded on the site. The low number of proof of breeding cases was most likely due to heavy rain the day before the survey.

4.4 Coulin Pinewoods

Ten species were recorded and seven proved breeding, but the azure hawker, blue-tailed damselfly and keeled skimmer were not found. The azure hawker was recorded breeding less than 1 km away in 2011 for another SCM contract on Beinn Eighe SSSI, and it is likely to be found in suitable habitat surrounding this SSSI. The blue-tailed damselfly was just likely not to have been seen on the survey days, as it has been recorded locally. Good numbers of the white-faced darter were found in the Kidney Loch.

The whole Loch Maree, Coulin and Glen Torridon area is among the most important for Odonata in Scotland, both in terms of the number of species and the extent and density of habitat, particularly for those species that are uncommon or hard to find elsewhere in Scotland, such as the azure hawker, the white-faced darter and the northern emerald. In the 1990s, Betty Smith recommended that this area be designated for its Odonata species assemblage, perhaps not a formal designation but one that would serve to coordinate more regular monitoring of these important sites.

4.5 Glen Affric

Twelve species were recorded with breeding proved for 10; this highlights the quality of this site. The azure hawker, the northern emerald and the brilliant emerald were not found in this survey but have been recorded recently. The drying out of the suitable shallow pools at low altitudes for the first two species may have affected their breeding success, or the timing of the visits was a bit too late. Both species have been recorded a few kilometres away at Dundreggan in 2010 and 2011 (Willet, 2011). It is possible that the best breeding habitat in Glen Affric is at higher altitudes or in areas that were not surveyed.

Some of the bog pools have almost all dried out and were in a much worse state than in the 2002 SCM; very few species were found as there was almost no water. I did not consider the drying out of these pools to have affected the Odonata as a notified feature too severely as there is a considerable area of habitat that was not surveyed. The habitat of the bog pools was also still there, it just needed water.

The brilliant emerald was seen on a site near the Glen Affric SSSI (Lochan Dubh) on 31 July and it is felt that this species certainly has been missed, particularly as it has been seen regularly at Coire Loch in previous years. The final day of survey was overcast, so conditions were not ideal.

There was a survey of all water bodies in the FC ownership undertaken by Bob and Betty Smith in the 1990s, and this is the most comprehensive survey of its type in Scotland that I am aware of. Allied with the fact that Glen Affric (in my estimation) is one of the top four sites in Highland for Odonata and has the highest number of breeding species (16) of any site north of Clais Dearg SSSI, this survey should be repeated in full to determine the status of the Odonata fauna and also detect any changes in species composition and distribution.

4.6 Loch Bran

The target species, the brilliant emerald, was found in good numbers and although conclusive evidence of breeding was not found, it is safe to say that the population here is in good condition. Previous FCS surveys of surrounding lochs (Willet, 2009) have shown there is a strong population in the South Loch Ness area.

The main recommendation would be to build a boardwalk from the car park to the main viewing site at the loch edge to avoid further trampling the delicate margins of the loch. This trampling has increased noticeable in the six years the author has been visiting the site. Although this does not damage the site significantly overall, it is an ongoing issue that has not been addressed and is going to continue to get worse if nothing is done, detracting from the best known site in Scotland to see the brilliant emerald.

4.7 Loch Maree

Eleven species were found and breeding was proven for 10 of them. To date there are reliable records for 13 species recorded on site. The main reason that Eilean Subhainn has such a diverse Odonata fauna is its habitat diversity, with open water lochans on the island, both sparsely and densely vegetated bays on its shores, peat bog complexes, runnels and small bog pools. The only habitat that is missing is running water.

One anomaly of the SSSI boundary is that the best known site for the azure hawker and the northern emerald in the UK, Grudie Bridge, is not within the current SSSI or NNR. This site is full of bog pool habitat and very well recorded and does have at least 12 species recorded there. There is a strong case, with lots of evidence, to extend the SSSI boundary south from the shore to the A835 from Talladale to east of Bridge of Grudie.

In July there was no sign of any azure hawkers and very few *A. juncea* larvae. This may have been due to the rain over the last few days prior to the survey making larvae in general hard to find. I visited Grudie in the west side of Loch Maree, but not in the designated area, to see if they were any easier to find there, as this is a very reliable site for the azure hawker. However, they weren't found there either, so I suspect it was the water temperature that is making this species hard to find. It is possible that the trend for drying out of the shallower bog pools in the spring over the last 10 years or so may have had an effect on the population of the azure hawker leading to a local extinction, but two site visits is not enough to determine that. The other species not recorded was the keeled skimmer; it is very elusive so I cannot speculate on its status other than I saw several areas of suitable habitat.

The SNH site file was full of information particularly from the late 1980s and 1990s when the then Warden Tim Clifford and the British Dragonfly Society Scottish Recorder at the time Betty Smith were very active in the area. It is a shame that such activity has not persisted on site in the 21st century. Regular surveys to monitor change would be very useful in this area.

In conclusion, all sites are in favourable-maintained condition.

4.8 General Points

4.8.1 Weather

Overall the weather for surveying was very good. May, June and July were excellent months with settled weather, particularly in July, which was hot and provided the best spell for Odonata survey since 1997. The long period of settled weather allowed the populations to build up, hence some of the species counts reaching hundreds. The weather usually is the biggest determiner of adult survival.

Large numbers of adults also mean they can disperse and colonise new sites. As long as there is suitable breeding habitat not too far away and covering a large enough area, then this can continue (Corbet, 1999).

The very cold March would not affect the early emerging species as they overwinter in their final larval instar and do not need to grow any more. They merely wait for the correct day length and water temperature to initiate their emergence phase (Corbet & Brooks, 2008).

4.8.2 Monitoring the impacts of climatic change

One factor that has changed in the last 10 years is the prevalence of very dry springs, particularly on the west coast. This causes the shallow bog pools to dry out and have a major impact on species such as the azure hawker, the white-faced darter and the northern emerald. There have been no studies to determine if this is having an impact, but comparing this year's findings with the previous SCM seems to suggest it to be the case. Certainly on Loch Maree, Coulin and Glen Affric, there were many bog pools that were almost completely dry or had dried out.

