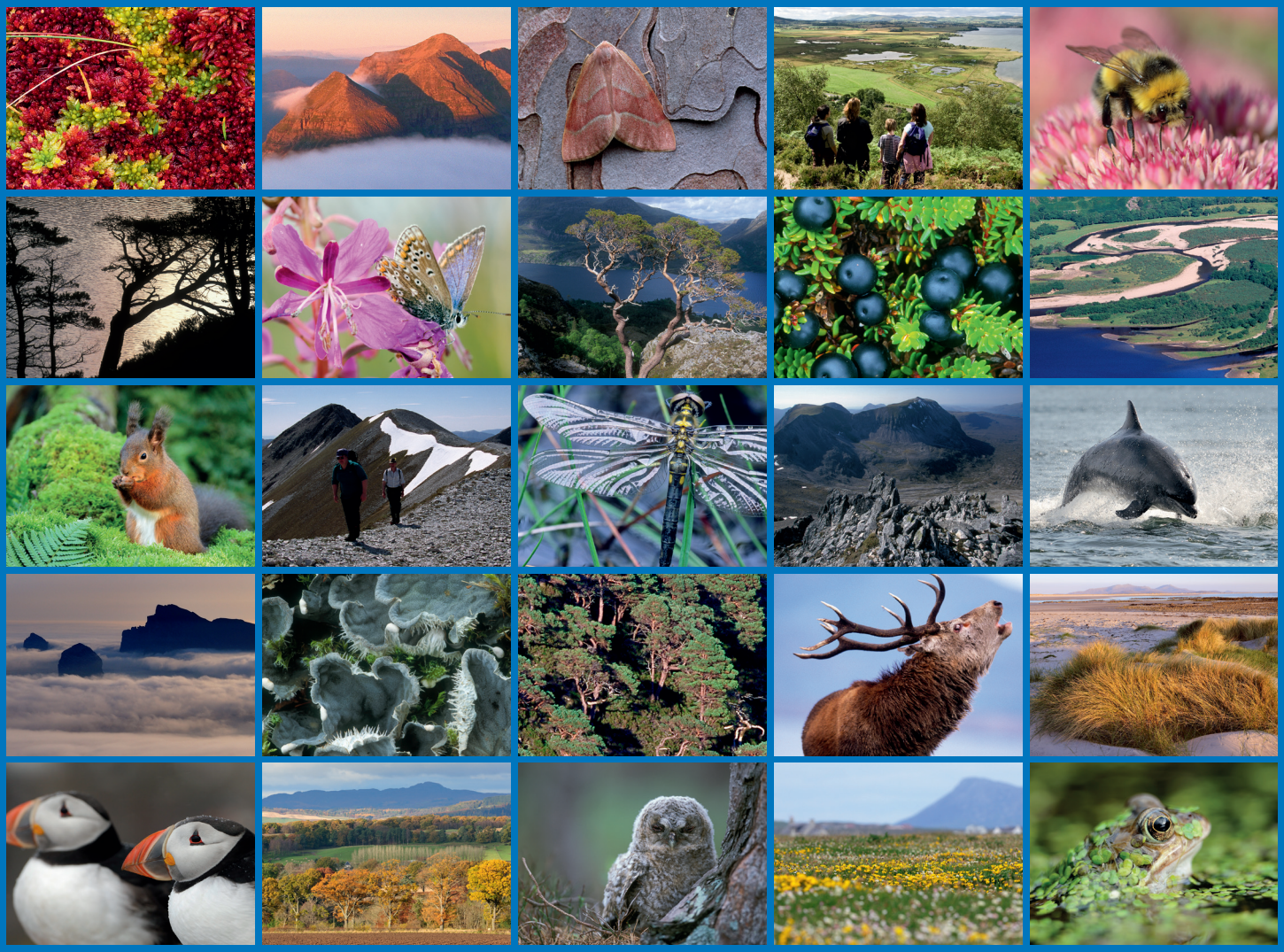
Scottish Natural Heritage
Commissioned Report No. 1007

A revision of invertebrate features of designated sites in Scotland



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COMMISSIONED REPORT

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A revision of invertebrate features of designated sites in Scotland

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COMMISSIONED REPORT

Summary

A revision of invertebrate features of designated sites in Scotland

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assemblages; invertebrates; notified features; qualifying features; site condition monitoring; SSSI

Background

Sites of Special Scientific Interest (SSSI) are designated on the basis of notified features. For invertebrates, notified features range from individual species, through assemblages of a specific taxon, to the overall invertebrate assemblage. For a variety of reasons, the invertebrates' notified features do not always reflect the currently established criteria for selecting such features for site protection and designation purposes. In some cases, citations are based on old records that may now be considered unreliable whilst in others, the records do not demonstrate that the species or assemblages are of sufficient quality to meet the criteria.

The objective of this project was to revise and update the list of all 241 invertebrate features of SSSIs in Scotland, covering 158 SSSIs. For each feature, an assessment was made as to whether it was a qualifying feature under current guidelines, whether the feature could be better defined, and, if it is a qualifying feature, how it should be monitored for site condition monitoring purposes. Assessments were also made of whether there were any invertebrate features that were qualifying features, but not represented in the notified features.

The outputs of the project should not be read as guidance for revising SSSI citations, but instead as guidance to help prioritise and implement field programmes for SCM purposes.

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1. INTRODUCTION

1.1 Project justification

Sites of Special Scientific Interest (SSSI) are designated on the basis of notified features, which may be particular habitats or vegetation types, species or geological features. For invertebrates, notified features range from individual species, through assemblages of a specific order (e.g. beetles) to the overall invertebrate assemblage. The primary criteria for notification of individual species and assemblages are 'typicalness' (species that are characteristic of an ecosystem in the 'Area of Search', and also the best examples available), fragility, population size, diversity, naturalness and rarity (Bainbridge *et al*., 2013). For a variety of reasons, the invertebrate notified features do not always reflect the currently established criteria for site protection and designation purposes. In some cases, citations are based on old records that may now be considered unreliable whilst in others the records do not demonstrate that the species or assemblages are of sufficient quality to meet the criteria.

The objective of this project was to review all 241 invertebrate features that are notified features of SSSIs in Scotland, covering 158 SSSIs. For each feature, an assessment was made of whether it was a qualifying feature under current guidelines (Bainbridge *et al*., 2013), whether the feature could be better defined and, if it is a qualifying feature, how it should be monitored for site condition monitoring (SCM) purposes. Assessments were also made of whether there were any invertebrates that were qualifying features but which were not represented among the notified features. The overall purpose of the project was to provide information to be used alongside citations in order to develop more accurate, coherent, rational and useful prescriptions for SCM.

1.2 Project outcomes

It was agreed with SNH staff that, for each SSSI with invertebrate species or assemblages listed as notified features, there should be three main outcomes. First, an assessment should be made as to whether the notified feature meets current criteria for a qualifying feature. Second, an assessment should be made, where appropriate, of the definition of the qualifying feature to determine if it could be more appropriately described (such as by broadening the species to assemblages or by combining features across different invertebrate orders into a single ecologically coherent assemblage). Third, a recommendation was to be made about how the qualifying features identified could best be monitored for SCM purposes.

1.3 Limits of project coverage

The project covers SSSIs that have invertebrate notified features, thus no assessment was made as to whether invertebrate features on other SSSIs could be qualifying features.

The project did not take account of invertebrate features in citations for other statutory designations such as Special Areas of Conservation, although in some cases these overlap with SSSIs.

Finally, the outputs of the project should not be read as guidance for revising SSSI citations, but instead as guidance to help prioritise and implement field programmes for SCM purposes.

2. METHODS

2.1 Resources used

A series of documents, referred to as Invertebrate Site Reviews (ISR), was available for 150 of the 158 sites covered in this report. These documents were written in 2003 by SNH staff for internal use, and comprise assessments of monitoring that were deemed appropriate for SCM together with comments from the late Dave Phillips, then Invertebrate Policy Officer with SNH. Most ISR documents include lists of species recorded from the site that had been extracted from the Invertebrate Site Register. These included the year of recording (where known) and the rarity status at that time. It should be noted that the Invertebrate Site Register has since been shown to contain a significant number of inaccuracies and errors (see section 2.3). Some ISRs included data from other data sets, such as file notes from visits by entomologists or extracts from national species group data sets. The degree of coverage of these species lists varied significantly between sites and none could be regarded as comprehensive. The main limitations of these species lists are sometimes poor data quality and inconsistencies in the degree of recording. This might be a particular issue, for example, for saproxylic species, which are typically difficult to locate and for which results from single visits may not accurately represent habitat quality.

SCM reports and, in a few instances, reports from other invertebrate monitoring on SSSIs, were also made available by SNH. In most cases, these reports resulted from contracts issued by SNH. Other publications were widely consulted. These included books, national and regional distribution atlases, online reports, notes in entomological periodicals and scientific papers. The only comprehensive reviews of Red Data Book for invertebrates are Shirt (1987), which covered the insects, and Bratton (1991), which covered invertebrates other than insects. These are now superseded by more recent reviews for many invertebrate groups, but both the original and subsequent reviews were referred to.

Online resources (in addition to downloadable reports) were used where appropriate especially, for example, to access up-to-date distribution information for moths (http://www.eastscotland-butterflies.org.uk/mothflighttimes.html). The National Biodiversity Network Gateway was used occasionally to source specific information, though time limitation did not permit a comprehensive review of the species records for each site. If such an exercise was carried out to incorporate evidence from national recording schemes, undoubtedly further invertebrate records would be revealed to strengthen existing evidence of qualifying features, though this would be a very significant undertaking.

All information sources cited were viewed directly by the author unless otherwise stated.

2.2 Status and threat definitions

The description of the rarity status of species has evolved considerably in recent years. At the time of Shirt (1987), Bratton (1991) and the ISRs, Red Data Book species were sub-divided into RDB1 (Endangered), RDB2 (Vulnerable), RDB3 (Rare), RDBI (Indeterminate) and RDBK (Unknown). All species found in 15 or fewer hectads in Great Britain were assigned to one of these categories. Nationally Scarce species was a lower status class, sometimes subdivided into Nationally Scarce A (species found in 16 to 30 hectads in the UK) and Nationally Scarce B (31 to 100 hectads in the UK). These Nationally Scarce categories are sometimes referred to as Nationally Notable, and abbreviated Na and Nb, respectively. 'Local' species occupy 101 to 300 hectads, and those found in over 300 hectads were classed as 'Common'.

More recent reviews have used refined definitions based on IUCN criteria for level of threat. Species can be assigned to any of the following threat categories: Regionally Extinct, Critically Endangered, Endangered, Vulnerable, and Near Threatened. There are also categories of Least Concern for species that do not fall into any of the threat categories, and

Data Deficient and Not Evaluated categories. In some reviews, species that are not classed as threatened but still meet the Nationally Scarce criteria are listed. For a fuller explanation of the categories and how they are applied, see, for example, Hubble (2014). It should be noted that the threat categories do not correspond neatly to the Red Data Book categories. For the sake of this review, categories of Regionally Extinct to Near Threatened are regarded as being of broadly equal importance to the Red Data Book categories although some species, based on the knowledge of their distribution and status, will meet the threshold for inclusion under one system but not the other.

In carrying out these reviews, the status listed in the ISRs were the initial sources used. At sites where a large number of Rare and Scarce species were listed, these are summarised by order and by status categories. Where individual species are then discussed, more recent rarity or threat categories, when available, are referred to in the text. In most cases, this concerns species formerly included in one of the Red Data Book categories that, due to an increase in knowledge of their distributions, have later been classed as Nationally Scarce. In some instances, SCM reports have pointed out species whose statuses have been revised in the opposite direction. However, comprehensive checks were not made of all species, and it is possible that the status of some have been elevated to a Red Data Book or threat category.

Throughout this review, the capitalised word, 'Rare', is used specifically to refer to species listed in Red Data Book categories 1 to 3 and 'Scarce' to species categorised as either Nationally Notable A or Nationally Notable B. 'Nationally Scarce' is used alternatively where either this follows on from terminology used in the citation or else it refers to an order of invertebrates for which this terminology is used in the most recent review. For example, for beetle status, Hyman & Parsons (1992, 1994) refer to species as Nationally Notable A and Nationally Notable B, following the designations therein. On the other hand, Falk & Crossley (2005) referred to flies, where relevant, as being Nationally Scarce. In all cases, the original source reference should be consulted for clarity on status definitions.

2.3 Criteria used for assessing qualifying features

The guidelines for determining what is a qualifying feature in selection of SSSIs are given by Bainbridge *et al*. (2013). Precise criteria for invertebrates based on distribution, abundance or threat level are impossible to establish due to the relative lack of such information for most species. For most invertebrate groups, general principles are given such that the highest priority should be given to species classed as Rare (Red Data Book species). Nationally Scarce species should, where possible, also be represented in the SSSI network in each Area of Search. More specific criteria are given for the best recorded invertebrate groups, butterflies and dragonflies.

The criteria appear to support more strongly the selection of SSSIs for some of the better recorded groups (e.g., butterflies, macro-moths, grasshoppers and crickets, ground beetles, water beetles and hoverflies). The implication is that for taxa where status information is less known, stronger cases for selection must be made.

The criteria do not describe how an important assemblage should be defined and this, therefore, requires some interpretation. Here, Red Data Book species are considered to be qualifying features where there are recent, apparently substantiated, records. Wherever possible, species were deemed to be qualifying features as part of assemblages, either taxonomically-based or ecologically-based. Where single species were classed as qualifying features, greater evidence of their presence was required. In some cases, the review recommends surveys to establish the status of a species. Old records were treated with less importance than recent records though no fixed date was used for defining recent records.

In some cases, the review refers to a feature as probably being a qualifying feature because of criteria interpretation. For others, information was insufficient for complete status assessments but their conservation importance was nonetheless apparent. Taking a precautionary approach, these cases were regarded as being qualifying features. For a few features, it was simply not possible to make any assessment based on the information available.

In carrying out the review, discrepancies between literature sources sometimes became apparent. It is widely acknowledged that the Invertebrate Site Register contains a number of errors. In some cases, records of Red Data Book species are listed in the ISR but are not referred to in national reviews of species groups. Where this was significant for a specific assessment, such discrepancies were mentioned in the review. Further apparent errors in former records are described in some of the SCM reports and, again, are referred to in the review where they were significant for the assessment. It is likely, though, that some erroneous records listed in the ISRs and deriving from the Invertebrate Site Register are repeated in this report.

2.4 Recommendations for monitoring

The decision to recommend direct monitoring for one or more species, or indirect monitoring by assessment of habitat quality and quantity for species or assemblage, was generally based on how practical it is to locate species during a necessarily time-limited visit. Some species are difficult to locate because they are cryptic and difficult to identify whereas others might have just a very narrow time window in which their life stages are most easily found. Others live at low population densities. SCM reports were used to aid assessment of species or assemblages that are most readily located through direct searches. Saproxylic insects in particular account for significant numbers of Rare and Scarce species in citations and ISRs but are not regularly recorded during monitoring visits. In such cases, regular monitoring over many years may turn up some species only occasionally, and failure to find them is usually not very informative about the status of the species.

At some sites, it was recommended that direct and indirect methods of monitoring be combined. For example, where a species is dependent on a single food plant, searches for the species will inevitably focus first on locating the host plant. An assessment of food plant resources can be made at the same time as direct searches for the species, so that even if the species is not located, a statement can be made about habitat resources.

It is important to note that recommendations for indirect monitoring for SCM purposes should not be taken as an indication that direct species surveys should not be carried out or facilitated. In the absence of direct species surveys, occurrence data will become increasingly outdated whilst indirect monitoring may be based on ecological information that itself is flawed. Only by carrying out periodic surveys at a site can future assessments of qualifying features be made with any degree of confidence.

2.5 Layout of site reports

The individual site reports, which include citations and notified feature information, are available through the SNH Sitelink website (https://gateway.snh.gov.uk/sitelink/). The citation texts consist of entire paragraphs containing specific information on invertebrate features. This means than in some cases the information is not entirely relevant to invertebrate interests, but citing whole paragraphs avoids the selection of individual sentences out of context. The citation texts were not edited to fit with this report style, or to correct errors.

The Discussion is usually laid out to consider the notified features in turn. If a feature is, for example, a beetle species, any additional beetles that might warrant consideration for

inclusion within a qualifying feature are then discussed. In some instances, there may be a case for defining ecological assemblages across orders rather than taxonomic assemblage. Taxa of potential importance listed in the ISR or elsewhere but which do not form part of a notified feature are then generally considered later in the Discussion.

Summary tables are included for sites with large lists of Rare or Scarce species. These tables display species by Order and rarity status given in the ISR. In some cases, status updates from more recent reviews are referred to in the Discussion.

In Recommendations, I discuss: a) whether each notified feature currently meets the criteria for being a qualifying feature; b) suggest re-definitions such as assemblages being qualifying features rather than individual species; c) whether a feature should be monitored directly or indirectly; and d) where appropriate, recommend focussing monitoring on specific species or habitats.

Throughout the site reports, scientific names are given in full at the first mention for each site and then abbreviated on subsequent mentions within the account for that site. In a few instances, the full scientific name may be used on a subsequent mention such as where two species appear to have the same name when the abbreviated form is used or where revisions to taxonomy or spelling corrections are being discussed. Scientific names are also retained in their full form when they are listed in the notified features, even if already mentioned in the SSSI citation excerpt. Vernacular names are used for butterflies, macro-moths and dragonflies, with scientific name in parentheses at first mention within each site report. These names follow Agassiz *et al*. (2013) and Cham *et al*. (2014). For all other taxa, scientific names only are used, except where a widely accepted English name is used in the SSSI citation, in which case it is used in preference elsewhere in the site report.

3. SITE ASSESSMENTS

3.1 Abbey Burn Foot to Balcary Point

3.1.1 SSSI citation (reviewed 27 November 2009)

"There is considerable invertebrate interest particularly around Balcary Point and Rascarrel Bay. Records include rare or local species of butterfly Northern Brown Argus *Aricia artaxerxes*, Forester Moth *Adscita statices* and the woodlouse *Armadillidium pulchellum*, as well as a diverse range of grasshoppers, beetles and spiders, with a number of species at or near their northern limit in the British Isles."

3.1.2 Notified invertebrate feature(s)

Biological: Invertebrates: Woodlice.

3.1.3 Discussion

The woodlouse *A. pulchellum* is listed in the ISR as having been recorded in 1991. It was found to still be present during an Isopoda SCM visit in 2003 (Lee, 2003). At that time, it had been recorded in 86 10-km squares in Britain and is thus too widely distributed to be considered as a qualifying feature. Although the site may have regional importance for its woodlouse fauna (Lee, 2003) this also does not merit a qualifying feature status. Maintenance of the notified habitat, maritime cliff, in a favourable condition may be sufficient to ensure habitat quality for most Isopoda species.

Two insects are listed in the citation though do not form part of the notified feature. The forester moth has a Local status (Waring & Townsend, 2003) and therefore is not a candidate for qualifying feature. The northern brown argus butterfly occurs primarily in the eastern Highlands, southern Scotland and northern England. It suffered an estimated 27% decline in range between 1976 and 2014 (Fox *et al*., 2015). According to JNCC guidelines, up to five sites in an Area of Search (AOS) containing substantial proportions of colonies of this species can be qualifying features (Bainbridge *et al*., 2013). The Stewartry AOS is indeed important for the species (Fox *et al*., 2006a). However, at the time of compilation of the ISR, the species had not been recorded since 1997. Thus there is insufficient evidence that this species is a qualifying feature.

3.1.4 Recommendations

The woodlouse assemblage is not a qualifying feature.

3.2 Abbey Craig

3.2.1 SSSI citation (reviewed 2 November 2009)

"The site also supports an outstanding fauna of beetles. These include the Red Data Book (RDB) species *Ptinella limbata* and the Nationally Scarce beetle *Phyllodrepoidea crenata*, both of which are saproxylic species living under dead wood, in fungi on dead wood, and in sap runs. Other beetles include the Nationally Scarce flower beetle *Oedemera femoralis* known only from this site in Scotland."

3.2.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.2.3 Discussion

The citation previously stated that “The wood supports a number of beetle species which are occurring near the northernmost limit of their British range”. This was revised in 2009 to the current text, which makes specific mention of three species. The RDBK species, *P. limbata*, is found under bark of various dead broadleaved trees and conifers, particularly in old forest areas (Alexander, 2002; Hyman & Parsons, 1994). Although listed in the ISR, it is also noted there as requiring confirmation. *P. crenata* is also a saproxylic species that is found under the bark of a range of dead or dying trees. It has a Nationally Scarce B status (Hyman & Parsons, 1994) though is thought to be relatively common in Scotland (Alexander, 2002). The date of the most recent record at Abbey Craig is unknown. Neither *P. limbata* nor *P. crenata* were found during saproxylic beetle surveys on the site in 2003 (Eyre, 2003a). None of the species listed on the citation were found in 2015, although their habitat was considered suitable (Cathrine *et al*., 2017a).

The origin of the record for the third species mentioned in the citation, *O. femoralis*, is not clear. It is not listed in the ISR. *O. femoralis* was classified (under the name *Oncomera femorata*) as Nationally Notable B, with a comment that it was noted in the past from southern Scotland (Hyman & Parsons, 1992). This may refer to an Abbey Craig record. A Scarce status is not, in itself, justification for a qualifying feature, and there is no evidence that this species is part of a wider assemblage with similar broad ecological requirements. However, if Abbey Craig can indeed be confirmed as the sole Scottish site for the species, the significance of the record may be elevated.

Results from SCM surveys in 2003 were interpreted as appearing to “reflect a rather impoverished saproxylic beetle fauna” (Eyre, 2003a). Taken with the undated and unverified nature of the sole Rare species record from the site, the evidence of importance of the site for saproxylic species may be insufficient. Saproxylic beetles are usually difficult to survey, especially during short visits, so it would be necessary to view results over several surveys to assess the importance of the site.

3.2.4 Recommendations

The beetle assemblage refers primarily to the saproxylic assemblage. It is not clear whether this is a qualifying feature.

3.3 Abernethy Forest

3.3.1 SSSI citation (reviewed 16 December 2009)

"In addition, Abernethy is amongst the most important invertebrate sites in Scotland. It is rich in scarce or rare invertebrates characteristic of the native pinewoods including species of flies such as the pine hoverfly *Blera fallax*, spiders such as *Dipoena torva*, ants such as the Narrow-headed ant *Formica exsecta*, and moths such as the Cousin German *Protolampra sobrina*. Over 400 species of beetle such as *Atomaria badia*, *A. hislopi* and *A. ornata* have been listed for the area, many of which are indicators of ancient woodland. The dragonfly assemblage includes rare species such as the Northern Damselfly *Coenagrion hastulatum*, White-faced Darter *Leucorrhinia dubia* and the Northern Emerald *Somatochlora arctica* which breed in the forest mires and lochans."

3.3.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Invertebrate assemblage.
	Invertebrates:	Beetle assemblage.
	Dragonflies:	Dragonfly assemblage.

3.3.3 Discussion

Abernethy Forest is long recognised as a site of major importance for rare and scarce invertebrates. Considerable effort has been put into recording over the years, and this has produced an impressive species list, with nine RDB1 species, 14 RDB2 species and 39 RDB3 species (Table 1).

Table 1. Red Data Book species listed in the Invertebrate Site Review.

	RDB1	RDB2	RDB3	RDBI	RDBK	Notable A	Notable B
Araneae		4				1	1
Coleoptera	1	1	9	15	5	22	71
Diptera	5	5	26	2	1	1	37
Hemiptera	1						4
Hymenoptera	1	1	1				2
Lepidoptera	1		2			3	7
Mollusca							1
Odonata		1	1			1	1

Table 1 shows clearly that species recognised as Rare or Scarce are dominated by beetles and flies. Among these are a large number of saproxylic species, including some that have been the focus of conservation effort, most notably the pine hoverfly (e.g., Rotheray, 2010; Rotheray & Rotheray, 2012). Fowles *et al*. (1999) assessed saproxylic beetle assemblages at 56 UK sites, and ranked Abernethy as the sixth richest site and the best in Scotland. A wide range of species and assemblages could be regarded as qualifying features, but there are clearly benefits from regarding the whole saproxylic invertebrate assemblage as a qualifying feature. Indirect monitoring of dead wood quality and quantity should be the primary focus of routine SCM visits. However, direct searches should also be carried out in order to maintain knowledge of saproxylic species in the long term.

The dragonfly assemblage was monitored for SCM purposes in 2002, when ten species were recorded, including northern damselfly, which was formerly a notified feature in its own right, and the white-faced darter (Edgar, 2002). Both are classed as endangered (Daguet *et al*., 2008). SCM in 2013 produced records of 11 species, with breeding evidence for ten of them, again including the northern damselfly and the white-faced darter (Willet, 2014). In mainland Scotland, a dragonfly assemblage must comprise at least nine species to be a qualifying feature (Bainbridge *et al*., 2013). The figure for Abernethy Forest SSSI clearly exceeds this threshold.

In addition to the saproxylic species and dragonflies, there remains a long list of Rare invertebrates. These include species with a wide range of ecological requirements. For example the spider *D. torva*, found in only eight British hectads since 1992, occurs in deep fissures in the bark of Scots pine (*Pinus sylvestris*) (Dawson *et al*., in prep). The narrow-

headed ant, an endangered species (Falk, 1991a), is found more in woodland edges and has specific requirements of light, vegetation and tree cover (Stockan *et al*., 2010). The moth *Pammene luedersiana* has the highest conservation designation, pRDB1 (Davis, 2012). This species feeds as a larva on bog myrtle (*Myrica gale*) and so is found in more open situations (Bradley *et al*., 1979). Given the wide range of niches within the site and the different species habitats, it would be difficult to define narrow ecological assemblages without omitting some species that would clearly be qualifying features in their own right. However, to assist with directing of SCM activities, the invertebrate assemblage can be subdivided simply into those associated with broad categories of broadleaved woodland, Caledonian pinewoods and woodland edge/bog habitat. Direct monitoring should focus especially on some of the species that can be reasonably expected to be located through field sampling. A selection of species within each of the categories should be targeted including, where practical, those with the highest conservation status. For Caledonian pine woods, these could include especially the spiders, such as the RDB1 species *Clubiona subsultans,* which was readily found during SCM in 2013/14 (Cathrine *et al*., 2015), along with *Haplodrassus soerenseni*, *D. torva* and *Pelecopsis elongata*. In broadleaved woodland, targets for monitoring could include the cousin German moth. In forest edge and bog habitats, monitoring targets could include the narrow-headed ant and the moths *P. luedersiana* and Kentish glory (*Endromis versicolora*).

3.3.4 Recommendations

The Invertebrate assemblage as a whole is clearly a qualifying feature. However, for monitoring purposes, if can be divided into species associated with Caledonian pine wood, broadleaved woodland and woodland edge/bog habitats. Direct monitoring should focus on selected Rare or Scarce species for each broad habitat.

The beetle assemblage is better regarded as a saproxylic invertebrate assemblage, including both beetles and flies. A combination of indirect and direct monitoring should be employed.

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.4 Ailsa Craig

3.4.1 SSSI citation (reviewed 25 July 2008)

"The insect assemblage within the site includes the nationally rare blowfly (*Calliphora uralensis*) a species associated with the carrion derived from the islands breeding bird colonies. Ailsa Craig is believed to be the most southerly point in the range of this species. The island also supports the nationally scarce ground beetle (*Agonum gracilipe*) on the steep bare scree slopes to the east of the island."

3.4.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Flies.

3.4.3 Discussion

Although the notified feature refers to flies, the citation explicitly names one species, the blowfly *C. uralensis*, which is classed as RDB3 (Falk, 1991b). It is not clear if this species has been found since the 1983 record. However, indirect monitoring was carried out in 2011

by way of an assessment of resource availability, namely fresh seabird carcasses. There was a plentiful supply of fresh corpses and also dead rabbits (*Oryctolagus cuniculus*) and it was suggested that the species was unlikely to be at threat at the site (Wilkinson, 2011). Given the specific requirements of this species and their relative scarcity at other sites in the Area of Search, the site is thought to be the most important in the Area of Search, thus this species is a qualifying feature. Indirect monitoring is appropriate for establishing the continued presence of suitable resources for *C. uralensis*. However, given the lack of information of recent records, it would be desirable to carry out a direct survey for the species to confirm its presence.

The ground beetle *A. gracilipe* was recorded between 1976 and 1978. It is not clear if this refers to one or more records. The status of this species in the UK is uncertain and it has been suggested that the pattern of records is more consistent with it being a vagrant rather than an established resident (Nash, 1983). As such, Ailsa Craig would not be an important location.

3.4.4 Recommendations

The blowfly *C. uralensis* is a qualifying feature. Monitoring should primarily be by way of indirect assessment of larval food resources but a survey would also be desirable to establish the current status of the species.

The ground beetle *A. gracilipe* is not a qualifying feature.

3.5 Airds Park and Coille Nathais

3.5.1 SSSI citation (reviewed 1 December 2010)

"Marsh fritillary butterfly is present on the site. Significant areas of suitable habitat, with an abundance of devil's bit-scabious, can be found in the many glades and open areas that are distributed across the site. In combination with the surrounding area, Airds Park and Coille Nathais supports one of the largest and most important meta-populations of marsh fritillary in the Lorn area."

3.5.2 Notified invertebrate feature(s)

Biological: Butterflies: Marsh fritillary (*Euphydryas aurinia*).

3.5.3 Discussion

No SCM or associated documents were available. The citation states that there are significant areas of suitable habitat for the marsh fritillary (*Euphydryas aurinia*) with an abundance of the larval food plant, devil's-bit scabious (*Succisa pratensis*). Additionally, the Site Management Statement (dated 2010) stated that "In combination with the surrounding area, Airds Park and Coille Nathais supports one of the largest and most important meta-populations of marsh fritillary in the Lorn area", although it also stated that the feature was classed as Unfavourable – No Change in October 2006. Up to five marsh fritillary sites should be considered for protection through the SSSI network in an Area of Search that is important for the species (Bainbridge, *et al*., 2013). The Lorn Area of Search is one of four in Scotland that are especially important; in absence of evidence that alternative sites are of greater importance, marsh fritillary should continue to be regarded as a qualifying feature at Airds Park and Coille Nathais SSSI.

The site Management Statement also reports the presence of the butterflies purple hairstreak (*Neozephyrus quercus*), small pearl-bordered fritillary (*Boloria selene*) and dark green fritillary (*Argynnis aglaja*). The first two are listed in JNCC guidance as species for which two sites with the strongest colonies in the Area of Search should be considered for protection within the SSSI network (Bainbridge *et al*., 2013). There may be merit in considering the butterfly assemblage as a whole, rather than specifically marsh fritillary, to be a qualifying feature. However, the species all have different broad habitat requirements and do not all overlap in optimal timing for carrying out fieldwork, so this would be unlikely to be efficient for SCM assessments. Furthermore, the purple hairstreak is probably significantly under-recorded due to its elusive nature whilst the small pearl-bordered fritillary is relatively widespread in the area (Fox *et al*., 2006a), so demonstrating the particular importance of the site for these species may be challenging.

3.5.4 Recommendations

Marsh fritillary is a qualifying feature and should be monitored directly. Monitoring should involve direct counts of adults or the conspicuous larval tents in which larvae aggregate.

3.6 Alvie

3.6.1 SSSI citation (reviewed 17 November 2009)

"This site is important for the variety of scarce invertebrate species that it supports, including flies, beetles, butterflies and moths. Many of these invertebrates are aquatic or require wet conditions in at least part of their life-cycle and they are therefore associated with the fen habitats. Others are associated with aspen woodland, bog and river shingle habitats. Notable species include the endangered net-winged caddis fly *Hagenella clathrata* which is at its most northerly known location in the UK, a snail-killing fly *Pherbellia brunnipes*, a beetle *Olophrum fuscum*, the aspen hoverfly, *Hammerschmidtia ferruginea* and a true fly *Microprosopa pallidicauda* which in Scotland has only been found in Strathspey."

3.6.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.6.3 Discussion

The ISR lists 16 species of invertebrate classified as Rare. These comprise 13 species of flies and one each of caddisfly, beetle and snail.

The caddisfly, *H. clathrata*, is referred to as net-winged caddis fly in the citation but is also known as window-winged sedge. It is an RDB1 species (Shirt, 1987). It was found at Kinrara (which appears to be at or just outside the edge of the SSSI) in 1967, recorded again in 1968, but has not been found since (Wallace, 2011). Unsuccessful searches for the species were made in 2004, which was acknowledged to have been made outwith the main flight period (Godfrey, 2004), and in 2013 (Cathrine *et al*., 2015). In Scotland, the species has been recorded solely at two Speyside sites and at a site in Wigtownshire (Wallace, 2011). If it remains extant within Alvie SSSI, it clearly is a qualifying feature in its own right and should be monitored following guidelines given in Littlewood & Stockan (2013).

The beetle *O. fuscum* is named in the citation but as a Local species, it cannot be a qualifying feature in its own right. The RDB3 water beetle *Donacia aquatica*, which is also a UK BAP Priority Species, has a stronger claim on being a key element within a qualifying

feature. This species is listed in the ISR as having been recorded in 1982 and it was found again during SCM work in 2013 (Godfrey, 2004).

The RBD1 aspen hoverfly has been found in 1982 and was recorded again in 1990 when five or more larvae and two puparium were found (Rotheray & MacGowan, 2000). The species has been recorded from just nine UK hectads since 1985 (Ball *et al*., 2011) with the core of the population being in Speyside. It also appears to be a qualifying feature in its own right.

The snail-killing fly *P. brunnipes*, was recorded in 1990. This wetland species is classed as Nationally Notable and is distributed widely through Britain (Falk, 1991b). The fly *M. pallidicauda* is an RDB3 species which appears to be a Speyside speciality and has been recorded at Alvie in 1976 and 1986. The fly *Symballophthalmus pictipes* is also listed in the ISR as RDB1, but it has since been reclassified as Nationally Scarce (Falk & Crossley, 2005).

Whilst records of remaining RDB species span a long period, with a number apparently having not been recorded for over 30 years and, in the case of the fly *Laphria flava*, since 1933, the invertebrate assemblage is clearly a qualifying feature. Two habitats stand out for special attention. Firstly, a number of Rare species are either aquatic or are species of water edges, including the flies *Tipula bistilata*, *Thereva valida*, *Tipula nodicornis* and *Tipula marginata,* and the mollusc *Vertigo lilljeborgi*. These could be combined with *H. clathrata* and *D. aquatica* as key features of an aquatic assemblage for direct monitoring for SCM purposes. Secondly, the fly *L. flava* is saproxylic on Scots pine (*Pinus sylvestris*) and could, along with the aspen hoverfly, be regarded as elements of a saproxylic invertebrate assemblage. Saproxylic species are often difficult to locate during brief visits, so indirect monitoring of dead wood may be more instructive, though direct monitoring of aspen hoverfly is appropriate.

Whilst the above two assemblage categories cover the primary habitats at Alvie, other species are not so easily covered, such as the RDB2 fly *Eudorylas terminalis*, which is a parasite of Cicadellidae leafhoppers. Recognition of the importance of the invertebrate fauna as a whole is important and direct species surveys should be carried out where possible.

3.6.4 Recommendations

The invertebrate assemblage is a qualifying feature. Direct monitoring should be carried out where possible but with a particular focus on wetland species. The aspen hoverfly should be monitored directly but indirect monitoring may be more appropriate for other elements of the saproxylic assemblage.

3.7 Ardgour Pinewoods

3.7.1 SSSI citation (reviewed 30 September 2008)

"The pinewoods also support a nationally important assemblage of beetles, which includes the rare beetle *Bolitophagus reticulates* and the beetle *Cetonia cuprea*, a species for which part of its life cycle is dependent upon colonies of wood ants, which are widespread within the woods.

Within and adjoining the woodlands are extensive areas of heath and blanket bog, often with scattered trees or stumps indicating former woodland. These have created suitable habitat for a number of insect species including the nationally scarce chequered skipper *Carterocephalus palaemon* butterfly which is primarily a woodland edge species."

3.7.2 Notified invertebrate feature(s)

Biological:	Butterflies:	Chequered skipper (*Carterocephalus palaemon*).
	Other invertebrates:	Beetles.

3.7.3 Discussion

The chequered skipper, which is classified as endangered (Fox *et al*., 2010), has been present at Ardgour Pinewoods since at least 1973. The site lies within the South Lochaber Area of Search, one of four that encompasses the whole UK range of this species. JNCC guidance for chequered skipper is that the five strongest colonies in each Area of Search qualify for selection through the SSSI network (Bainbridge *et al*., 2013). Although sites in the Area of Search have not been formally ranked for such assessment, collation of past records shows a concentration around the northern boundary of this site whilst monitoring of butterfly transects in 2012-14 shows continued presence of this species (Prescott, 2015). As such, the chequered skipper should continue to be regarded as a qualifying feature. Direct monitoring should continue.