4.8.3 Further comments regarding Odonata SCM

The author's experience of researching the SSSIs with Odonata as a notified feature undertaken with SNH has made it clear that the current list of SSSIs are not wholly representative of the key species found in each area, or in some cases the best Odonata sites.

Much of the designation of SSSIs took place in the 1980s and early 1990s, when there was

less knowledge of Odonata. Since then there has been a great deal of surveying by volunteers. In addition, the selection criteria for qualifying Odonata assemblages are similarly out of date. The current threshold is nine species, a number found in just about every suitable water body in Scotland. Increasing this threshold to 12 or more (but different for island or west coast SSSIs) depending on the area, would highlight the best sites for Odonata in Scotland.

In relation to assemblages, the rarer species tend to be habitat specialists, mainly at bog pools, so whole Odonata assemblage implies different habitats. It can be problematic to determine condition when one type of habitat is in good condition and another on the same site is not. There are different ways to deal with this; sites could be notified just for species that are locally or nationally important rather than for the whole assemblage. Or if a site is notified for an assemblage then the condition of the rarer species could be determined separately.

The current SSSI network is representative of the best sites in Scotland for Odonata but many of them are not notified for Odonata. If some sites were removed from the designation list and other SSSIs notified, the resulting assemblage of SSSIs would be truly representative of the key Odonata sites in Scotland.

If the regularity of SCM is going to be reduced, then a different way of looking at the state of Odonata on a regional basis could be introduced. Key sites in each region (plus the national parks) could be identified from the current suite of SSSIs and a partnership with the British Dragonfly Society could be developed for the long-term monitoring of both habitat and species and repeated every five years or so. In addition, local recorders could be encouraged to undertake interim recording to add to the data gathered over the years. It is envisaged that eight to 12 sites could cover Scotland.

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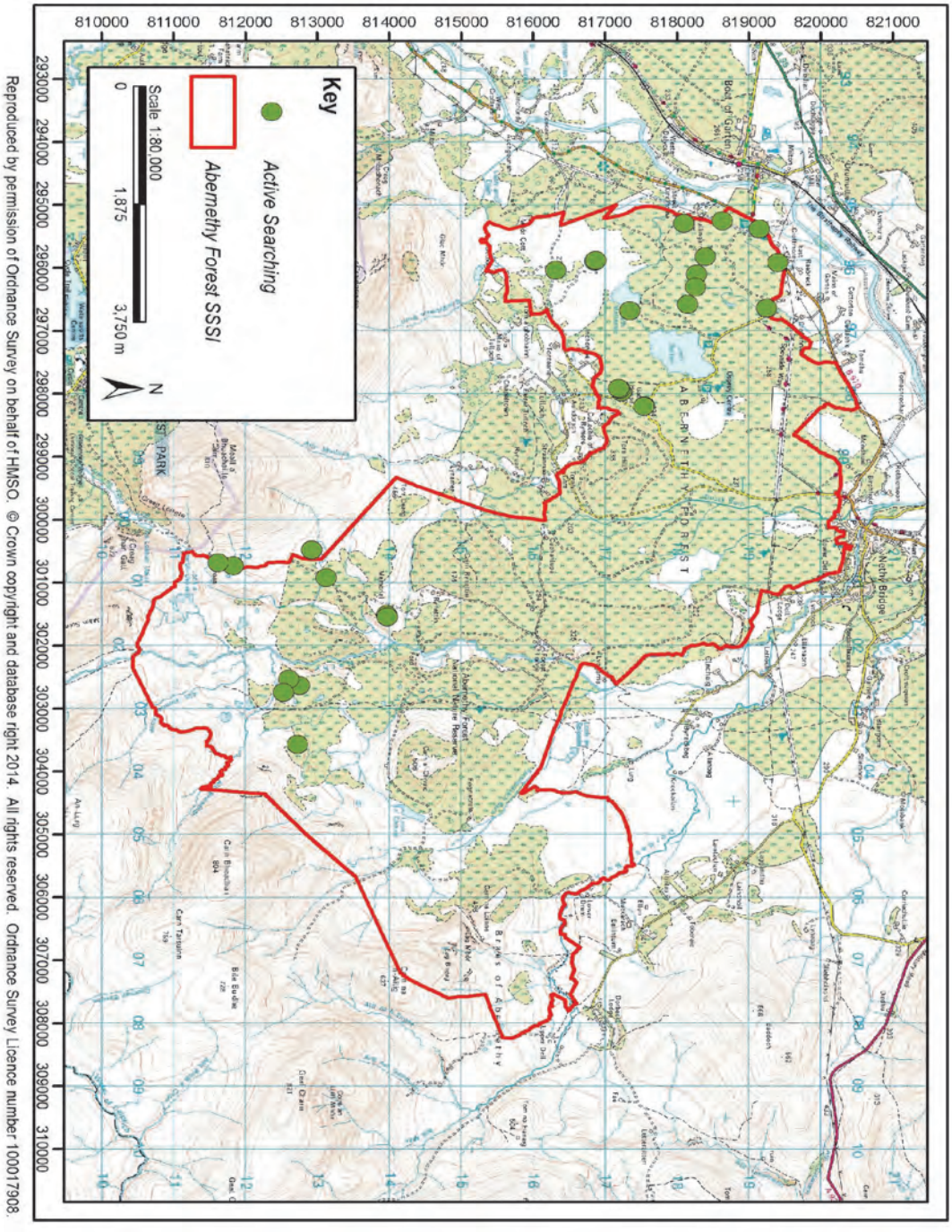
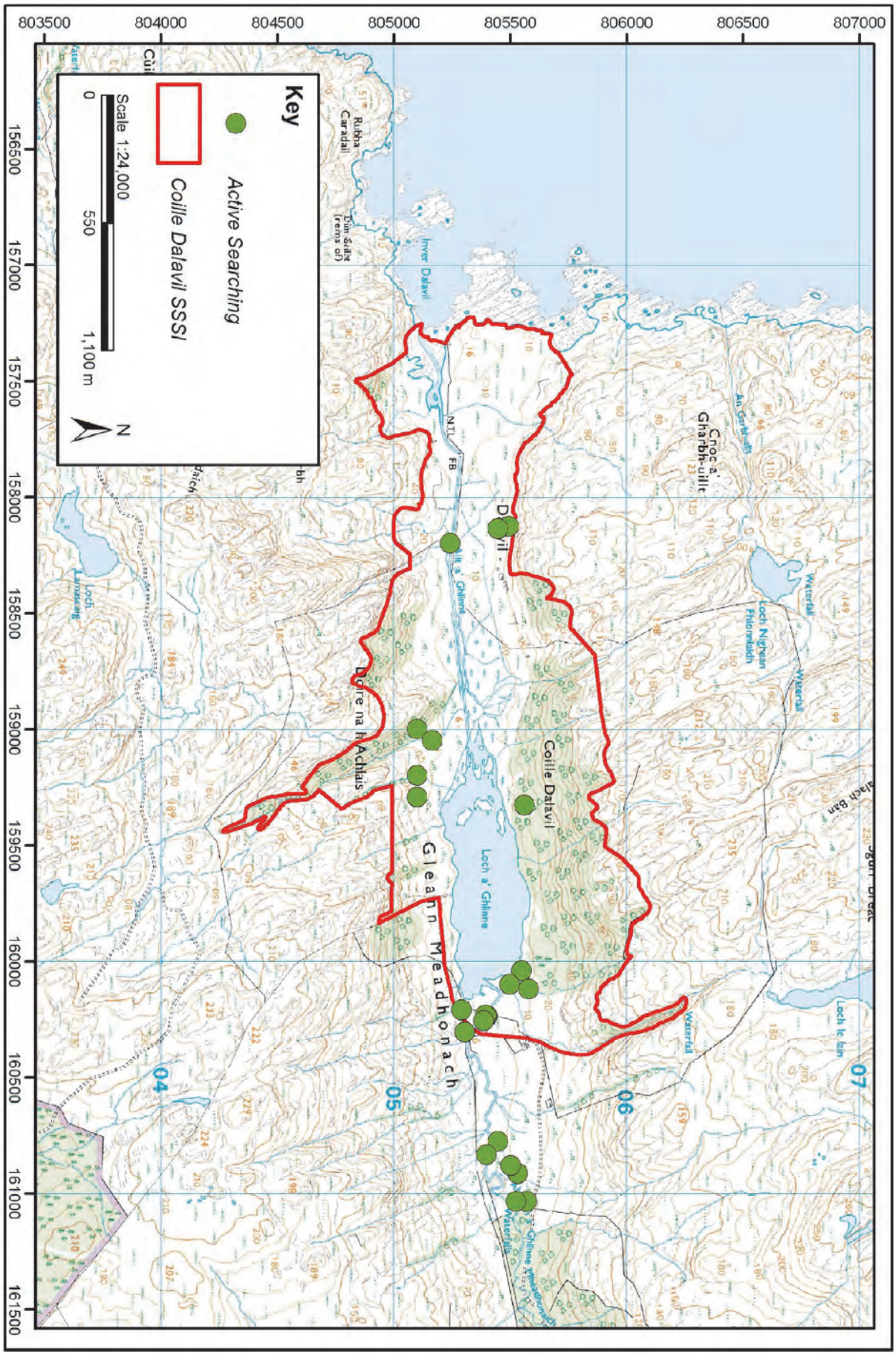
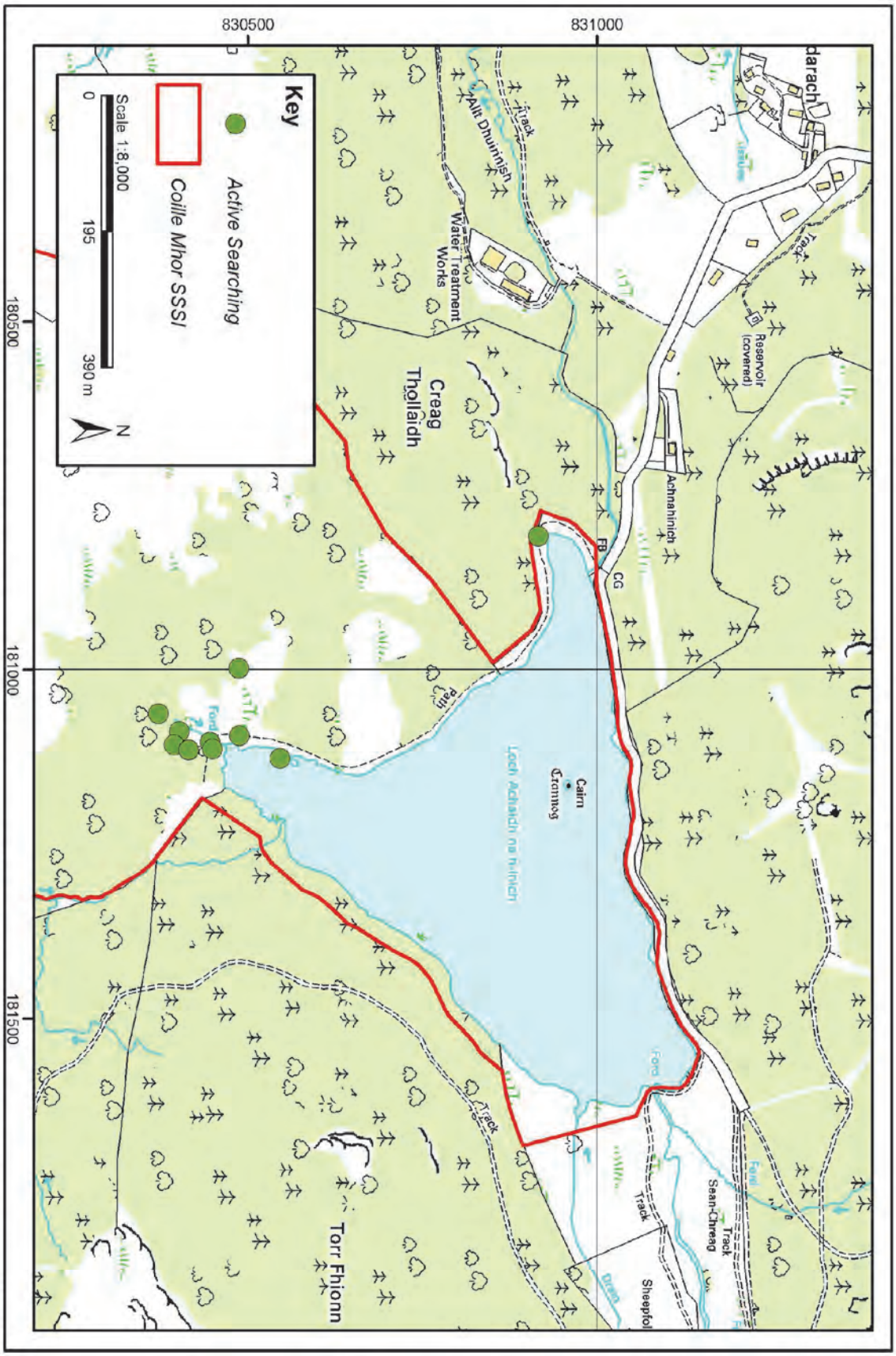
ANNEX 1: SITE MAPS