Bolitophagus reticulatus (incorrectly referred to in the citation as *Bolitophagus reticulates*), a saproxylic beetle, was formerly considered as RDB3 but its status has been revised to Nationally Scarce (Alexander *et al*., 2014). It was found to be present during SCM fieldwork in 2015 (Cathrine *et al*., 2017a). A range of further Scarce beetles have been found during recent surveys. These are overwhelmingly saproxylic species, with *Xylita laevigata*, *Diacanthous undulatus*, *Scolytus ratzeburgi* and *Pytho depressus* all being found during SCM 2010 (Telfer, 2011). The latter species along with *Malthodes guttifer*, *Rhagium inquisitor* and *Dendrophagus crenatus* had previously also been found in 2003 (Eyre, 2003a). Additionally, there are records of the Scarce species *Hylecoetus dermestoides* (most recent 1977) *Dictyoptera aurora* (1973) and *Acanthocinus aedilis* (1977).

The RDB3 beetle *Ropalodontus perforatus* was recorded in 2010 (Telfer, 2011). This is another saproxylic species, and is found in brackets of the fungus *Fomes fomentarius* on birch (*Betula*). In the UK, it is recorded solely from Scotland (Alexander, 2002). Although it might warrant being a qualifying feature in its own right, given the assemblage of saproxylic beetles, *R. perforatus* is better considered as a key part of that assemblage, which should itself be regarded as a qualifying feature.

Cetonia cuprea, specifically referred to in the citation, was not found during a survey in 2011. However this species is associated with wood-ant nests and the 2011 survey concentrated on parts of the site away from where wood-ant nests are likely to occur (Telfer, 2011). *C. cuprea* is a Nationally Scarce species so does not warrant being regarded as an additional qualifying feature.

3.7.4 Recommendations

Chequered skipper is a qualifying feature. Direct monitoring should continue.

The beetle assemblage, specifically the saproxylic beetle assemblage, is a qualifying feature. Monitoring should be through a combination of direct and indirect methods.

3.8 Ardmeanach

3.8.1 SSSI citation (reviewed 31 March 2010)

"The UK population of the slender Scotch burnet moth *Zygaena loti* is confined to the islands of Mull and Ulva, with the largest colonies occurring at the Burg on the Ardmeanach

peninsula. Colonies of the moth are found on south and south-westerly facing short calcareous grassland."

3.8.2 Notified invertebrate feature(s)

Biological: Invertebrates: Slender Scotch burnet moth (*Zygaena loti*).

3.8.3 Discussion

The slender Scotch burnet is an RDB3 moth found, in the UK, solely on the islands of Mull, Ulva and Gometra. Within these areas, the Ardmeanach peninsula holds the most significant population (Prescott *et al*., 2016a). Considerable monitoring and conservation work has been carried out under the Species Action Framework including, on the Ardmeanach peninsula, bracken control and grazing management through the Rural Priorities scheme of the Scotland Rural Development Programme (SRDP) (Prescott *et al*., 2016a).

3.8.4 Recommendations

The slender Scotch burnet should continue to be regarded as a qualifying feature in its own right. This day-flying moth is conspicuous, so direct monitoring is appropriate.

3.9 Ardura – Auchnacraig

3.9.1 SSSI citation (reviewed 18 February 2010)

"Saltmarsh showing a transition from pioneer marsh to upper marsh occurs within the Auchnacraig section of the SSSI and is notable for the very extensive transition from upper marsh to wet grassland and stream-flushed vegetation in An Gleannan. Within this transition, extensive areas of acidic marshy grassland occur with calcareous flushes supporting important communities of invertebrates including the rare marsh fritillary butterfly *Eurodryas aurinia*."

3.9.2 Notified invertebrate feature(s)

Biological: Butterflies: Marsh fritillary butterfly (*Eurodryas aurinia*).

3.9.3 Discussion

The ISR states: “this SSSI holds the great majority of records [of marsh fritillary] from the Mull Coll & Tiree AOS”. JNCC guidelines suggest up to five sites should be protected for the species through the SSSI network (Bainbridge *et al*., 2013), and this is one of four Areas of Search that are especially important for marsh fritillary in Scotland. With increased knowledge of the status of this species accrued through Species Action Framework work (Prescott *et al*., 2016b), it is now less clear if this concentration of records actually relates directly to the relative importance of the population. However, the Site Management Statement shows that the species remains one of the objectives for management of the SSSI and that the feature was assessed as Favourable – Recovered in 2006.

Five other Scarce Lepidoptera are listed in the ISR though none warrant direct monitoring in their own right. These species do not represent a particularly remarkable assemblage for this relatively well-studied invertebrate group.

3.9.4 Recommendations

The marsh fritillary should continue to be regarded as a qualifying feature and monitored directly.

3.10 Arran Northern Mountains

3.10.1 SSSI citation (reviewed 28 January 2011)

"The invertebrate interest within the site includes dragonflies and water beetles. Many of the mires and lochans have good dragonfly communities, particularly Loch a' Mhuilinn in which nine species have been recorded out of the ten which occur in the site. The other species, the keeled skimmer *Orthetrum coerulescens* has been found in Glen Iorsa, its only known station in Ayrshire and Arran. Of the lochans, those on Clachan and An Tunna are of most interest for water beetles with three Nationally Scarce species being recorded, including *Dytiscus lapponicus* which is at the southern limit of its Scottish range in this site."

3.10.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

Biological: Invertebrates: Beetle assemblage.

3.10.3 Discussion

The ISR lists ten dragonfly species on the SSSI. A SCM visit in 2002, focussed on Glen Iorsa, produced records of nine species, with a tenth recorded just outside the site. Breeding evidence was found for five of these species (Anon., 2003). The ten species were again recorded during SCM visits in 2010 with breeding evidence for nine species (Batty, 2011). The species recorded include keeled skimmer, which although classed as Least Concern by Daguet *et al* (2008), is locally distributed in Scotland (Cham *et al*., 2014). Dragonflies can be a qualifying feature across most of Scotland if at least nine species are present (Bainbridge *et al*., 2013). This figure is exceeded at Arran Northern Mountains SSSI, with a particular concentration in Glen Iorsa.

The citation refers to three Nationally Scarce water beetle species. *D. lapponicus* is named individually, a species classed as Near Threatened (Foster, 2010a). A SCM visit in 2003 focussed on five boreal and montane water beetle species; *Hydroporus morio*, *Stictotarsus multilineatus, Ilybius aenescens*, *D. lapponicus*, and *Gyrinus minutus* (Eyre, 2003b). In addition to *D. lapponicus*, two of these species, *S. multilineatus* and *G. minutus*, are classed as Nationally Scarce (Foster, 2010a). On this visit, 21 species of water beetle were recorded, taking the total for the site to 38 species. Species recorded included *H. morio*, *I. aenescens*, *D. lapponicus* and *G. minutus*. A SCM visit in 2010 produced records of 18 species (Foster, 2010b), including *I. aenescens* and *D. lapponicus*. Following the 2010 visit, a list of 31 water beetle species was presented. It is not clear why this list is shorter than that presented following the 2003 visit but it may be that it refers to a smaller area within this large SSSI.

Although the number of species recorded from this site is fewer than at most other sites for which the water beetle assemblage is a qualifying feature, this may simply reflect the more

exposed upland nature of the location. One Near Threatened species has been repeatedly recorded, and the assemblage includes a distinct northern element. It is therefore appropriate to continue to regard beetles, specifically the water beetles, as a qualifying feature. Direct monitoring is appropriate with previous SCM visits providing a baseline from which changes to the assemblage can be assessed.

3.10.4 Recommendations

The dragonfly assemblage is a qualifying feature and should be monitored directly.

The beetle assemblage, specifically water beetles, should be regarded as a qualifying feature and monitored directly.

3.11 Avenel Hill and Gorge

3.11.1 SSSI citation (reviewed 15 June 2010)

"The green hairstreak butterfly occurs here at one of only three post-1960 Border localities, finding suitable food source plants, including gorse and blueberry, in the open woodland habitat."

3.11.2 Notified invertebrate feature(s)

Biological: Invertebrates: Green hairstreak (*Callophrys rubi*).

3.11.3 Discussion

Green hairstreak is widely distributed in England, Wales and Scotland, although Scottish records south of the Central Belt are sparse (Fox *et al*., 2006a). This species lost 30% of its UK range between 1976 and 2014 (Fox *et al*., 2015). As a declining species, the green hairstreak can be a qualifying feature at two sites with the strongest colonies in each Area of Search (Bainbridge *et al*., 2013). Avenel Hill & Gorge SSSI lies within the Ettrick and Lauderdale Area of Search for which just a single hectad was mapped for the species by Fox *et al*. (2006a). Green hairstreak is, indeed, very local in the Scottish Borders as a whole (Prescott, 2015). It has been recorded intermittently at Avenel Hill & Gorge SSSI since 1985, although it was not found between 2002 and 2008. Two surveys in 2013 produced records of three and nine adults respectively on the SSSI and six just outside the boundaries on the second visit. Whilst it is not clear if this is indeed one of the two strongest colonies in the AOS, regarding it as such would be a precautionary approach, particularly in view of recent evidence of presence. The species is less conspicuous than some other butterflies but adults can be located easily enough in suitable conditions.

Guidelines for SSSI selection, when referring to declining butterflies such as the green hairstreak, recommend that, where possible, sites selected should also support colonies of some nationally rare and scarce species. Four of the six invertebrates listed as Scarce in the ISR are also Lepidoptera though only one, *Dahlica lichenella*, is retained as Scarce (Nationally Notable A) in the most recent review (Davis, 2012). Thus, on available evidence, the butterfly and moth assemblage as a whole are insufficiently important to be a qualifying feature.

3.11.4 Recommendations

The green hairstreak should be regarded as a qualifying feature as a single species and monitored directly.

3.12 Barry Links

3.12.1 SSSI citation (reviewed 5 November 2010)

"The peninsula consists of blown-sand showing all of the classic elements of coastal dune succession, with the full range of characteristic plant communities. These communities are relatively undisturbed, and support a large number of vascular plant species. In the damp dune slacks the site has also supported a number of rare mosses and liverworts including Warne's thread-moss *Bryum warneum*. There is an extensive range of invertebrates including beetles, moths and butterflies, flies and spiders; they include notable species such as the shore spider *Dictyna major*, the stiletto fly *Dialineura anilis*, and the small blue butterfly *Cupido minimus*."

3.12.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.12.3 Discussion

The RDB2 spider *D. major* is the species assigned to the highest rarity category in the ISR, and it was recorded in 1991 and 1992. This spider inhabits sandy coasts and has been found in eastern Scotland, from Lothian to Moray, but with no recent reliable records at the time of Bratton (1991). It was not found during a SCM visit in 2003 when the contractor reported that there was relatively little strandline material on which the species is often located (Lee, 2004). It was also not recorded during SCM visits in 2011, when the same observation about lack of strandline material was made (Kirkland *et al.*, 2012). It may be that the habitat has become unsuitable for the species but it has also been noted that SCM visits in 2003 and 2011 were made later in the year than might be optimal for finding *D. major*. If extant, the species will be a qualifying feature in its own right and direct monitoring should be attempted at the optimal time of year to confirm its presence.

The fly *D. anilis* has one 1977 record in the ISR. It is an RDB3 species, found on sand dunes mainly in Wales and east Scotland (Falk, 1991b). No SCM data relevant to this species were available to this review. Given that Barry Links provides one of the largest areas of potentially suitable habitat in the Area of Search, it may be a qualifying feature in its own right, though lack of recent information may make direct monitoring challenging.

The small blue butterfly is a UK Priority Species that, in the UK, is found mainly in southern England but also in scattered areas elsewhere, including eastern Scotland. It has lost 44% of its UK range between 1976 and 2014 (Fox *et al*., 2015). Eggs of small blue were found at five locations during an evening SCM visit in 2011 (Kirkland *et al.*, 2012). Direct searches of adults, larvae or eggs should be straightforward.

The ISR lists records of a two further Rare species. One is the beetle *Sphaerites glabratus*, an RDB3 species (Hyman & Parsons, 1992). The species is associated with conifers and attracted to sap runs (Kirkland *et al.*, 2012). It was recorded at Barry Links in 1990. SCM visits in 2011 did not locate the species although suitable habitat was noted. The other Rare species (undated) is the weevil *Miarus plantarum*, an RDBK species for which Hyman & Parsons (1992) list known localities solely in the south of England, and north to south-west

Yorkshire. In absence of further information, this species should be regarded as requiring confirmation at Barry Links.

Given that there is a range of species from several invertebrate orders that are potentially qualifying features in their own right, it is appropriate to regard the invertebrate assemblage as a whole as a qualifying feature. *D. major*, *D. anilis* and small blue all occupy sand dune or associated strandline habitats and, together, could be regarded as the key species within a more focussed qualifying feature of sand dune invertebrates, for which a mix of direct and indirect monitoring could be carried out.

3.12.4 Recommendations

The invertebrate assemblage is a qualifying feature. The sand dune invertebrates are of primary importance.

Direct monitoring should be carried out of small blue and attempted at the optimal time of year (May) for *D. major*. Other species should be monitored indirectly by habitat features.

3.13 Beinn Eighe

3.13.1 SSSI citation (reviewed 1 December 2010)

"Diverse habitats spread over a broad altitudinal range support diverse invertebrate communities, including the nationally scarce argent & sable moth *Rheumaptera hastata* and the nationally scarce pearl-bordered fritillary *Boloria euphrosyne* butterfly and at least other 14 threatened species. The 13 species of dragonfly and damselfly comprise a nationally important assemblage that includes the nationally rare northern emerald *Somatochlora arctica*. Also of note are the nationally rare moth species *Plutella haasi*, *Aethes rutilana* and *Udea uliginosalis* and several saproxylic beetles and flies, including species restricted to Caledonian pinewood such as the hoverfly *Calilcera rufa*."

3.13.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.13.3 Discussion

This is a large SSSI with a variety of habitats covering a range of altitudes. It is not surprising, therefore, that a wide range of invertebrates has been recorded including, up to 1999, 100 species that were regarded as Rare or Scarce.

An assessment made by David Phillips in 1999 (memo to David Miller, unpublished) provides a suitable basis for defining the key elements of the Beinn Eighe invertebrate assemblage. That assessment defines assemblages under a range of habitat sub-headings. Much of the information below is summarised from the memo, citing the species with RDB status at the time that it was compiled:

<u>Caledonian Pinewoods – saproxylic species</u>

This assemblage includes the pRDB1 fly *Medetera excellens*, pRDB3 flies *C. rufa* and *Xylophagus cinctus* and the RDB3 fly *Chamaesyrphus scaevoides*. *C. rufa* is named in the citation though was not found during SCM fieldwork in 2013 (Alexander, 2013a).

Living Pine Trees

The assemblage includes the RDB3 beetle *Pissodes validirostris* and the pRDB3 sawflies *Diprion simile* and *Microdiprion pallipes*.

Litter Layer

Larvae of the pRDB3 dagger fly *Platypalpus tuomikoskii* are thought to live in the soil or under moss. The status of this species has now been downgraded to Nationally Scarce (Falk & Crossley, 2005).

Other Woodlands – saproxylic species

The beetle *Bolitophagus reticulatus* and fly *Mycetophila lapponica* were the RDB species assigned to this category. A large number of the invertebrates that fall within this category at Beinn Eighe are specifically associated with birch (*Betula*).

Other Woodland – folivores

No RDB species were assigned to this category but the pearl-bordered fritillary which is referred to in the citation, falls within it.

Other Woodland - litter layer

Six Rare or Scarce species are listed under this category, including the RDB3 cranefly *Tipula alpina*. The authenticity of this record is questioned, though, by Phillips. It is not mentioned by Falk (1991b) or Stubbs (1992), both of whom refer solely to a scatter of records in England.

Bogs

Among ten Rare and Scarce species listed for this habitat are the RDB3 northern emerald dragonfly (dragonflies are considered separately below) and the RDB3 cranefly *Tipula grisescens,* which Stubbs (1992) maps from 14 upland hectads in England, Wales and Scotland, though not from Beinn Eighe.

Freshwater – upland pools

This group comprises five Scarce species, four beetles and a spider.

Other open freshwater

Three Scarce beetles are listed in this category.

Semi-aquatic species

As well as two Scarce beetles and a Scarce fly, this group includes an RDB cranefly, *Orimarga virgo*. This species, which is found in seepages, is recorded from a wide area, though with relatively few recent records (Falk, 1991b).

Species of Exposed sediments

Five beetles and four flies are listed for this category, including the RDB3 ground beetle *Bembidion virens*.

Grassland

Four RDB species are among the 11 Rare and Scarce species listed. These include the RDB3 sawflies *Pachynematus smithiae* and *Pachynematus torridonensis*, the RDB3 slender-striped rufous moth (*Coenocalpe lapidata*) and the RDB2 tortricoid moth *Aethes rutilana*. The latter species feeds as a larva on Juniper (*Juniperus communis*).

Montane – predators

Thirteen species are listed in this category, including 11 Scarce and two RDBK species. These latter two are the beetle *Stenus glacialis* and the fly *Spilogona alpaca.*

Montane folivores

Two Scarce species are listed along with the RDB3 beetle *Phyllodecta polaris*. In addition, the presence of the moth *Plutella haasi*, is recognised. This is a pRDB1 species (Davis, 2012) for which a 1954 record from Beinn Eighe was, until 2009, the sole British record. In that year, five adults were found at Beinn Eighe and larvae were found there and at three further locations on northern rock-cress (*Arabidopsis petraea*) (Heckford, 2011).

Moorland

Six Scarce moths and one notable beetle are listed in this category.

The invertebrate assemblage is clearly a qualifying feature. Among the above categories, the saproxylic assemblage of pinewoods as well as assemblages associated with Living Pine Trees, Other Woodland, Bogs, Freshwater, Grassland, Montane and Moorland exceed importance criteria for the SSSI network and they should each be regarded as being qualifying features in their own right. Monitoring should, therefore, focus on assemblages associated with these habitats.

Dragonflies (13 species) are listed on the citation as a distinct notified feature. No relevant SCM documents were available, but, assuming the figure to be correct, it exceeds JNCC criterion of nine species required (Bainbridge *et al*., 2013). As such they should be monitored directly as a feature in their own right.