Map 1. Odonata survey sites in Abernethy Forest SSSI



Map 2. Odonata survey sites in Coille Dalavil SSSI



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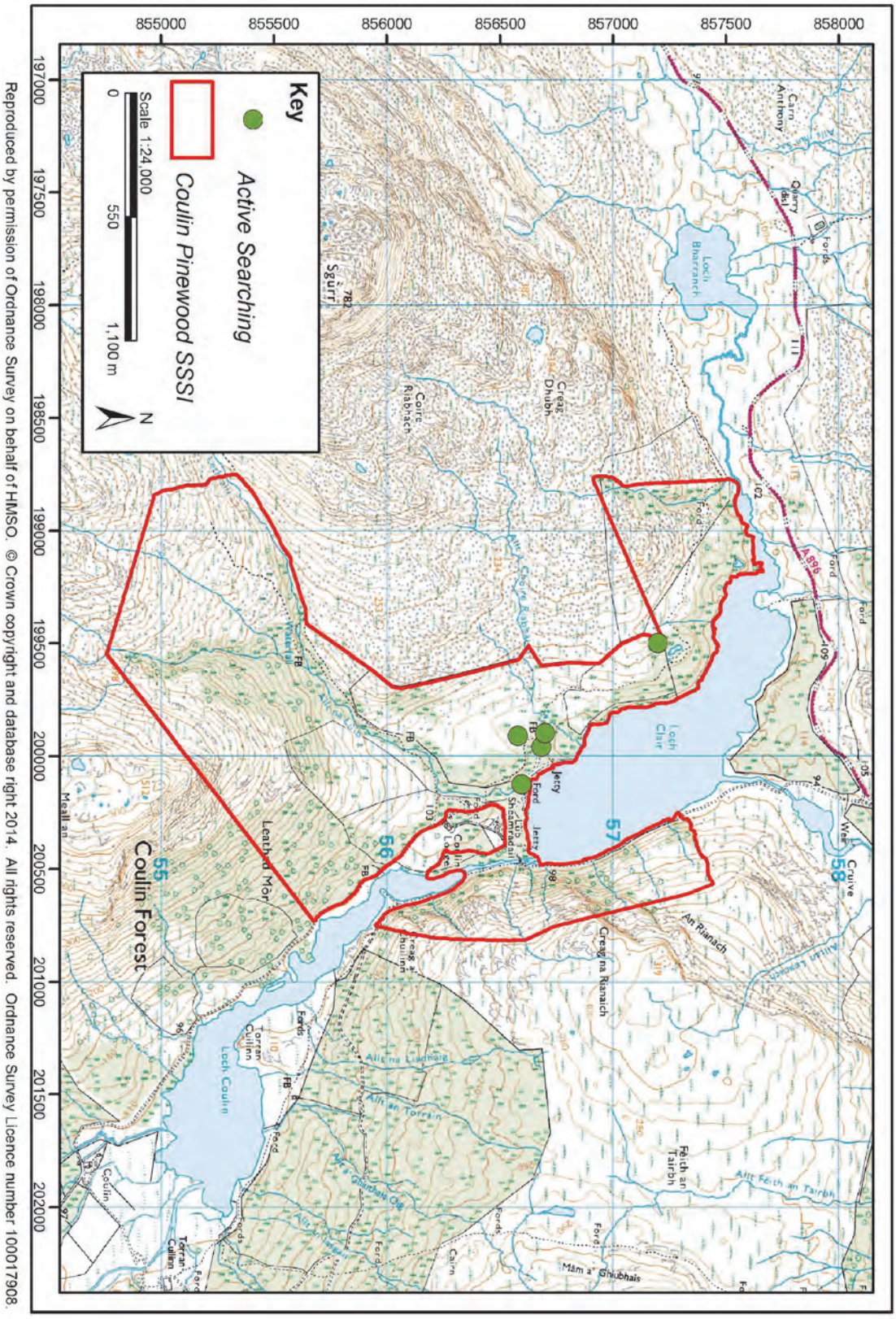
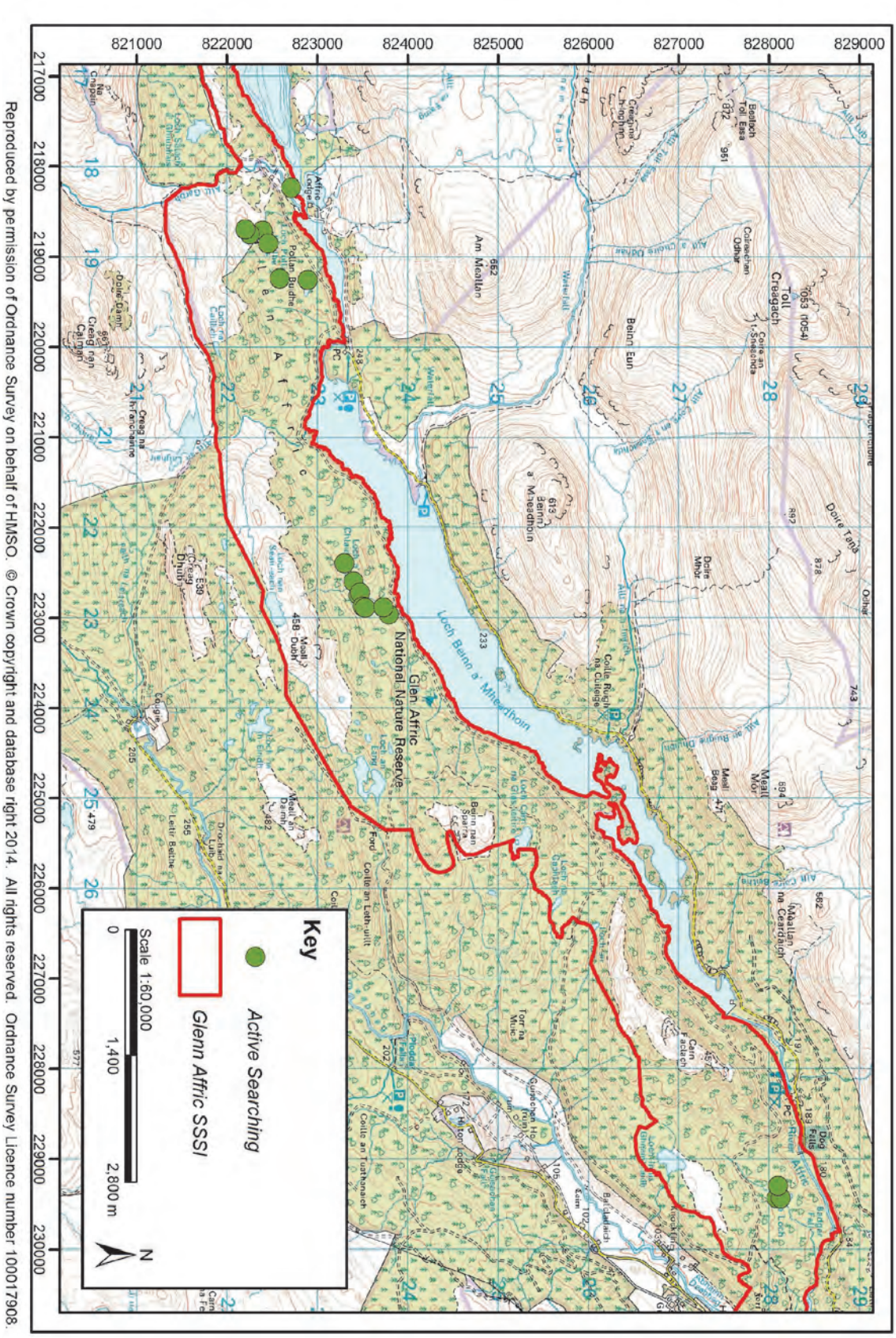
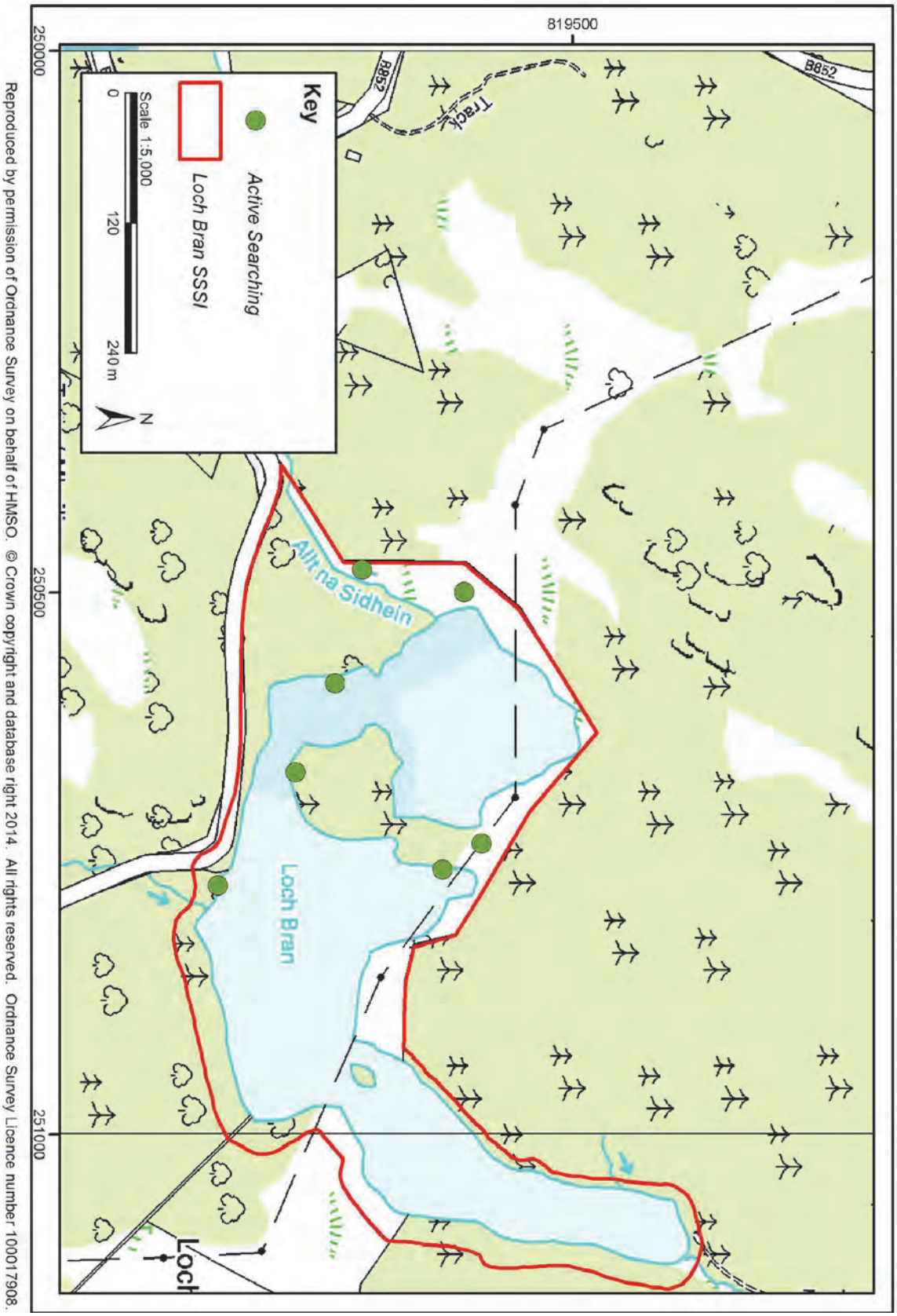
Map 3. Odonata survey sites in Coille Mhor SSSI



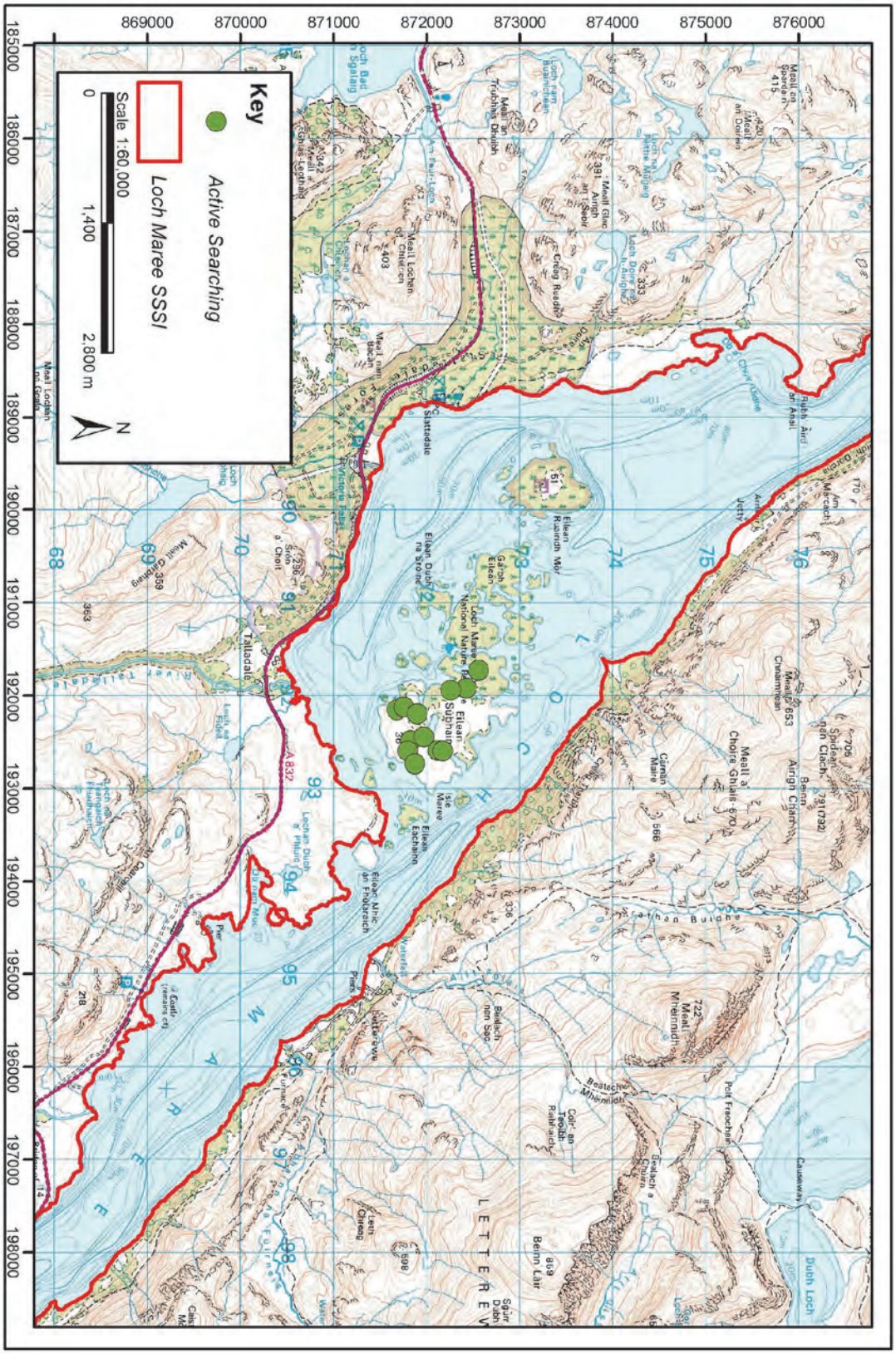
Map 4. Odonata survey sites in Coulin Pinewoods SSSI



Map 5. Odonata survey sites in Glen Affric SSSI



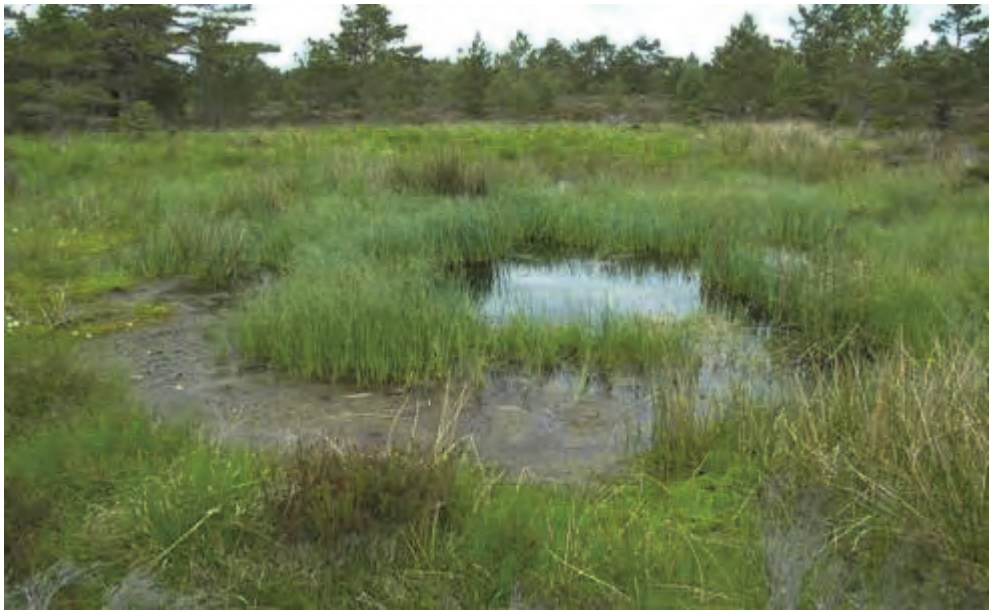
Map 6. Odonata survey sites in Loch Bran SSSI