3.13.4 Recommendations

The saproxylic assemblage of pinewoods and invertebrate assemblages of Living Pine Trees, Other Woodland, Bogs, Freshwater, Grassland, Montane and Moorland all reach the criteria to be qualifying features. Monitoring should focus on these assemblages.

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.14 Ben Heasgarnich

3.14.1 SSSI citation (reviewed 14 January 2011)

"The site is notified for the Dipteran flies *Clinocera nivalis* and *Dolichopus maculipennis*, which are boreal moorland species. Uncommon and rare fly species recorded for the site also include *Delia piliventris*, *Hydrophorus rufibarbis* and *Hydrophorus albiceps*.

The site is notified for the Red Data Book (RDB) sawfly (Symphyta) *Pachynematus arcticus*. Other common or notable species recorded include *Dolerus aeneus*, *Pontania viminalis* and *Pristiphora staudingeri*."

3.14.2 Notified invertebrate feature(s)

Invertebrates: Flies, Sawflies.

3.14.3 Discussion

The first named fly species in the citation, *C. nivalis*, was formerly classed as RBD3 (Shirt, 1987) and later defined as Near Threatened (Falk & Crossley, 2005). Within the UK, *C. nivalis* is restricted to the Scottish Highlands from where Horsfield & MacGowan (1997) list records from eleven 10-km squares. This species is associated with bryophyte springs and flushes and all records are from between 850 and 1300 m altitude. Although only recorded on Ben Heasgarnich in 1932 (by Edwards, 1933), the remote nature of the species' habitat

and potential inefficiency of trapping methods (Horsfield & MacGowan, 1997) imply that this species may still be realistically searched.

The fly *D. maculipennis* was formerly classed as RDB2 (Shirt, 1987) and then as Near Threatened (Falk & Crossley, 2005). Within the UK, it is restricted to the Scottish Highlands from where it is known from 23 records in ten hectads (Horsfield & MacGowan, 1997). The Ben Heasgarnich record was a single female swept from rough grassland at 950 altitude in 1981 (Nelson, 1984).

Three further flies are mentioned in the citation. The status of *D. piliventris* is unclear. *H. rufibarbis* was classed as RDB2 by Shirt (1987) though downgraded to Nationally Scarce by Falk & Crossley (2005), with 60 records from 33 hectads (Horsfield & MacGowan, 1997). *H. rufibarbis* is an upland species, found mainly at peat pools between 420 m and 1020 m altitude (Horsfield & MacGowan, 1997). The status of *H. albiceps* is unclear and it is not listed by Falk & Crossley (2005). It appears to replace *H. rufibarbis* at lower altitudes (Horsfield & MacGowan, 1997).

Given the occurrence of Rare and Scarce species, the fly assemblage is a qualifying feature. Although specific searches were not carried out, the site was deemed to be in favourable condition for the notified feature following indirect monitoring in 2011 (Wilkinson, 2011). As these upland fly species are challenging to find, future monitoring may best be focussed on indirect monitoring of habitat resources, though direct surveys should be carried out periodically in an attempt to confirm the presence of the key species.

The sawfly listed in the citation as *Pachynematus arcticus* is now known as *Pristicampus arcticus* (Knight, 2006). It is classed as RDB1 and, in Britain, is known only from Scotland (Liston *et al*., 2010). It is a relatively little known species thought to feed as a larva on alpine cinquefoil (*Potentilla cranzii*) (Liston, 1982). This plant occurs in alpine calcareous grassland, which is a notified feature of Ben Heasgarnich. Targeted survey of *P. arcticus* in sub-optimal weather conditions in 2013 found the presumed food plant though failed to locate the insect (Cathrine *et al*., 2015). Liston (1982) described how he found his specimen in 1981 whilst searching on non-grazed ledges and steep-face herb communities; such areas should form the focus for future searches.

D. aeneus is described as “one of the commonest sawflies throughout Britain including many of the islands and even at the tops of our highest mountains” (Benson, 1952) and *P. viminalis* is “very common throughout Britain and Ireland” (Benson 1958). *P. staudingeri*, on the other hand, is a more specialised species, being found in “the arctic alpine zones on the tops of the Grampian Mountains in Perths., Inverness, Aberdeen and Angus” (Benson, 1958).

Although sawflies are relatively under-recorded, given its RDB1 status, *P. arcticus* might be a qualifying feature as a single species, though is better regarded along with *P. staudingeri* and other species recorded as part of a sawfly assemblage. Direct searches, especially for *P. arcticus*, are desirable, although indirect monitoring is likely to be more instructive for SCM purposes.

3.14.4 Recommendations

The most important species of fly at Ben Heasgarnich are montane species, and this assemblage is a qualifying feature. The feature should primarily be monitored indirectly, though direct surveys should be carried out periodically, in particular to seek to confirm the presence of *C. nivalis* and other Rare and Scarce species.

The sawfly assemblage is a qualifying feature. Indirect monitoring should be supplemented with direct searches, especially for *P. arcticus*.

3.15 Ben Lomond

3.15.1 SSSI citation (reviewed 13 August 2010)

"A number of Nationally Rare and Scarce invertebrate species are also known from the site, most notably the beetle *Carabus nitens*, for which Ben Lomond is a stronghold, as well as the mountain ringlet butterfly *Erebia epiphron* and the small pearl-bordered fritillary butterfly *Boloria euphrosyne*."

3.15.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.15.3 Discussion

C. nitens is a Notable B species of heaths and moor (Hyman & Parsons, 1992) that occurs primarily in northern England and southern and central Scotland (Luff, 1998). The species was collected at Ben Lomond in 1984 though it is not known if it has been recorded subsequently. The site ISR does not list any further beetle species.

The mountain ringlet occupies upland and montane mat grass (*Nardus stricta*) grasslands. Within the UK it occurs primarily in the central to south-western part of the Scottish Highlands and also on the Lake District fells (Fox *et al*., 2006a) with records across 46 hectads between 2005 and 2009 (Fox *et al*., 2011). The mountain ringlet is a UK Priority Species and although it is monitored by butterfly transects at some sites, their numbers are insufficient for determining population trends (Fox *et al*., 2011). The species is regularly recorded from Ben Lomond and was found during SCM visits in 2013 (Cathrine *et al*., 2015). JNCC guidance recommends that the three strongest colonies of mountain ringlet in each Area of Search should be considered for protection through the SSSI network (Bainbridge *et al*., 2013). In practice, determining which three colonies are the strongest is problematic but a precautionary approach would be to regard mountain ringlet as an important feature within the invertebrate assemblage, although it also meets the requirements for a qualifying Species as a single species.

The citation for the final butterfly species contains an error in that the common name given, small pearl-bordered fritillary, does not match the scientific name, *Boloria euphrosyne*, which actually refers to pearl-bordered fritillary. The latter species was presumed to be the intended butterfly searched during SCM visits in 2013 and 2014 but no definite evidence of its presence was found. However, as Butterfly Conservation holds no records of pearl-bordered fritillary for Ben Lomond, and small pearl-bordered fritillary (*Boloria selene*) is numerous at the site (Cathrine *et al*., 2015), it may be more likely that the small pearl-bordered fritillary was the intended citation. The small pearl-bordered fritillary is the more widespread of the two species, although underwent a significant population decline during the 1976 to 2004 period (Fox *et al*., 2006a). However, it was nonetheless recorded in 671 hectads across the UK between 2005 and 2009 (Fox *et al*., 2011). JNCC guidance for this species is that two sites within each Area of Search should be considered for selection for protection within the SSSI network (Bainbridge *et al.*, 2013). Although listed in the ISR, the status of the species at Ben Lomond is unclear.

The SSSI citation previously mentioned “a nationally rare sawfly” and this was determined to be *Nematus reticulatus* with a record dating from 1983. Larvae of this species feed on bilberry (*Vaccinium myrtillus*) at elevations above 600 m (Cathrine *et al*., 2015). The species was searched for during SCM visits in 2013 and 2014 with a single adult female found in the latter year (Cathrine *et al*., 2015). Within the UK, the species is confined to Scotland (Liston *et al*., 2010). It was provisionally classed as RDB3 though sawflies are an under-recorded group of insects and its true status remains unclear.

Mountain ringlet and possibly *N. reticulatus* are qualifying features as single species. The mountain ringlet should be monitored directly. *N. reticulatus* should be monitored directly if it can be readily located. Otherwise, indirect monitoring focussing on larval resources may be more appropriate.

3.15.4 Recommendations

The invertebrate assemblage is a qualifying feature. The mountain ringlet and *N. reticulatus* should be monitored directly if possible.

3.16 Ben Lui

3.16.1 SSSI citation (reviewed 11 February 2011)

"The characteristic montane invertebrate fauna of the Ben Lui range has been shown to include at least five Red Data Book species: the moth *Stigmella dryadella* and the flies *Spilogona depressiuscula*, *Limonia stylifera*, *Platycheirus melanopsis* and *Cheilosia chrysocoma*. There are also strong populations of the mountain ringlet butterfly *Erebia epiphron*, which is a BAP species."

3.16.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.16.3 Discussion

The citation names six species that are all montane or upland insects. Further 23 Scarce species are listed in the ISR comprising two moths, seven beetles and 15 fly species.

The Rare micro-moth *S. dryadella,* recorded at Ben Lui in 1984, was formerly considered as pRBD3 (Parsons, 1984) but was reassessed as pRDB1 (Davis, 2012). It feeds as a larva on mountain avens (*Dryas octopetala*) (Heath, 1983). It appears to be primarily an upland species though has been found on the coast in the far north of mainland Scotland (Beavan & Heckford, 2011).

Four RDB flies are listed in the citation. *S. depressiuscula* is classed as RDB3 (Shirt, 1987; Falk, 1991b). It occupies boggy areas (Wilkinson, 2010) and has been reported from Inverness-shire and Perthshire (Fonseca, 1968). *L. stylifera* was classed as RBD3 (Shirt, 1987), which was revised to RDB2, with records from a scatter of sites in Scotland and northern England, mainly from base rich upland flushes (Falk, 1991b). This species was searched for, but not found, in suboptimal conditions as part of SCM in 2003 (Godfrey, 2004). The montane species *P. melanopsis* is classed as RBD3 (Shirt, 1987; Falk, 1991b) and is found in the Scottish Highlands and in the Lake District (Falk, 1991b). *C. chrysocoma* is an RDB3 species associated with broadleaf woodlands in England and Wales and north to Perthshire (Falk, 1991b). These four Rare flies and 15 Scarce flies indicate the site's importance for this group. The fly assemblage could be regarded as a qualifying feature in its own right, though the Rare species differ sufficiently in their habitat requirements and do not form a coherent assemblage in an ecological sense.

The mountain ringlet has been recorded at Ben Lui up to 1999. JNCC guidance recommends that the three strongest colonies of mountain ringlet in each Area of Search should be considered for protection through the SSSI network (Bainbridge *et al*., 2013). In practice, determining which three colonies are the strongest is problematic but a precautionary approach would be to regard the species as being a qualifying feature.

The ISR lists the pRDB rove beetle *Atheta mortuorum* as having occurred in 1974. This is a little known species. Sharp (1869) reported it solely from the southern Highlands at Rannoch 1887and Thornhill while Fowler (1887) reports the species from Tay, Dee, and Solway districts.

With the combination of the fly assemblage, *S. dryadella*, mountain ringlet and a range of Scarce beetles and moths, the invertebrate assemblage is clearly a qualifying feature. The feature is spread over montane, upland and woodland habitats, each of which hosts important species. Given this wide range of requirements of the most noteworthy species, these should primarily be monitored indirectly with a focus on, for example, habitat suitability for *P. melanopsis* in montane areas, *L. stylifera* in upland areas and *C. chrysocoma* in woodlands. Direct monitoring should be carried out of mountain ringlet and could be attempted for *S. dryadella*. Direct surveys should be undertaken periodically to assess the presence of other key species.

3.16.4 Recommendations

The invertebrate assemblage is a qualifying feature. Habitat condition in montane, upland and woodland areas should be monitored indirectly. The mountain ringlet and possibly *S. dryadella* should be monitored directly and periodic direct surveys undertaken for other important species.

3.17 Ben Nevis

3.17.1 SSSI citation (reviewed 29 July 2009)

"The fly assemblage includes six species of 'true' fly that are nationally rare. They are *Dolichopus maculipennis*, *Cheilosia sahlbergi*, *Platycheirus melanopsis*, *Calliphora stelviana*, *Delia caledonica*, and *Spilogona alpaca*. The small mountain ringlet is a nationally scarce butterfly, which on Ben Nevis is at the western edge of its range."

3.17.2 Notified invertebrate feature(s)

Biological:	Butterflies:	Small mountain ringlet butterfly (*Erebia epiphron*).
	Invertebrates:	Fly assemblage.

3.17.3 Discussion

Six Rare flies are listed in the citation. All were recorded in 1989 at least. *D. maculipennis* occurs on Scottish mountains between 600 and 950 m altitude and is classed as Lower Risk (Near Threatened) (Falk & Crossley, 2005). *C. sahlbergi* is classed as RDB2 and occurs between altitudes of 760 to 915 m (Falk, 1991b) though Horsfield & MacGowan (1997) suggested that RDB3 status was more appropriate. *P. melanopsis* is RDB3 and has been recorded from sites in the Central Highlands at between 510 and 1050 m altitude (Falk, 1991b). With records from 25 post-1980 hectads and the under-recorded nature of the areas occupied by the species, it was reclassified as Near Threatened by Ball & Morris (2014). *Calliphora stelviana* is listed in the ISR (under its former name *Calliphora alpina*) as RDB3, though with 17 records from nine hill ranges, Horsfield & MacGowan (1997) suggested that Notable was a more appropriate classification. The fly referred to as *Delia caledonica* is now known as *Heterostylodes caledonicus* (Chandler, 2014) and is listed in the ISR as pRDBK though Horsfield & MacGowan (1997) proposed that this montane grassland species meet RDB2 criteria. The reference in the citation to *Spilogona alpaca* is presumed to be a misspelling of *Spilogona alpica*, listed in the ISR as pRDBK. Having collated just six

records, from five hill ranges, Horsfield & MacGowan (1997) proposed that the species meet RDB2 criteria. SCM fieldwork in 2003 recorded just *P. melanopsis* although the surveyor commented that this simply reflected difficulty in recording these flies rather than an apparent decline of the feature (Godfrey, 2004). A 2010 SCM visit just entailed indirect monitoring but concluded that suitable habitat conditions for the RDB species remained present at the site (Wilkinson, 2010). Further information on the status of the species listed in the citation at Ben Nevis would be desirable, but given the remote terrain and elusive nature of some of the species, this may be difficult. In any case, the assemblage is a qualifying feature. Given challenges in locating the species, indirect monitoring of habitat conditions may be more instructive that direct monitoring though direct surveys should nonetheless be carried out periodically.

Ben Nevis SSSI lies within the North Lochaber Area of Search which is at the north-western edge of the mountain ringlet range (Fox *et al*., 2006a). Ben Nevis has the greatest concentration of records in the Area of Search and "good numbers" were recorded at three sites within the SSSI in 2002 and 2003 (Prescott *et al.,* 2006). Whilst this does not necessarily mean that the site hosts one of the strongest colonies, it should, as a precaution, be regarded as being a qualifying feature and should be monitored directly.

3.17.4 Recommendations

The fly assemblage is a qualifying feature. It should be monitored indirectly for SCM purposes though direct surveys should be carried out periodically. The mountain ringlet butterfly is a qualifying feature and should be monitored directly.

3.18 Black Wood of Rannoch

3.18.1 SSSI citation (reviewed 19 October 2007)

"The canopy consists principally of native pine and birch with typical ground flora communities of acid heath plants. The Black Wood is the most extensive area of relict Caledonian pine forest in Perthshire and an example of the genetically distinct Central group of native pinewoods. It supports a varied range of highland woodland, upland and open water breeding bird species, including several uncommon species. The margins of open water and the shelter of the extensive woodlands provide a variety of conditions which are of value to dragonflies for feeding and breeding. These include an number of rarer species found only in northern Britain, for example the northern emerald *Somatochlora arctica* and the azure hawker *Aeschna caerulea*. Ancient pine and birch trees with dead wood of varying ages, some standing, some fallen, provide niches for a wide selection of other invertebrates: moths, beetles, spiders and flies. This site has the largest number of very rare insects of any Scottish site outwith speyside and is the prime example of the outstanding insect fauna of the Tummel-Garry valley system."

3.18.2 Notified invertebrate feature(s)

Biological: Invertebrates: Dragonfly assemblage.

Invertebrates: Invertebrate assemblage.

3.18.3 Discussion

The invertebrate fauna of Black Wood of Rannoch has long been recognised as outstanding. The ISR lists 39 species that were classed as Rare and 72 that were Scarce. However two of the RDB species, the beetles *Mycetophagus fulvicollis* and *Abdera affinis*, have been

listed in error (Eyre, 2004) and one moth, the dingy mocha (*Cyclophora pendularia*), is probably also an error (Prescott *et al.*, 2006). These are not included in subsequent discussion. The remaining species are summarised in Table 2.

Table 2. Black Wood of Rannoch SSSI Red Data Book invertebrates listed in the Invertebrate Site Review.

	RDB1	RDB2	RDB3	RDBI	RDBK	Notable A	Notable B
Araneae	1	3					4
Coleoptera		3	5	1	3	6	30
Diptera	2	4	9				20
Hemiptera	1						1
Hymenoptera							1
Lepidoptera	2		1			4	3
Odonata			1			1	1
Trichoptera							1

The dragonfly assemblage is a notified feature by itself as the ISR lists records of 11 species including those referred to in the citation, the Near Threatened northern emerald and Vulnerable azure hawker (*Aeshna caerulea* – misspelled in the citation), and also the endangered white-faced darter (*Leucorrhinia dubia*) (Daguet *et al*., 2008). The National Biodiversity Network Gateway shows records of 13 species on or adjacent to the site. Eight species were recorded during SCM carried out in 2002, with breeding evidence noted for five of these (Hewitt, 2002); nine were recorded in 2011 with breeding evidence recorded for eight, including the two species listed in the citation (Willet & Corcoran, 2011). The site continues to meet the qualifying feature threshold for dragonflies and direct monitoring should continue.