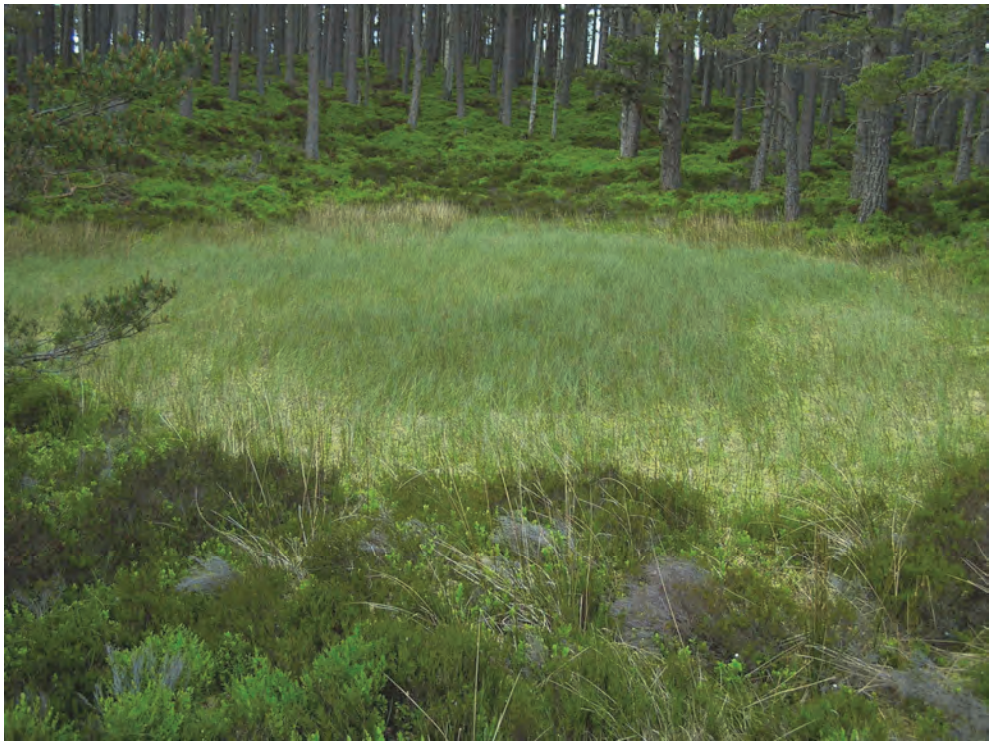
Map 7. Odonata survey sites in Loch Maree SSSI

ANNEX 2. SITE PHOTOGRAPHS

1. Abernethy



1.1 Abernethy Dell Woods NJ009185



1.2 Pond 1.5 km north of Ryvoan Bothy NJ009131

1.3 Caravan pond NH966193

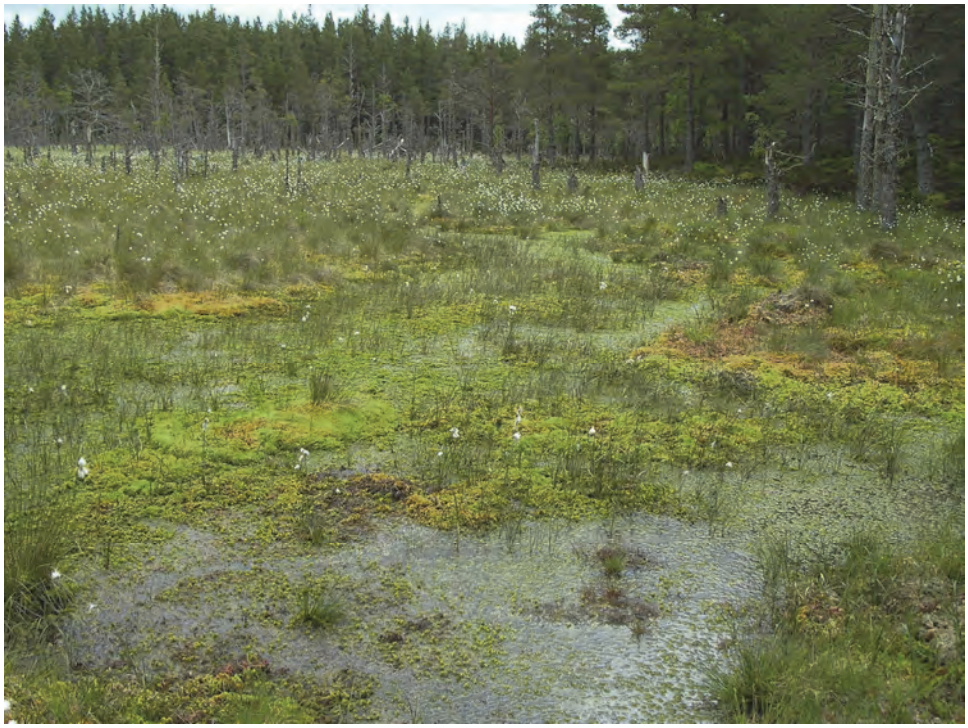
1.4 Alden Lodge pond NH954191

1.5 East Croftmore NH959195

1.6 Ridge pool NH966182

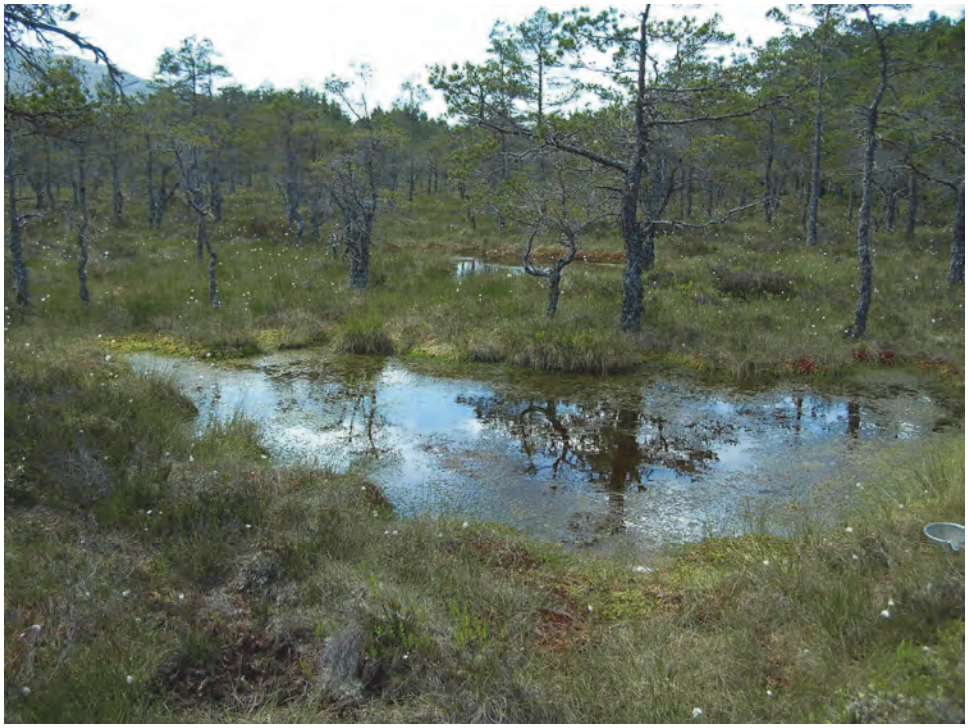
1.7 Mid-Garten Wood marsh NH962183

1.8 Mullingarroch farm marsh NH953181



1.9 Mullingarroch forest bog NH9630718264

1.10 Leucorrhinia *pool NH982175*



1.11 Gate House wood centered around NH980172

1.12 Loch Mallachie-Loch Garten ditch/drain NH967173

1.13 Lochan a'Chait NJ0068711621

1.14 Tulloch Moor lochans NH961163

1.15 Tulloch Moor peat cuttings NH959168

1.16 Pylon line – Garten wood NH953184

1.17 Layby pool NJ0048512925

1.18 Pine tree pool NJ0264212751

1.19 Dragonfly loch NJ0357612729

2. Coille Dalavil

2.1 Orthetrum coerulescens *runnel south NG592051*

2.2 Allt a'Ghlinne NG5819905242

2.3 Orthetrum coerulescens *runnel north NG5812705495*

2.4 Loch a'Ghlinne NG5932805563

2.5 Pool at east end of Loch a'Ghlinne NG6004005550

2.6 "Overmature" female Orthertrum coerulescens *NG5813605449*

3. Coille Mhor

3.1 Lochside NG8080830916

3.2 Bog area NG8110430446

3.3 Clearing NG8099830487

3.4 Male golden-ringed dragonfly NG8111530415

4. Coulin Pinewood

4.1 Lily Loch west NG999567

4.2 Lily loch east NG999567

4.3 Kidney pond NG995572

4.4 Bog pools north of the Lily lochs NG9996056685

5. Glen Affric

5.1 Pollan Buidhe 'mires' NH191227

5.2 Loch Pollain Buidhe NH189224

5.3 Unnamed loch NH1925722891

5.4 Loch a' Chlaidheimh 'small bog' NH22972379

5.5 Loch a' Chlaidheimh 'mires' NH22902349

5.6 Loch a' Chlaidheimh NH226234

5.7 Sphagnum *pools in the inflow to Loch a' Chlaidheimh NH228235*

5.8 Coire Loch NH293281

5.9 Sphagnum *pools west of Coire Loch NH293281*

6. Loch Bran

6.1 Loch Bran trampled bank NH505192

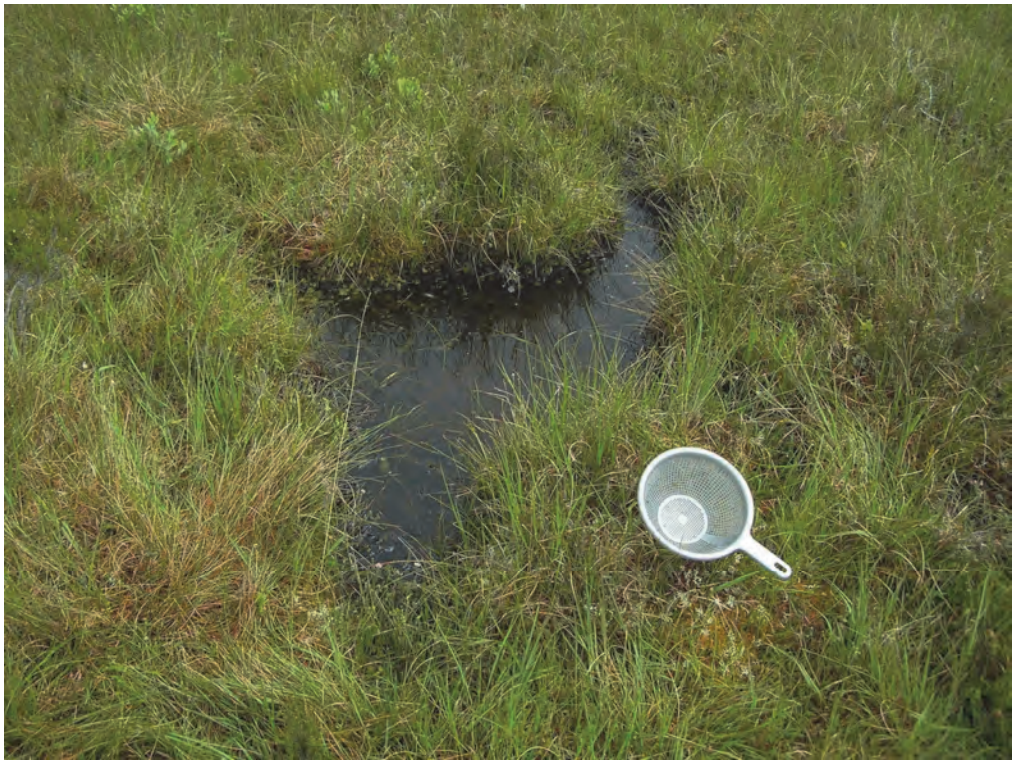
6.2 Loch Bran NH5058419281

6.3 Loch Bran NH505194

6.4 Loch Bran NH5060219270

6.5 Loch Bran NH5075619380

7. Loch Maree



7.1 Somatochlora arctica *pool NG9215971679*

7.2 Easternmost loch NG921718

7.3 Westernmost loch NG917725

7.4 Dragonfly bay bog pools NG926721

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