Among the remaining invertebrates, beetles and flies clearly dominate Rare and Scarce species. Many will be qualifying features in their own right, and it may be impractical to monitor all. However, using basic ecological information from the ISR, Alexander (2002), van Emden (1954) Hyman & Parsons (1992, 1994), Southwood & Leston (1959) and Stubbs & Falk (2002), some ecologically coherent sub-sets may provide suitable foci for monitoring as detailed below, excepting the ten fungus gnat species.

Saproxylic species account for nine of the Rare species listed in the ISR: the beetles *Ampedus tristis*, *Rhopalodontus perforatus*, *Rhizophagus parvulus*, *Bolitophagus reticulatus* and *Agathidium arcticum*, the flies *Tachypeza heeri*, *Callicera rufa* and *Limonia annulata*, and the Welsh clearwing (*Synanthedon scoliaeformis*). In addition, *Sphaerites glabratus* is associated with dead trees, whilst most of the ten species of Rare fungus-gnat are associated with dead wood habitats (Wilkinson, 2010).

This is an exceptionally rich assemblage, thus Black Wood of Rannoch is considered to be the twelfth richest site out of 56 UK sites assessed for saproxylic fauna (Fowles *et al*., 1999). SCM of saproxylic species in 2003 did not reveal presence of any of the rare species but did confirm presence of *S. glabratus*. The site was considered to be in excellent condition for beetles (Eyre, 2004). On a SCM visit in 2010, again just one rare species, *B. reticulatus*, was recorded (Alexander, 2011). Additional SCM visits in 2010 focussed primarily on indirect assessment of important fly species, many of which are saproxylic. There were suitable habitats to support them. Some trapping was also carried out and whilst a range of Scarce species was recorded, none of the Rare species was found. As demonstrated by the

results of these SCM visits, many saproxylic species are difficult to find, so indirect monitoring, especially the extent and quality of the dead wood resource, may be more instructive for SCM purposes. However, given the richness of the saproxylic fauna, direct surveys for Rare and Scarce species should nonetheless be supported.

Pinewoods (especially old Caledonian Pinewoods) are important to six of the Rare species: *A. tristis, C. rufa* and the spiders *Robertus scoticus*, *Clubiona subsultans*, *Haplodrassus soerenseni* and *Dipoena torva*. Thus these four, at least, can be regarded as key species in a pinewood spider assemblage. SCM focussed on precisely these species in 2003. None was located, though the habitat was thought to remain suitable for all except *H. soerenseni*, which the contractor considered of doubtful presence (Lee, 2004). SCM visits in 2013 did succeed in locating *C. subsultans* but not the other species (Cathrine *et al*., 2015). Given the difficulty experienced in locating the rare species, indirect monitoring may be more appropriate for SCM purposes.

Heath and scrub habitats are important for three species, namely the true bug *Eremocoris fenestratus* and the moths *Apotomis infida* and *Pammene luedersiana*. Direct monitoring may be challenging, though, especially because the moths are very poorly known, and *A. infida* was reported solely in 1919 (Prescott *et al.*, 2006).

Wetland habitats are important for the water beetle *Hydroporus rufifrons* and the rove beetle *Eusphalerum sorbicola*. These do not probably constitute an assemblage as such, at least not one that is important and distinct as the assemblages above, but do demonstrate the need to indirectly monitor a wide range of habitats to encompass the full range of Rare species. This is further emphasised by a range of Rare species utilising a diverse habitats or resources such as living as parasites, inhabiting moss and plant litter or utilising carrion.

3.18.4 Recommendations

Dragonflies are a qualifying feature and should be monitored directly.

The saproxylic fauna is very rich and should primarily be monitored indirectly as a qualifying feature.

The pinewood assemblage, especially pinewood spiders, is a qualifying feature. Indirect approaches may be the most appropriate way of monitoring.

Three Rare species occupy heath and scrub though two especially are hard to locate and indirect monitoring may be the most appropriate approach.

A range of further Rare species will not be covered directly by the above monitoring categories. It is important that indirect monitoring of the site as a whole takes account of the diverse range of habitats and resources utilised.

3.19 Blind Moss

3.19.1 SSSI citation (reviewed 20 December 2007)

"The site has over thirty species of aquatic beetle recorded. Only three other sites in the Scottish Borders have such a high diversity, and none of these are upland sites. One upland aquatic beetle *Hydroporus morio* is known from only one other Scottish Borders moss. Two others, *Hydroporus longicornis* and *H .elongatulus*, are rare British species, the former being found in only 25 other UK sites and the latter from only 10 other sites. *H. elongatulus* is classified as a Red Data Book species."

3.19.2 Notified invertebrate feature(s)

Biological: Other invertebrates: Beetles.

3.19.3 Discussion

The ISR refers to over 30 species of water beetle recorded from the site. These include the Rare *H. elongatulus*, classed as RDB3 (Shirt, 1987) and recently as Vulnerable (Foster, 2010a), which is known from ten areas in nine hectads in southern Scotland and East Anglia (Foster, 2010a). Of the Scarce species, *Enochrus quadripunctatus* and *Chaetarthria seminulum sensu latu* are retained as Nationally Scarce in the latest review, *H. longicornis* is classed as Near Threatened and *Hydroporus longulus* no longer meets the criteria (Foster, 2010a). *H. morio*, listed in the citation, is not classed as Rare or Scarce (Foster, 2010a) and whilst many former of its sites appear to have been lost, it remains widely distributed in Scotland (Foster, 2001).

Reports from three rounds of SCM for water beetles were available to assist with this review. In 2002, 26 water beetle species were recorded, bringing the overall site total to 45 (Eyre, 2003c). *H. elongatulus* was recorded whilst the Nationally Scarce *Cyphon punctipennis* was added to the list. In 2010, 27 species were recorded, including five that were new to the site, thus increasing the list to 50 species. Those found included *H. elongatulus* and *H. longicornis* with *Laccornis oblongus*, a Near Threatened species (Foster, 2010a) also added to the list (Foster, 2010b). Finally, SCM in 2015 generated records of 31 species, of which five were new site records. Species found included *H. elongatulus*, *H. longicornis* and *C. seminulum sensu stricto* (Foster *et al*., 2017).

Although absolute thresholds have not been established, the 55 species now recorded show the site to be a rich one for water beetles. The repeat recording of a Rare species as well as a number of Scarce species is indicative of a qualifying feature water beetle assemblage. Direct monitoring is appropriate for this feature with previous SCM rounds providing a good basis from which to assess changes.

3.19.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature and should be monitored directly.

3.20 Bothwell Castle Grounds

3.20.1 SSSI citation (reviewed 10 September 2010)

"The variety of habitat conditions present within the site has created conditions favourable for an important invertebrate assemblage, especially saproxylic species associated with old or dead wood, fungi growing on dead wood and sap runs. The site supports a number of Nationally Scarce beetle and fly species, including the beetles *Cerylon fagi*, *Hallomenus binotatus*, *Enicmus rugosus* and the flies *Brachyopa insensilis*, *Aulacigaster leucopeza* and *Periscelis* sp. Some of the adult forms of these species feed in flower-rich grassland within the site, e.g. the fungus beetle *Hallomenus binotatus*. Others, such as the weevil *Coeliodes ruber*, will also make use of the regenerating woodland areas."

3.20.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.20.3 Discussion

The citation refers to a number of Nationally Scarce species but no Rare species. Similarly the ISR lists ten Nationally Notable B species recorded in 1964, all beetles, and no Rare species. A number of the species recorded are saproxylic and SCM visits have focussed on this element of the fauna. SCM in 2003 produced records of 14 saproxylic beetle species, including three then classed as Scarce; *Cerylon fagi*, *Cis fagi* and *H. binotatus* (Eyre, 2003a). A further SCM visit in 2011 generated records of 16 saproxylic beetle and eight saproxylic fly species (Alexander, 2011). These did not include any of the species named in the citation, although the Scarce beetle *Orchesia minor* was in the list.

Saproxylic species are typically difficult to find on brief visits though it was also noted that the eastern part of the site is no longer in favourable condition for this fauna (Alexander, 2011). Whilst the list of Scarce species recorded previously may justify calling the assemblage a qualifying feature, the failure to locate most of them coupled with degradation of part of the site may call into question whether the feature still qualifies. More detailed species surveys are desirable, to establish the current composition of the fauna. For routine SCM, indirect methods are likely to be more instructive than direct monitoring based on short visits.

3.20.4 Recommendations

The invertebrate assemblage refers primarily to the saproxylic fauna. Its current status is unclear. Therefore, should the feature be found still to qualify, routine monitoring should primarily be by way of indirect assessment of habitat resources.

3.21 Braelangwell Wood

3.21.1 SSSI citation (reviewed 27 November 2009)

"The open wet muds associated with the calcium-rich springs are important for nationally rare invertebrate species including the soldier fly *Stratiomys chamaeleon* and two species of whorl snail *Vertigo genesii* and *V. geyeri*."

3.21.2 Notified invertebrate feature(s)

Biological: Invertebrates: Flies.

Invertebrates: Molluscs.

3.21.3 Discussion

The soldierfly *S. chamaeleon* is named in the citation. The ISR notes that it was recorded in 1991 and 1998 and perhaps larvae found during SCM in 2003 may belong to this species (Godfrey, 2004). Records at Braelangwell Wood therefore came too late for its inclusion in Falk (1991b), which lists post-1960 records from four sites in England and Wales and categorises the species as RDB1. However the site is referred to by Stubbs & Drake (2014) as one of only seven known sites and the only one in Scotland. If the species remains extant, it should be regarded as a qualifying feature in its own right. Management changes, and especially a lack of grazing, may result in overgrown of areas of bare mud that are used by this fly though subsequent assessment indicated that suitable habitat did remain. Five other RDB flies are on the site list, namely *Suillia oxyphora* (RDB2), *Chaemesyrphus scaevoides* (RDB3), *Ectinocera borealis* (RDB3), *Brevicornu fennicum* (RDBK) and *Medetera veles* (RDBK) (Wilkinson, 2011). *C. scaevoides* was recorded in 1991 whilst the other four species were recorded in 1976. A further 14 Scarce fly species have been

recorded (Wilkinson, 2011). The assemblage of Rare and Scarce flies is clearly a qualifying feature. Given the dated nature of most of the records, it may be difficult to focus direct surveys. Thus the feature should be monitored by a combination of indirect assessment of habitat quality, combined, where possible, with direct surveys.

The two whorl snails listed in the citation, *V. genesii* and *V. geyeri*, are both UK Priority Species. *V. genesii* was classified as Nationally Rare and *V. geyeri* as Nationally Scarce by Seddon *et al.* (2014). *V. genesii* was only mapped as non-fossil records from three British hectads by Kerney (1999) whilst *V. geyeri* was mapped in 16 British hectads. Both species were confirmed for the site during SCM work in 2012 (Killeen, 2013). The 2012 SCM fieldwork also revealed the presence of *Pupilla pratensis*, only separated from *Pupilla muscorum* in 2009 and recorded at just one British site previously. Although records are still to be checked to determine whether they are for *P. pratensis*, it is thought that the species is likely to be rare (Seddon *et al*., 2014). As such, it would be appropriate to combine *P. pratensis* with the *Vertigo* species in a Mollusc assemblage, which is clearly a qualifying feature. Direct monitoring is appropriate and standardised methods have been developed (Killeen, 2013).

3.21.4 Recommendations

The fly assemblage is a qualifying feature. Rare species should be monitored directly if possible, combined with indirect monitoring of habitat resources.

The mollusc assemblage is a qualifying feature and should be monitored directly.

3.22 Buckstruther Moss

3.22.1 SSSI citation (reviewed 22 February 2011)

"Associated with the fen and its pools is a range of aquatic beetles with exceptional species diversity relative to other Borders peatland sites. Several of these species are of only local distribution including *Acilius sulcatus*."

3.22.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.22.3 Discussion

The ISR lists 20 species of beetle, mostly water beetle. These include two Rare and three Scarce species in addition to *A. sulcatus*, named in the citation, which is a Local species. One of the Rare species (RDB3), *Donacia aquatica*, occurs in emergent aquatic vegetation at the margins of still and slow-moving water (Foster *et al*., 2007). It was recorded at Buckstruther Moss in 1981 and still present in 1998 and in 2005, with this site being one of only three Scottish and eight British sites with recent confirmed records at that time (Foster, 2005). The other Rare species, *Acilius canaliculatus*, is now regarded as Nationally Scarce (Foster, 2010a). The Scarce species are *Rhagonycha elongate* (a soldier beetle) and the water beetles *Cercyon ustulatus* and *Enochrus ochropterus*, but the last two do not the meet the Nationally Scarce criteria (Foster, 2010a).

A SCM visit in 2003 generated records of 31 water beetle species, with the overall list including 62 species (Eyre, 2003c). These included *Cyphon kongsbergensis*, a Nationally Scarce beetle recorded as new for the site (Foster, 2010a). A further SCM visit in 2013 produced records of 28 species, including *A. canaliculatus*. The Nationally Scarce species

Hydraena rufipes and *Rhantus suturalis* were added to the site list (Knight, 2014), but *D. aquatica* was not recorded. The contractor reported that there have been no site records of *D. aquatica* since 1981 and that it may no longer be present. This is at odds with the results from Foster (2005) and it is presumed that this report was overlooked by the contractor.

The water beetle assemblage is particularly species rich compared to that of nearby sites (Knight, 2014). The presence of *D. aquatica* and a range of Scarce species is indicative of an assemblage of sufficient quality to be regarded as a qualifying feature. Direct monitoring should continue with previous SCM rounds providing a baseline from which changes can be assessed.

3.22.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring should continue.

3.23 Burnmouth Coast

3.23.1 SSSI citation (reviewed 16 March 2011)

"Associated with the coastal grassland habitat are several invertebrate species of restricted distribution nationally. Of national interest are the flies found in the seepages of the cliffs, including the Red Data List limoniid cranefly *Dicranomyia goritiensis*. Of local interest are butterflies including a colony of the rare small blue butterfly *Cupido minimus*, grayling *Hipparchia semele*, wall *Lasiommata megera*, dark green fritillary *Argynnis aglaja*, the cinnabar moth *Tyria jacobaeae* and the six-spot burnet moth *Zygaena filipendulae*."

3.23.2 Notified invertebrate feature(s)

Biological: Invertebrates: Fly assemblage.

3.23.3 Discussion

The ISR lists just a single Rare or Scarce fly species, the RDB3 cranefly *D. goritiensis,* with records from a SCM visit in 2002. This species inhabits seepages on coastal cliffs and rock faces and has been reported from widely scattered locations in England, Wales and Scotland (Falk, 1991b). Among other craneflies recorded, *Idiocerus bradleyi* (RDB2) is listed from just five sites, all in England and Wales, and *Orimarga virgo* (RDB3) is reported from widely scattered locations in Britain, but with a western bias (Falk, 1991b). *Dicranomyia aquosa* and *Molophilus corniger*, both Scarce craneflies, were also recorded as was the Scarce soldierfly *Oxycera pygmaea* (Drake, 2004). All these Rare and Scarce species are associated with seepages and represent a specialised fauna of seepages in rock faces. Indirect SCM for flies in 2010 focussed on assessing the potential of the site for these species, though did not present a substantive assessment (Wilkinson, 2010).

The fly assemblage of coastal seepages, especially craneflies, is a qualifying feature, with three Rare and three Scarce species. Repeat visits will be required to determine how easily found the important species are but direct monitoring should be attempted to assess any changes in the assemblage.

The ISR lists the woodlouse *Armadillidium pulchellum* with a 1974 record. The species is classed as Nationally Notable B, so would not now be a qualifying Species. It was looked for during a SCM visit in 2003 but not located, and the contractor suggested that the original record may be an error (Lee, 2003).

Six butterfly and moth species are listed as being of local interest, although they do not form part of a notified feature. Probably the most noteworthy is the small blue. As a declining species, it can be a qualifying feature at two sites with the strongest colonies in each Area of Search (Bainbridge *et al*., 2013). Burnmouth Coast lies within the Berwickshire Area of Search and almost all colonies in this area lie along the coast (Cowe, 2015) and, thus, probably within this SSSI. Therefore, the species is a qualifying feature. JNCC guidelines also allow for the grayling and the northern brown argus to be protected at two and three sites respectively with strong populations in each Area of Search (Bainbridge *et al*., 2013). Both species are present on Burnmouth Coast SSSI though information on the relative importance of populations was not available to this review. Nonetheless, there may be a case for the butterfly assemblage to be a qualifying feature. If the feature is monitored, direct monitoring is appropriate and, for the small blue and the northern brown argus, can be carried out both of adults and of eggs.

3.23.4 Recommendations

The fly assemblage, especially the assemblage of craneflies associated with seepages, is a qualifying feature. Direct monitoring should be attempted to compare results with SCM in 2003.

The small blue butterfly is a qualifying feature and the butterfly assemblage as a whole is probably a qualifying feature, though neither are notified features. Direct monitoring is most appropriate if SCM of this feature is carried out.

3.24 Cadder Wilderness

3.24.1 SSSI citation (reviewed 21 January 2010)

"The diverse range of habitats within the woodland, including local areas of marsh and grass field layers in the more open areas, hosts a rich invertebrate assemblage including beetles, flies and moths. This is the best site in west central Scotland for its diversity of sawflies Hymenoptera: *Symphyta*. Of particular note are the three Red Data Book species present; the beetle *Cryptophagus corticinus* and sawflies *Arge enodis* and *Strongylogaster contigua*. Of further interest are the six Nationally Scarce fly and beetle species found on site."

3.24.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.24.3 Discussion

Relatively little information was available for Cadder Wilderness. In particular, no ISR was available. However, a later memo summarises key features (Horsfield, 2009) with records of three Rare sawflies, *A. enodis* and *S. contigua* (both pRDB1) and *Nematus brevivalvis* (pRDB3). Additionally, a Rare beetle is listed, namely *C. corticinus*, an RDB1 species apparently associated with burnt birch (*Betula*) (Hyman & Parsons, 1994). The beetle record is from 1986 whilst the sawflies were recorded between 1900 and 1910. Note that the British status of the sawfly *S. contigua* may be based on a misidentification (Horsfield, 2009), and the species is not listed for Scotland (Liston *et al*., 2010).

SCM visits in 2013 did not produce records of any of the Rare species (Cathrine *et al*., 2015). The sawflies in particular are difficult to locate as their requirements are poorly known, though food plants were noted to be present.

Given the antiquity of the sawfly records, it is difficult to assess if the assemblage of Rare species recorded can be regarded as a qualifying feature. However, it would be highly desirable to determine the current status of these species and to review this situation. Detailed surveys for sawflies should be carried out if possible and would be required before any ongoing monitoring program (direct or indirect) can usefully be designed.

3.24.4 Recommendations

The invertebrate assemblage may not be a qualifying feature. Two of the Rare species have not been recorded for over 100 years. Further surveys are required before any monitoring is planned.

3.25 Caenlochan

3.25.1 SSSI citation (reviewed 19 March 2010)

"There is a great abundance and density of upland invertebrates associated with the variety of montane plant communities including spiders, moths and flies. Rare species include the endangered *Callisto coffeella*, for which Caenlochan in one of only two sites in Scotland where this moth has been recorded and the spider *Mecynargus paetulus*, which is only found in eight sites in Scotland."

3.25.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.25.3 Discussion

The ISR lists six Rare invertebrates. These comprise three moths, a hoverfly, a spider and a sawfly. Of the moths, *C. coffeella* has the highest rarity status, pRDB1 (Davis, 2012). Heath (1985) listed just a single UK record, from near Braemar, though this publication predates the Caenlochan record, which was made in 1992. It has subsequently been recorded on the SSSI between 2000 and 2003 (Prescott *et al.*, 2006) and around 2007 or 2008, though not recorded during SCM carried out in either 2011 or 2012 (Kirkland *et al.*, 2012). *C. coffeella* feeds as a larva on sallow (*Salix*) with the Braemar record referring to tea-tree willow (*S. phylicifolia*) (Heath, 1985). This moth is a qualifying feature as a single species. The other two moths are the small dark yellow underwing (*Coranarta cordigera*) and the black mountain (*Glacies coracina*). It has been suggested that the small dark yellow underwing was listed in error (Kirkland *et al.*, 2012), though it was recorded on the nearby Invermark estate in 2015 (Common & Littlewood, 2016). These two species are listed in the ISR as RDB3, but are now regarded as Nationally Notable A (Waring & Townsend, 2003). They are not, therefore, qualifying feature but could still be regarded as part of a qualifying assemblage of upland and montane invertebrates.

The spider, *M. paetulus*, is an RDB2 species. It was recorded on the SSSI in 1992 and 1994 and its presence was confirmed on a SCM visit in 2004 (Lee, 2004) and then again in 2011. Depending on precisely where these records were made, Caenlochan is one of two sites in the Kincardine & Deeside Area of Search or the only site in the Dundee & Angus Area of Search (the SSSI straddling these Areas of Search). Thus it meets the criteria to be a qualifying feature as a single species and, as demonstrated in 2004, can be monitored by direct survey.

The RDB2 hoverfly *Cheilosia sahlbergi* was categorised as Vulnerable by Ball & Morris (2014). It is a montane species, found between 750 and 1000 m altitude. It has been found

as a larva on alpine bistort (*Persicaria vivipara*), especially in parts of the Cairngorms and the Breadalbane mountains in Perthshire (Ball & Morris, 2014; Stubbs & Falk, 2002). The map in Ball & Morris (2014) shows just a single hectad in the Dundee & Angus Area of Search, with a post 1980 record. This is presumed to relate to the Caenlochan record (where it was found in 1987) and, if so, it is a qualifying feature as a single species. Direct monitoring may be challenging, but it could be combined with searches of the larval food plant.

The remaining RDB species, the arctic-alpine pRDB3 sawfly *Nematus reticulatus*, was recorded in 1939 and it is little known. In the UK it is restricted to the Grampian Mountains (Liston *et al*., 2010), and the larvae feed on *Vaccinium* spp. (Benson, 1958). It may be a qualifying feature, but in the absence of further information, indirect monitoring may be appropriate.

In addition to the species detailed above, the ISR lists 17 further Scarce species comprising seven moths, four beetles, five craneflies and a snail-killing fly. Many are specialist upland or montane species. Some, especially the day-flying upland moths, can be monitored alongside the Rare moths. The invertebrate assemblage, particularly the assemblage of upland and montane species, is a qualifying feature and, given the diverse range of orders from which the species stem, it is sensible to continue to treat it as a single feature, albeit with elements that qualify in their own right and with a range of potential approaches to monitoring.

3.25.4 Recommendations

The invertebrate assemblage, especially upland and montane invertebrates, is a qualifying feature.

The moth *C. coffeella*, the spider *M. paetulus* and the hoverfly *C. sahlbergi* are qualifying features as single species. *C. coffeella* and *M. paetulus* can be monitored directly. *C. sahlbergi* may be best monitored by a combination of direct and indirect monitoring.

The sawfly *N. reticulatus* may be a qualifying feature, for which indirect monitoring may be the most appropriate approach.

3.26 Cairngorms

3.26.1 SSSI citation (reviewed 25 April 2013)

"The Cairngorms is nationally important for its assemblage of invertebrates, with the second highest number of Red Data Book species for any Scottish site including beetles, flies, spiders, butterflies and moths. These are found in a number of habitats, in particular in the pine woods and on the mountains. Several species are known only from these mountains, for example the fly *Wiedemannia simplex* and the spider *Lepthyphantes antroniensis*. Others restricted to areas of high ground include the flies *Rhamphomyia albosegmentata*, *Clinocera nivalis* and *Rhamphomyia hirtula*, the fungus gnats *Macrocera aterrima*, *M. zetterstedti, Boletina groenlandica*, and the rove beetle *Eudectus whitei*. The northern dart *Xestia alpicola* is also found in the mountains, where it feed on crowberry."

3.26.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.26.3 Discussion

The extensive Cairngorms SSSI has long been recognised for the importance of its invertebrate assemblage, and as the main UK site for a range of upland and montane species. Significant effort has gone into recording over the years. Eight RDB1 species, 15 RDB2 species and 39 RDB3 species are among the species in the ISR lists (Table 3).

Table 3. Cairngorms SSSI Rare and Scarce invertebrates listed in the Invertebrate Site Review. One species, the fly Medetera striata*, has been removed as most or all records refer to a different species (Falk & Crossley, 2005).*

	RDB1	RDB2	RDB3	RDBK	Notable A	Notable B
Aranea	1	3	1			6
Coleoptera	1	4	8	2	17	57
Diptera	2	6	19	3		24
Hemiptera					1	7
Hymenoptera	2	1	1			1
Lepidoptera	1		8		9	25
Mollusca	1					
Odonata		1	2			2

It is evident that flies, beetles and moths dominate the Rare and Scarce species. Whilst each of these groups may be qualifying features, their constituent members vary significantly in ecological requirements. Thus, basic habitat information was collated from the ISR, Benson (1958), Emmet & Langmaid (2002a), Falk (1991a, b), Falk & Chandler (2005), Falk & Crossley (2005), Harvey *et al*. (2002), Horsfield & MacGowan (1997), Hyman & Parsons (1992, 1994), Kerney (1999), Smallshire & Squash (2014) and Sterling & Parsons (2012). Of the species that could be readily assigned to a broad habitat category, eight of the Rare species are associated with bogs or bog pools, eight with some form of other type of freshwater habitat, 14 with upland or montane habitats and 26 with woodland habitats, primarily pinewoods.

The invertebrate assemblage as a whole is clearly a qualifying feature. However, given the wide range of Rare and Scarce species, it would be impractical to monitor all but a handful for SCM purposes. Invertebrate assemblages of the four broad habitats referred to above meet qualifying features criteria in their own right, and monitoring would best focus on a selection of species from each, which can be readily located. Where practical, species monitored should include at least some of those with the very highest RDB designations. For bog habitats, candidates for monitoring include the narrow-headed ant (*Formica exsecta*) and the white-faced darter (*Leucorrhinia dubia*). Candidates for monitoring in freshwater habitats include the five-spot ladybird (*Coccinella quinquepunctata*) and the fly *Philolutra simplex* (listed in the citation as *Wiedemannia simplex*), which in Britain is known only from the shores of Loch Avon (Godfrey, 2004). In upland habitats, candidates for monitoring include the snail *Vertigo modesta* and the netted mountain moth (*Macaria carbonaria*), which is dependent on bearberry (*Arctostaphylos uva-ursi*). The woodland assemblage is the largest, and could potentially include more species that are difficult to locate. Monitoring candidates include the bee *Osmia uncinata*, while attempts could be made to find the RDB1 beetle *Platycheirus melanopsis*, the fly *Ectrepesthoneura pubescens* or the sawfly *Pristiphora retusa*. The woodland assemblage includes a number of saproxylic species, especially among the beetles. These are particularly difficult to locate during brief

visits, so monitoring of dead wood quality and quantity should supplement direct monitoring for this section of the assemblage.

SCM visits have been mainly focussed on flies. A visit in 2003 concentrated on searches for the RDB1 species *P. simplex* along with *R. albosegmentata* (now classed as Nationally Scarce) and was successful in locating both species (Godfrey, 2004). In 2010, the RDB hoverflies *Platycheirus melanopsis* and *Xylota jakutorum* were located as was another Rare fly, *Pelidnoptera nigripennis* (Wilkinson, 2010). A wider set of SCM visits in 2013 located primarily a range of Scarce spiders (Cathrine *et al*., 2015).

3.26.4 Recommendations

The invertebrate assemblage is very clearly a qualifying feature.

The assemblages can be split into groups of species associated with bog habitats, freshwater habitats, upland habitats and woodland habitats. Each of these is a qualifying feature.

Direct monitoring should be carried out on a number of example species in each broad habitat, focussing where possible on those with the highest rarity status but also taking account of detectability of the species. Indirect monitoring should be employed for saproxylic species in woodlands.

3.27 Cambusurich Wood

3.27.1 SSSI citation (reviewed 9 December 2010)

"Cambusurich Wood also supports two rare species of Diptera (flies), *Ectrepesthoneura colyeri* and *Mycetophila mohilevensis*, both Red Book Data species."

3.27.2 Notified invertebrate feature(s)

Biological: Invertebrates: Fly assemblage.

3.27.3 Discussion

E. colyeri and *M. mohilevensis* are both fungus-gnats. *E. colyeri* was classed as RBD2 (Shirt, 1987; Falk, 1991b) though has since been downgraded to Nationally Scarce, having been recorded through much of Britain (Falk & Chandler, 2005). *M. mohilevensis* was classed as RBD2 (Falk, 1991b) and Near Threatened (Falk & Chandler, 2005). In addition to being recorded at Cambusurich Wood in 1979, it has been recorded in the UK just from two further sites in the Scottish Highlands, taken in a wooded flush at one of the sites (Chandler, 1988).

Two other Scarce insects are listed on the ISR, *Ocydromia melanopleura,* a Nationally Scarce fly (Falk & Crossley, 2005), and *Dendroxena quadrimaculata*, a Notable B beetle associated with oak woodland (Hyman & Parsons, 1992).

Though Falk & Chandler (2005) suggested that *M. mohilevensis* is more widespread, a precautionary approach should be considered given the current lack of known sites. Although from an under-recorded group, the species could be a qualifying feature as a single species. However, given the presence of the other named Scarce flies, the fly assemblage as a whole (the notified feature) should continue to be regarded as the qualifying feature. Monitoring of fungus gnats is challenging, so routine monitoring for SCM purposes may best be carried out be by way of indirect monitoring of habitat features.

3.27.4 Recommendations

The fly assemblage is a qualifying feature with the fungus-gnat, *M. mohilevensis*, being especially important. Indirect monitoring is likely to be more instructive for SCM purposes than direct monitoring.

3.28 Canna and Sanday

3.28.1 SSSI citation (reviewed 25 January 2011)

"Between them, Canna and Sanday have a very rich moth fauna for Hebridean islands and several of the species present, such as *Phyllonorycter insignitella*, *Coenocalpe lapidate*, *Lycia zonaria* and *Hadena caesia mananii* are nationally rare."

3.28.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moths.

3.28.3 Discussion

P. insignitella was formerly considered RDB3 but was reassessed by Davis (2012) as pRDB1. This remains the only Scottish record and the moth was not found during targeted SCM searches in 2013 and 2014 (Prescott, 2015). The moth is inconspicuous, and finding its feeding signs requires specialist knowledge. In the absence of further records, it would be difficult to meaningfully monitor this element of the notified feature.

The slender-striped rufous (*Coenocalpe lapidata*, though misspelled as *Coenocalpe lapidate* in the citation) is a Scottish Highland speciality. It is classed as Nationally Notable A but it has been found at a greater range of sites in recent years, with records from 49 hectads (http://www.eastscotland-butterflies.org.uk/mothflighttimes.html - accessed 24/03/2016). Thus Nationally Notable B status might be more appropriate. The species has been recorded just once at this site, with one specimen caught at light in 1956 on Canna. It was not found during SCM visits in 2013 and 2014 (Prescott, 2015). The precise requirements of this moth are not well understood as larvae have not been found in the wild (Waring & Townsend, 2003). Areas similar to sites known to support slender-striped rufous do exist on Canna and Sanday (Prescott, 2015), though in the absence of any further records, it would be difficult to monitor this element of the notified feature.

The belted beauty (*L. zonaria*) is a Nationally Notable A moth (Waring & Townsend, 2003). The Scottish sub-species, *L. zonaria atlantica*, occurs on the Outer Hebrides, some of the Inner Hebridean islands and on the mainland at Ardnamurchan (Hill *et al*., 2010). However, its sub-specific status is questionable (Prescott, 2015). A total of 79 adults were located during a SCM visit in April 2014 (77 on Sanday and two on Canna) and larvae were located on Sanday during the 2014 visit.

The grey (*H. caesia mananii*) was recorded on Canna between 1952 and 1979 (Prescott, 2015). It is an RDB3 species restricted in the UK to the Inner Hebrides from Islay north to Skye (Hill *et al*., 2010). Targeted SCM searches for the species in July 2014 succeeded in locating one adult at light on Canna and one larva on Sanday (Prescott, 2015).

The Canna and Sanday ISR lists another 19 species that were classed as Nationally Notable at the time of its compilation. Many are old records with the majority dating from the 1950s or earlier.

With the presence of three Rare moths and an extensive list of Scarce species, the moth assemblage is a qualifying feature. Direct monitoring is appropriate for most of these

species though more recent data and further surveys for *P. insignitella* would be required to help define the most important elements of this assemblage for targeting such monitoring.

3.28.4 Recommendations

The moth assemblage is a qualifying feature and monitored directly, although *P. insignitella* may be difficult to find and may not be appropriate as a target for SCM purposes.

3.29 Carnach Wood

3.29.1 SSSI citation (reviewed 25 March 2008)

"The site supports a good range of invertebrate species characteristic of wet woodland; but it is the unusually diverse population of flies, especially craneflies which are of special interest."

3.29.2 Notified invertebrate feature(s)

Biological: Invertebrates: Flies.

3.29.3 Discussion

The citation for this site is particularly vague, with no species listed to support the notified feature. The ISR lists 29 species of fly and one “either/or” pair of craneflies, all recorded in 1976. This latter record is potentially the most interesting as it involved either *Lipsothrix ecucullata* or *L. errans*, the former being a RDB3 species (Falk, 1991b). The full species list is greater, with 41 species found on the 1976 visit. Six of these are listed as Nationally Scarce B in the ISR. SCM fieldwork in 2003 revealed the presence of *Lipsothrix* larvae but the species involved could not be determined, and just one Scarce species was noted (Godfrey, 2004). On a SCM visit in 2010, monitoring was carried out of the habitat features that support the fly assemblage rather than sampling the flies themselves (Wilkinson, 2010).

3.29.4 Recommendations

In the absence of direct evidence of the presence of any RDB species, and the modest number of Scarce species recorded, the fly assemblage of this site may not be a qualifying feature. It appears, though, that survey effort has been limited so this situation could change if further data are gathered and, especially, if the *Lipsothrix* sp. is confirmed as being *L. ecucullata.*

3.30 Carrick Ponds

3.30.1 SSSI citation (reviewed 27 August 2010)

"This richness of the beetle assemblage is in part due to the availability of the wide range of fen habitats, the undisturbed nature of the pools surrounded by old rough grassland and to the favourable mild climate of the location. It is rated as the fifth most important site in south Scotland in a group of open permanent water sites with mesotrophic or eutrophic fen. Although only one species, *Donacia obscura*, of the 81 species of water beetle present is rare within the British context, the species assemblage represents a very diverse community. A northern species *Helophorus strigifrons*, which is in serious decline nationally, and seven

southern species, remaining from a time when temperatures in northern England and Scotland were higher than at present, are also found on this site. "

3.30.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.30.3 Discussion

The citation reports 81 species of water beetle from this site, but *D. obscura* is the only rare species in a British context. This species is not, however, Rare in a Red Data Book sense and is classed as Nationally Notable A by Hyman & Parsons (1992). Nine further water beetle species are listed in the ISR as Nationally Notable B including *H. strigifrons*, which is also mentioned in the citation.

A SCM visit in 2002 did not add any new species to the list and only recorded *Agabus unguicularis* among the Scarce species previously reported (Eyre, 2003c). SCM visits in 2010 resulted in records of 55 species including again *A. unguicularis* and the Scarce species *Enochrus ochropterus*, *Graptodytes granularis* and *Ilybius guttiger*. In addition, *Helophorus granularis* was recorded as new to the site (Foster, 2010b). The status of this species has been upgraded to Nationally Scarce (Foster, 2010a). Following this survey, the site list reached 76 species. A further SCM visit in 2015 yielded 52 species, of which just one, *G. granularis,* was a Scarce species (Foster *et al*., 2017).

Although there are no beetles now classed as Rare at the site, the species list of water beetles is extensive; the 2015 contractor reported it to be greater than at any other site north of York (Foster *et al*., 2017). As such, the assemblage should be considered to be remarkable and a qualifying feature. Direct monitoring is appropriate, with previous SCM rounds providing a baseline from which to assess change.

The hoverfly *Parhelophilus consimilis*, recorded in 1979, was regarded as Rare at the time of the ISR, but this species is now classed as Nationally Scarce (Ball & Morris, 2014) so it cannot be a qualifying feature.

3.30.4 Recommendations

Beetles, specifically the water beetle assemblage, are a qualifying feature. Direct monitoring should be continued.

3.31 Clais Dhearg

3.31.1 SSSI citation (reviewed 18 September 2009)

"Clais Dhearg is an important Scottish site for Odonata supporting 15 species of dragonfly and damselfly, the largest number of any site in Scotland. Odonata species are associated with the Black Lochs, Loch Lagain, water courses and mires throughout the site. Of particular note are the nationally scarce azure hawker *Aeshna caerulea*, hairy dragonfly *Brachytron pratense*, downy emerald *Cordulia aenea*, and variable damselfly *Coenagrion pulchellum* which breed in the Black Lochs and the northern emerald *Somatochlora arctica* which breeds in peaty pools in blanket mire associated with woodland margins. Woodland clearings with grazed grassland support the marsh fritillary butterfly, with the west of Scotland being one of its last remaining strongholds in Scotland."

3.31.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

Butterflies: Marsh fritillary butterfly (*Eurodryas aurinia*).

3.31.3 Discussion

The ISR lists 15 species of dragonfly and this figure is repeated in the citation. SCM fieldwork in 2002 confirmed the presence of 14 breeding species, and the author stated that "this is the best Scottish site for its assemblage of Odonata" (Batty, 2002). All 15 species were recorded during SCM visits in 2013 (Batty, 2013a). The dragonfly assemblage far exceeds JNCC's qualifying feature criteria (Bainbridge *et al*., 2013).

The ISR lists a 1985 record for marsh fritillary, and larval webs were recorded in 2002 (Ravenscroft, 2003). However, no larval webs were found during SCM in 2006 and the feature was classed as Unfavourable – no change. This species is known, though, for undergoing large population fluctuations so it may persist on the site or recolonize from adjacent areas.

Up to five sites should be protected for this species through the SSSI network (Bainbridge *et al*., 2013). Clais Dhearg SSSI lies within the Lorne Area of Search, and this is one of four areas in Scotland that are especially important for marsh fritillary. In absence of evidence that alternative sites are of greater importance, the marsh fritillary should continue to be regarded as a qualifying feature and direct monitoring should continue at Clais Dhearg.

The ISR notes 2000 records for the medicinal leech (*Hirudo medicinalis*). This is one of only two sites in Scotland with recent records (Maitland, 2011). As an RDB3 species, UK Priority Species and Wildlife & Countryside Act Schedule 5 species, it is certainly a qualifying Species. If possible, it should be monitored directly, although it is not a notified feature.

3.31.4 Recommendations

The dragonfly assemblage is a qualifying feature and should be monitored directly.

The marsh fritillary should be regarded as a qualifying feature and should be monitored directly

The medicinal leech is a qualifying feature as a single species, although is not included in the notified features. This species should be also be monitored directly.

3.32 Claish Moss

3.32.1 SSSI citation (reviewed 30 April 2010)

"The site is also notable for its nationally important assemblage of dragonfly species which includes black darter *Sympetrum danae*, blue-tailed damselfly *Ischnura elegans* and common hawker *Aeshna juncea*."

3.32.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.32.3 Discussion

The citation reports that the dragonfly assemblage is nationally important and names three species, all of which are widespread and classified as Least Concern (Daguet *et al*., 2008). Ten species of dragonfly were recorded during SCM carried out in 2013 and evidence of breeding was found for all of them (Batty, 2013b). The species recorded included the northern emerald (*Somatochlora arctica*), which is classed as Near Threatened (Daguet *et al*., 2008). The ISR further noted the azure hawker (*Aeshna caerulea*). This species appears not to have been subsequently reported though suitable habitat exists at the site (Batty, 2013b). The ISR further refers to a record of the chequered skipper (*Carterocephalus palaemon*) in 1990. This species can be a qualifying feature at the five strongest colonies in each Area of Search (Bainbridge *et al*., 2013). However, although the site is within the general range of the species, there are no records on the National Biodiversity Network Gateway. In absence of further information, it seems unlikely that it fulfils this criterion.

3.32.4 Recommendations

As the dragonfly assemblage at Claish Moss exceeds JNCC's qualifying criteria (Bainbridge *et al.,* 2013), the feature should continue to be monitored directly.

3.33 Clarilaw Grasslands

3.33.1 SSSI citation (reviewed 8 March 2011)

"The Moss supports a rich aquatic beetle fauna, with thirty species recorded to date, including the nationally scarce predatory aquatic beetle *Agabus (Gaurodytes) unguicularis*."

3.33.2 Notified invertebrate feature(s)

Biological: Invertebrate: Beetle assemblage.

3.33.3 Discussion

There are 16 species of water beetles reported from this site at the time of the ISR. *Hydroporus longicornis* and *A. unguicularis* were classed as Nationally Notable B. *H. longicornis* has more recently been assessed as Near Threatened, while *A. unguicularis* was downgraded and it no longer meets the Nationally Scarce criterion (Foster, 2010a).

The only SCM document available for this review relates to a visit in 2010 (Foster, 2010b). Thirty species of water beetle were recorded, including just one Scarce species, *Chaetarthria seminulum* s. str. (a female that could not be assigned to either of the two species now recognised within this taxon). Another species of interest was *Anacaena limbata*, with Clarilaw Grasslands becoming the most northerly known site for the species in Britain.

Compared to other designated sites in the South Highland region, the water beetle fauna is unremarkable. It contains no Rare species and just two Scarce species and the species list, numbering 34 following the 2010 SCM, is lower than for other sites in the region.

3.33.4 Recommendations

As recommended by the contractor following the 2010 survey, the water beetle assemblage should not be considered to be a qualifying feature.

3.34 Cleghorn Glen

3.34.1 SSSI citation (reviewed 1 February 2010)

"The variety of habitats present within the site has created conditions favourable for an important invertebrate assemblage, especially saproxylic species associated with old or dead wood, fungi growing on dead wood and sap runs. The site supports three Nationally Rare species, the minute fungus beetle *Orthoperus brunnipes*, the caddis fly *Adicella filicornis* and the small amber snail *Succinea oblonga*. The site also supports a number of Nationally Scarce species including the beetles *Bolitochara mulsanti* and *Datomicra zosterae*, the flies *Dactylolabis transversa* and *Oxycera pardalina* and the hoverflies *Brachyopa insensilis* and *Aulacigaster leucopeza*, both of which feed on elm sap-runs."

3.34.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.34.3 Discussion

The citation lists three Rare species. The RDB3 beetle *O. brunnipes* is associated with wetlands (Hyman & Parsons, 1992) and was recorded in 1976. The RDB3 caddisfly *A. filicornis* is associated with small spring streams and trickles (Wallace, 1991). It has only been known from one Scottish site: Mouse Glen, Lanarkshire (Wallace, 1991, 2010) but this is presumed to be an alternative name for Cleghorn Glen. *A. filicornis* was last recorded in 1975 (Wallace, 2010). The snail named in the citation as *Succinea oblonga*, but now called *Succinella oblonga*, is associated with damp, unshaded, sparsely vegetated places (Kerney, 1999). It was recorded in 1996 and currently assigned a status of Vulnerable (Seddon *et al*., 2014). The site also had records of eight flies, three beetles and one moth that were regarded as Nationally Notable B.

A SCM visit in 2003 focussed on searching for *A. filicornis*, though was not successfully (Godfrey, 2004). Further SCM visits in 2011 and 2012 involved searches for all three Rare species named above, but none was located (Kirkland *et al.*, 2012).

Although the Rare species span three invertebrate orders, regarding them as named elements of an invertebrate assemblage as a qualifying feature appears to be appropriate. All are associated with wet or damp places and whilst some or all might be qualifying features in their own right, a combined feature recognises that the site may have wider entomological interest. Additionally, given that the Rare species have not been located during recent SCM visits, a combined feature is probably more defendable. Given recent difficulties in locating the species, indirect monitoring of habitat resources is likely to be more instructive for SCM purposes though continued efforts should be made to relocate these species, at least periodically.

3.34.4 Recommendations

The invertebrate assemblage is a qualifying feature. The Rare species recorded have proved to be difficult to locate, so monitoring should primarily be by indirect methods.

3.35 Coille Coire Chuilc

3.35.1 SSSI citation (reviewed 9 December 2010)

"The ancient pinewood supports a rich invertebrate fauna which is particularly notable for the abundance of rare fly and beetle species. The SSSI supports one red data book (*Pityophthorus lichtensteini*) and 11 nationally scarce beetle species. The site also supports five red data book (*Scoliocentra scutellaris*, *Platycheirus melanopsis*, *Chamaesyrphus scaevoides*, *Tipula limbata* and *Fannia umbratica*) and seven nationally scarce fly species. Many of these are restricted to pinewood habitat and are therefore dependant on its continuation for their survival. The rare wood ant *Formica aquilonia* is also present within the SSSI."

3.35.2 Notified invertebrate feature(s)

Biological: Invertebrates: Fly assemblage.

Invertebrates: Beetle assemblage.

3.35.3 Discussion

The Rare beetle listed in the citation, *P. lichtensteini*, is associated with dead pine twigs (Alexander, 2002). Hyman & Parsons (1992) list the species as RDB3 and report it from South Aberdeenshire and Moray. Records from other sites have been shown to be erroneous, with specimens examined belonging to other species, in particular *P. pubescens* (Hyman & Parsons, 1994; Owen, 1994). The Coille Coire Chuilc record is dated as 1977, and so the Forth area should have been listed in Hyman & Parsons (1992) or Owen (1994) if the record was documented and verifiable. The species was not found during SCM visits in 2003 (Eyre, 2004) and 2010 (Alexander, 2011). As the 1977 record cannot be traced and verified, alternative species should form the main targets for SCM monitoring of the beetle assemblage.

The citation mentions that the site holds 11 Nationally Scarce beetles, and a number of them are saproxylic. Eight species have an elevated rarity status or old-growth association (including *P. lichtensteini*) (Alexander, 2011). Although lacking confirmed records of Rare species, the beetle assemblage, especially saproxylic species, is clearly important and should continue to be regarded as a qualifying feature. Indirect monitoring of dead wood features may be more instructive than direct monitoring for SCM purposes, but periodic surveys should be carried out where possible to determine if the site continues to support a range of Scarce species consistent with qualifying feature requirements.

Among the RDB flies, *S. scutellaris* is a RDB3 species (Shirt, 1987; Falk, 1991b). *Platycheirus melanopsis* was classed as RDB3 (Shirt, 1987; Falk, 1991b) but has been recently reassessed as Near Threatened (Ball & Morris, 2014). It occurs in the Highlands of Scotland and in the Lake District and is described as a montane species by Ball and Morris (2014) though Stubbs & Falk (2002) stated that it also occurs in open structured pine forest at about 250-300 m altitude. *C. scaevoides* was formerly RDB3 (Shirt, 1987; Falk, 1991b) but has since been downgraded to Nationally Scarce (Ball & Morris, 2014). It is widely recorded in the northern half of Scotland, usually associated with heather (*Calluna vulgaris*) in Caledonian pine forest, but it has also been recorded from conifer plantations (Falk, 1991b; Stubbs & Falk, 2002; Ball & Morris, 2014). *T. limbata* is classed as RDB3 (Shirt, 1987; Falk, 1991b) and occurs sparsely in Scotland and also in Westmorland and Yorkshire, mainly in lowland woodland flushes (Falk, 1991b). *F. umbratica* is RBDK (Falk, 1991b) with Fonseca (1968) listing sites just in Speyside and Glen Urquhart. None of these species

were found during a SCM visit in July 2003, though the surveyor reported that this could be attributed to poor weather (Godfrey, 2004).

Seven Nationally Notable B fly species listed in the ISR display a variety of habitat associations and ecological niches. In three cases, larval biology is unknown, and the remaining four are all predatory in the larval stage.

With the range of Rare and Scarce species recorded, the fly assemblage is a qualifying feature. The important species do not form an ecologically coherent group so monitoring will need to cover a range of habitats. Monitoring should focus on the species that remain classed as Rare. However, none have been recorded since the 1980s so indirect monitoring of habitat resources may be more instructive for SCM purposes.

The wood ant *F. aquilonia* is listed in the citation as “rare” but it is not rare in the formal Red Data Book sense (Shirt, 1987). In Scotland, it is widely distributed outside the central belt and the Borders, away from the east coast (Hughes, 2006). This ant is not a qualifying feature as a single species.

3.35.4 Recommendations

Beetles, especially the saproxylic beetle assemblage, are probably a qualifying feature. Indirect monitoring is likely to be more instructive that direct monitoring for SCM purposes but direct surveys should be carried out periodically to determine if a rich assemblage remains present.

The fly assemblage is a qualifying feature. Direct monitoring should be attempted for the Rare species in particular but supplemented by indirect monitoring as these species may be difficult to locate.

3.36 Coille Dalavil

3.36.1 SSSI citation (reviewed 28 March 2008)

"Ten species of dragonflies 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 also the demoiselle agrion *Agrion virgo*, which occurs at Dalavil in its most northerly known locality in Britain."

3.36.2 Notified invertebrate feature(s)

Biological: Invertebrates: Dragonfly assemblage.

3.36.3 Discussion

Nine species of dragonfly are listed in the ISR, including the keeled skimmer and the beautiful demoiselle (*Calopteryx virgo*). The latter species is referred to as demoiselle agrion (*Agrion virgo*) in the citation. Both species are now classified as Least Concern (Daguet *et al*., 2008) though have strong populations at Coille Dalavil at the edge of their geographic ranges. SCM visits in 2003 and 2010 produced records of the same ten dragonfly species; in 2013, breeding evidence was found for six of them, including the keeled skimmer, whilst considerable numbers of beautiful demoiselle were seen (Willet, 2014). The number of dragonfly species consistently present at Coille Dalavil exceeds the nine required (Bainbridge *et al*., 2013).

3.36.4 Recommendations

The dragonfly assemblage is a qualifying feature. Direct monitoring should continue.

3.37 Coille Mhor

3.37.1 SSSI citation (reviewed 29 July 2009)

"The loch and fen support an outstanding assemblage of dragonflies which is nationally important. Ten species of dragonfly have been recorded within the SSSI including the nationally rare northern emerald *Somatochlora arctica*."

3.37.2 Notified invertebrate feature(s)

Biological: Invertebrates: Dragonfly assemblage.

3.37.3 Discussion

The ISR lists 11 species of dragonfly from Coille Mhor, including the northern emerald which was formerly classed as RDB2 (Shirt, 1987) and is now regarded as Near Threatened (Daguet *et al*., 2008). SCM visits in 2002 produced records of ten species, nine of them breeding, whilst SCM visits in 2013 produced records of eight species with breeding evidence found for four of them (Willet, 2014). There was proof of breeding for the northern emerald in both years. Although only eight species were recorded in 2013, both visits were undertaken in poor weather and the result should not be taken as indicating that the dragonfly assemblage has reduced in numbers.

3.37.4 Recommendations

The dragonfly assemblage probably remains a qualifying feature. Direct monitoring should be continued.

3.38 Coille Phuiteachain

3.38.1 SSSI citation (reviewed 15 December 2010)

"The beetle fauna comprises several nationally scarce species, including *Saperda scalaris*, *Xylita laevigata*, *Dendrophagus crenatus*, *Diacanthous undulates*, *Hylecoetus dermestoides* and *Quedius xanthopus*. Several of the beetle species are closely associated with dead wood."

3.38.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.38.3 Discussion

The citation lists six species of beetle, all of which are saproxylic, with two classed as Nationally Notable A and four as Nationally Notable B (Alexander, 2002). One species, *Diacanthous undulatus*, is incorrectly spelt in the citation as *D. undulates*. The first and last two species named in the citation were recorded in 1977 with the middle two species in

1982. A 2010 SCM visit (Telfer, 2011) produced records of 17 species of saproxylic beetle including *Rhopalodontus perforatus*, an RDB3 species found in brackets of *Fomes fomentarius* on birch (*Betula*) (Alexander, 2002) in northern Scotland (Hyman & Parsons, 1992). Three saproxylic species classed as Nationally Scarce B were also recorded: *Hydrocyphon deflexicollis*, *D. undulatus* and *Orchesia minor,* along with the Nationally Scarce *Cryptophagus parallelus*.

Although Beetles are a notified feature, the evidence for their designation as such appears weak based on data presented. However the addition of Rare and Scarce species to the site list from the 2010 visit adds to the apparent value of the saproxylic beetle fauna.

3.38.4 Recommendations

The beetle assemblage, specifically the saproxylic beetle assemblage, may be a qualifying feature. Indirect monitoring of dead wood is most appropriate for regular SCM purposes but species surveys should be carried out to attempt to demonstrate the presence of an assemblage consistent with qualifying feature status.

3.39 Coille Thogabhaig

3.39.1 SSSI citation (reviewed 10 March 2011)

"The dead-wood beetle fauna of the SSSI is the most diverse in Skye and Lochalsh and includes the notable *Schizotus pectinicornis*."

3.39.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.39.3 Discussion

The ISR lists the Nationally Notable A beetle *S. pectinicornis* and the Nationally Notable B beetles *Rhizophagus nitidulus* and *Pterostichus aethiops*. *S. pectinicornis* and *R. nitidulus* are saproxylic species. SCM fieldwork in 2010 produced records of 14 saproxylic beetle species including the Nationally Notable B *Cis jacquemartii* and *Orchesia minor*. Four further Scarce species were recorded.

The assemblage does not include any Rare species, so the notified feature is based on Scarce species. However, the citation makes clear that it is the saproxylic fauna that is particularly valued, as the site is the most diverse for such a fauna in Skye & Lochalsh (which presumably relates also to the Syke & Lochalsh Area of Search). Diversity in itself does not necessarily mark a site out as sufficiently important for an assemblage to be a qualifying feature. Due to the low number of saproxylic beetles recorded so far, a reliable Saproxylic Quality Index (Fowles *et al*., 1999) cannot be calculated, but a provisional figure of 235.7 is given by Telfer (2011). Fowles *et al.* (1999) suggested that an index of 500 is an appropriate figure to consider a site of national importance. Although a lower figure may be appropriate for regional importance, more species and a greater proportion of Rare species would need to be recorded for the Coille Thogabhaig assemblage to approach any such threshold.

3.39.4 Recommendations

On current evidence, the beetle fauna (specifically the saproxylic beetle assemblage) is not a qualifying feature.

3.40 Conic Hill

3.40.1 SSSI citation (reviewed 3 February 2011)

"The rich invertebrate fauna includes a diversity of moths, many with restricted distribution, including *Pancalia schwarzella* whose larvae feed on violets. The site also supports many species of water beetles, including *Hydroporus longicornis*, classified as Near Threatened using IUCN criteria, and *Chaetarthria seminulum* and *Paracymus scutellaris*, which are Nationally Scarce (Nb)."

3.40.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
		Moth assemblage.

3.40.3 Discussion

The citation lists three water beetle species, which are the Rare or Scarce species recorded during a SCM visit in September 2010 (Foster, 2010b). The near-threatened *H. longicornis* is confined to habitats associated with seepages on a peaty substrate (Foster, 2010a). In Scotland, it is recorded most frequently from southern and western areas but with scattered records in the east and north mainland. *C. seminulum* is mostly associated with mud and non-*Sphagnum* mosses in base-rich water while *P. scutellaris* prefers acid flushes and bogs, including degraded areas (Foster, 2001).

The water beetle *Hydraena pygmaea* was reported from the site in 1983 though has not been located on subsequent searches (Foster, 2010b). This species is listed as RDB3 by Foster (2001) and Vulnerable by Foster (2010b). It is associated with mossy stones on clay in shallow streams. Additional Scarce species recorded are *Hydraena rufipes*, *Hydroporus longulus*, *Hydroporus obsoletus* and *Riolus cupreus* (Eyre, 2003b; Foster, 2010a). These species were not recorded during SCM visits in 2010 but *H. obsoletus* and *R. cupreus* were found during SCM in 2003.

The moth listed in the citation, *P. schwarzella*, has been classed as pRDB2 (Davis, 2012). Up to 2002, it had been recorded from 22 vice counties in Britain (Emmet & Langmaid, 2002b). It was first recorded at Conic Hill in 1983 and then again in 2004 (Prescott *et al.*, 2006) and 2014 (Prescott, 2015). In Scotland, larvae have been found on common dog-violet (*Viola riviniana*) and probably marsh violet (*V. palustris*) (Heckford, 2006). Given its rarity, it is likely that Conic Hill forms one of the most important sites, and perhaps the only known site, for *P. schwarzella* in the Area of Search. Another Scarce moth recorded at the site, the lead-coloured pug (*Eupithecia plumbeolata*), is fairly common in its limited range in the area (Knowler, 2010). A large list of additional moth species has been recorded though without any additional Rare or Scarce species.

It is questionable as to whether the moth assemblage as a whole should be regarded as a qualifying feature. If so, direct monitoring is only really justified for *P. schwarzella*. An alternative approach would be to regard *P. schwarzella* as a single species qualifying feature, though this too would be questionable given the range of vice counties from which it has been recorded. The former option is probably more justified as a precautionary

approach and effort should be made to collate records to determine whether the feature can be better defined.

3.40.4 Recommendations

The range of Rare and Scarce water beetle species appears to be sufficient for a qualifying feature. Direct monitoring should continue.

The moth assemblage should be regarded as being a qualifying feature though any direct monitoring carried out should focus on the micro-moth *P. schwarzella*.

3.41 Corrieshalloch Gorge

3.41.1 SSSI citation (reviewed 26 March 2009)

Cranefly (*Lipsothrix ecucullata*)

"The woodland provides habitat for the nationally rare cranefly species *Lipsothrix ecucullata*. Adult *Lipsothrix ecucullata* are found in wet areas in damp, deciduous woodlands, whilst the larvae are found in well decayed wood, lying partially immersed in water."

3.41.2 Notified invertebrate feature(s)

Biological: Invertebrates: Cranefly (*Lipsothrix ecucullata*).

3.41.3 Discussion

The cranefly *L. ecucullata,* recorded in 1969, is a species of seepages in damp woods in Highland districts (Falk, 1991b). It was listed as RDB2 by Shirt (1987) then revised to RBD3 by Falk (1991b), and it is also a UK Priority Species. The species was reared from larvae collected in 1999-2000 (Rotheray, 2000) though most of the seepages sampled were outside the SSSI boundary (Godfrey, 2004). It was not recorded during a SCM visit in 2003 (Godfrey, 2004). A SCM visit in 2010 assessed the species indirectly through habitat features and found that suitable resources still existed for *L. ecucullata* (Wilkinson, 2010).

The 2003 SCM visit produced a record of the fly *Kowarzia tenella*. This is a Lower Risk (Near Threatened) species with records from just seven counties between 1960 and 1995. It is mostly associated with small rocky streams and waterfalls (Falk & Crossley, 2005). The same SCM visit also produced a record for the fly *Minettia dissimilis* (Godfrey, 2004), listed as RDB3 by Shirt (1987). The requirements of this species are less clear, although larvae may be found in decaying vegetation (Barnard, 2001).

L. ecucullata may warrant continued direct monitoring as a qualifying feature in its own right but the presence of *K. tenella* in a similar habitat gives an opportunity for both species to be monitored together. Further information would be needed on *M. dissimilis* and how its requirements relate to the notified habitat features to determine how it should be monitored.

3.41.4 Recommendations

The fly assemblage as a whole should be considered as the qualifying feature, and represented in particular by three Rare species. *L. ecucullata* should be monitored directly alongside *K. tenella*. Further information is needed on the ecology of *M. dissimilis*.

3.42 Coulin Pinewoods

3.42.1 SSSI citation (reviewed 8 December 2010)

"Ten species of dragonfly and damselfly have been recorded within the SSSI which is unusual for such a northerly location. Species found include the nationally rare northern emerald *Somatochlora artica* and the nationally scarce azure hawker *Aeshna caerulea* and white-faced *darter Leucorrhinia dubia*."

3.42.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.42.3 Discussion

The citation states that ten species of dragonfly and damselfly have been recorded at the SSSI though the ISR actually lists 11 species recorded in the 1980s. Eleven species were also recorded during SCM visits in 2001 to 2003, with one species added to those recorded in the 1980s. Ten species were recorded, of which seven were breeding, during further SCM visits in 2013. These included one of the species not recorded during the previous SCM round (Willet, 2014). Thus 12 species have been recorded, including 11 after the year 2000. The assemblage at Coulin Pinewoods exceeds JNCC's qualifying criteria (Bainbridge *et al*., 2013) and remains exceptional for such a northern location.

3.42.4 Recommendations

The dragonfly assemblage is a qualifying feature and direct monitoring should continue.

3.43 Cragbank and Wolfehopelee

3.43.1 SSSI citation (reviewed 12 August 2010)

"The site is important for beetles including several rare and nationally scarce species, and many are associated with dead or dying timber, of which there is plenty on the site. The beetle records for the site show the presence of 37 species, of which 23 species are recorded as being of very local distribution, and another eight species of local distribution in the Scottish Borders. These records include the nationally scarce rove beetle *Phyllodrepa puberula*, the locally rare rove beetles *Dropephylla ioptera* and *Quedius plagiatus*, and the regionally rare leaf beetle, *Chrysomela aenea*."

3.43.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.43.3 Discussion

Few species are listed in the ISR. Among them, the Rare sawfly *Monophadnoides waldheimii* is a RDB2 species. However, the record is undated, and many old records are the result of identification errors. The only Scarce species listed is the northern brown argus butterfly (*Aricia artaxerxes*) though the site was not thought to be particularly important in a Dumfries & Galloway context.

Two of the four beetles mentioned in the citation, *Q. plagiatus* and *C. aenea*, are listed as being Local though the latest review describes *C. aenea* as widespread (Hubble, 2014). The sources of the records for the other two species are not known. One, *P. puberula*, is classed as Nationally Notable A (Hyman & Parsons, 1994).

None of the species mentioned in the citation were found during 2015 SCM, although eight species of saproxylic beetles were reported, including the Nationally Scarce *Saperda scalaris* and *Quedius xanthopus* (Cathrine *et al*., 2017a).

3.43.4 Recommendations

There is no evidence that the beetle assemblage at Cragbank and Wolfehopelee SSSI is especially important. Unless further records of Rare or Scarce species emerge, the beetle assemblage is not a qualifying feature.

3.44 Craig Leith and Myreton Hill

3.44.1 SSSI citation (reviewed 11 February 2011)

"The site supports a breeding colony of northern brown argus butterfly *Aricia artaxerxes*, a nationally scarce species whose food plant is rock rose."

3.44.2 Notified invertebrate feature(s)

Biological: Butterflies: the northern brown argus (*Aricia artaxerxes*).

3.44.3 Discussion

There may be some confusion over the presence of the northern brown argus at Craig Leith and Myreton Hill. The ISR states that there are 1998 and 1999 records from Alva Glen, which is nearly 1 km east of the SSSI boundary, and that this is the only recently recorded site in the Falkirk and Clackmannan Area of Search. However the National Biodiversity Network Gateway does show a 2013 record for NS8797, which is within the SSSI boundary. The three strongest colonies within an Area of Search can be qualifying features (Bainbridge *et al*., 2013); however, the National Biodiversity Network Gateway shows records for five other 1-km squares in the north of the Area of Search, with records from up to 2013 in most of them. Few other invertebrate species are recorded for the site and none warrant further monitoring.

3.44.4 Recommendations

From the evidence, it is far from clear whether the northern brown argus is a qualifying feature. A field survey should be carried out to confirm the status of the species at the site and its relative importance within the Area of Search. Surveys should include searches for adults and eggs, which are relatively straightforward to find on the larval food plant, common rock-rose (*Helianthemum nummularium*).

3.45 Craig Royston Woods

3.45.1 SSSI citation (reviewed 17 September 2010)

"The site is notified for its moths because it has the Red Book Data species vulnerable moth *Acleris abietana*, five nationally-scarce species, *Atemelia torquatella*, *Eupithecia plumbeolata*, *Olethreutes arcuella*, *Pammene albuginana*, *Scoparia ancipitella* and a long list of more common species.

Other fauna includes the largest breeding populations of pied flycatcher *Ficedula hypoleuca* within the Loch Lomond deciduous woodland. The woods support characteristic invertebrate populations including several colonies of the wood ant *Formica aquilonia* and a number of notable beetles."

3.45.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moth assemblage.

3.45.3 Discussion

Although listed in the citation as a RDB Vulnerable species, the micro-moth *A. abietana*, since its discovery in the UK in 1965, has been found to be more widespread, and thus was downgraded to Nationally Scarce A (Davis, 2012). It has been recorded in 18 vice counties in Scotland (http://www.eastscotland-butterflies.org.uk/sm_Tortricidae.html#49.067 – accessed 04/11/2015) and seven in England (Prescott, 2015). In Europe, it has been recorded feeding on silver fir (*Abies alba*), pine (*Pinus*) and Norway spruce (*Picea excelsa*) (Razowski, 2002). In the UK, it may be particularly associated with grand fir (*Abies grandis*) (Young, 1989). Its reliance on exotic conifers therefore makes it an anomalous species to be regarded as a part of a qualifying feature and, furthermore, whereas it is reported to have been recorded on the adjacent Rowardennan Woodlands SSSI, it has not actually been recorded at Craig Royston Woods (Prescott, 2015). Monitoring of this species as part of a qualifying feature is, therefore, inappropriate.

Of the remaining species listed in the citation, *A. torquatella* is Nationally Scarce A, *E. plumbeolata*, *O. arcuella* and *S. ancipitella* are Nationally Scarce B and *P. albuginana* is now regarded as local (Davis, 2012). The ISR lists *Udea decrepitalis*, a further Nationally Scarce A moth (Davis, 2012). As for *A. abietana*, there seems to have been confusion over the location of these records and all the species listed in Craig Royston Woods SSSI citation have actually only ever been recorded at the adjacent Rowardennan Woodlands SSSI (Prescott, 2015).

3.45.4 Recommendations

In the absence of definitive records, the moth assemblage at Craig Royston Woods is not a qualifying feature. Instead, the moth assemblage of Rowardennan Woodlands SSSI should be reviewed to determine whether it may be a qualifying feature there.

3.46 Craigellachie

3.46.1 SSSI citation (reviewed 17 November 2009)

"Craigellachie supports a rich diversity of northern moths which include the nationally scarce Kentish glory *Endromis versicolora*. Other local northern species include the Rannoch sprawler *Brachionycha* (*Asteroscopus*) *nubeculosa*, angle-striped sallow *Enargia paleacea*,

scarce prominent *Odontosia carmelita*, great brocade *Eurois occulta* and cousin German *Protolampra sobrina*. Birch is the larval food plant for most of these moth species with the great brocade dependant also on bog myrtle and willow *Salix* species. Other species include netted mountain moth *Macaria carbonaria*, which is found on the heath above the woodland, and feeds on bearberry *Arctostaphylos uva-ursi*."

3.46.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moth assemblage.

3.46.3 Discussion

Among the number of moth species, the Rannoch sprawler, cousin German and netted mountain moth are RDB3, the Kentish glory and great brocade are Nationally Notable A, the angle-striped sallow is Nationally Notable B and the scarce prominent is Local (Manley, 2008). Cousin German and netted mountain moths are UK Priority Species.

Among the RDB3 species, the Rannoch sprawler was searched for in the larval form during SCM in 2003 and 2004 and was not found, though the species was recorded in 2004 at light traps adjacent to the site (Prescott *et al.*, 2006). The cousin German and netted mountain moths were not searched for in that SCM round. SCM visits in 2013 were more successful; four Rannoch sprawlers were recorded in three traps and a single cousin German was light-trapped. The netted mountain moth was, again, not searched and a single specimen from 1957 remains the only record (Prescott, 2015).

Of the Scarce species, the Kentish glory was not found in 2003 or 2004 and no previous record for the site could be traced, although there is a record of larvae found adjacent to the site in 1989 (Prescott *et al*., 2006). However, in 2013, single Kentish glory moths were recorded in three light traps (Prescott, 2015). A great brocade was recorded in 2004 (Prescott *et al.*, 2006) and another in 2013 (Prescott, 2015). An angle-striped sallow was light-trapped in 2006 (Prescott *et al.*, 2006) and two were caught in 2013 (Prescott, 2015). The Local species, the scarce prominent, was recorded in good numbers in both rounds of SCM.

The presence of all species listed in the citation, with the exception of the netted mountain moth, indicates the importance of the site for moths. The rich assemblage of Rare and Scarce species is a qualifying feature and continued direct monitoring is appropriate.

There are records of seven flies and three beetles that were RDB species at the time of the ISR. Dated records (two are undated) stem from the 1970s to the 1990s. The biology of some of the species is little known, and several species have a diverse range of habits, such as parasitic, saproxylic and aquatic. Whilst further surveys would be required to confirm the species status, Craigellachie may host assemblages of flies and beetles that meet qualifying features criteria.

3.46.4 Recommendations

The moth assemblage is a qualifying feature and direct monitoring should continue.

Records of flies and beetles suggest that these assemblages may also be important. Therefore, alternatively, the invertebrate assemblage as a whole could be regarded as a qualifying feature, thus encompassing elements of the fly and beetle faunas and the moth assemblage. However, the diverse biology of potentially important species may make monitoring a challenge.

3.47 Crannach Wood

3.47.1 SSSI citation (reviewed 14 January 2009)

"Several species of arboreal insects characteristic of ancient native pine/birch woodlands have been recorded within the site. Many of these are ancient woodland indicator species and are also nationally scarce, such as the flat pine beetle *Pytho depressus* and the longhorn beetle *Saperda scalaris*. Another special insect present at this site is the northern emerald dragonfly *Somatochlora arctica*, a species which is restricted to the north-west of Scotland."

3.47.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Invertebrate assemblage.
	Invertebrates:	Northern emerald (*Somatochlora arctica*).

3.47.3 Discussion

The citation mentions two beetle species, *P. depressus* and *S. scalaris*. *P. depressus* is a Nationally Notable A species that lives under bark of Scots pine. *S. scalaris* is a Nationally Notable A species whose larvae develop in dead wood of broadleaved trees (Hyman & Parsons, 1992). The ISR lists also the RDB3 beetle *Rhopalodontus perforatus*, the Nationally Notable A beetle *Pityogenes quadridens*, and eight Nationally Notable B species, though all are undated. *R. perforatus* occurs on polypore fungus on birch (*Betula*) and *P. quadridens* breeds under the bark of Scots pine (*Pinus sylvestris*). Hyman & Parsons (1992) list no records of these two species from the Argyll & Bute region, although the records probably predate that review. In any case, more information on the status of *R. perforatus* would be needed for it to be regarded as a key part of a qualifying feature. Of the eight Nationally Notable B species, seven are saproxylic, with three living under bark (*Quedius xanthopus*, *Scolytus ratzeburgi* and *Dendrophagus crenatus*) and four in dead wood (*Hylecoetus dermestoides*, *Diacanthous undulatus*, *Ampedus nigrinus* and *Rhagium inquisitor*) (Hyman & Parsons, 1992, 1994; Alexander, 2002). The Scarce hoverfly *Callicera rufa* is associated with rot holes in coniferous trees (Ball & Morris, 2014), and it was listed as being recorded in 1988. It was not recorded during a SCM visit in 2011, but the surveyor believed that the site still holds the species (Wilkinson, 2011). Given this list of Rare and Scarce species, albeit mostly with undated records, woodland invertebrates, dominated in particular by saproxylic species, should be regarded as the qualifying feature.

The ISR lists no dragonfly records. SCM visits in 2002 revealed four dragonfly species but not the northern emerald (Batty, 2002). However, SCM visits in 2013 did show that the northern emerald occurs as a breeding species, and four further species were recorded (Batty, 2013a). The northern emerald is more widespread than previously known, with records in 84 British hectads (all in Scotland) up to 2012 (Cham *et al*., 2014). As such, it does not appear to meet current JNCC criteria to be a qualifying feature in its own right. The current list of species falls short of the nine required by JNCC guidelines (Bainbridge *et al*., 2013).

During 2015 SCM, ten common beetle species were identified, five of which were saproxylic (Cathrine *et al.,* 2017b)

3.47.4 Recommendations

The invertebrate assemblage, particularly woodland invertebrates including a strong saproxylic component, is a qualifying feature. Indirect monitoring may be most appropriate for SCM purposes though species surveys should also be carried out.

Neither the northern emerald, nor the dragonfly assemblage as a whole, are qualifying features.

3.48 Crathie Wood

3.48.1 SSSI citation (reviewed 21 June 2011)

"The invertebrate fauna includes a number of scarce species such as the bug *Zygimus nigriceps*, the moth *Exaeretia ciniflonella*, the northern brown argus butterfly *Aricia artaxerxes* and the mountain whorl snail *Vertigo alpestris*."

3.48.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.48.3 Discussion

No ISR was available to assist with this assessment.

The true bug *Z. nigriceps* is found on juniper (*Juniperus communis*) in the eastern Highlands and Speyside and is classed as Notable (Kirkby, 1992). It had been thought to be very rare or perhaps even extinct in the British Isles (Southwood & Leston, 1959).

The micro-moth *E. ciniflonella,* classed as pRDB1 (Davis, 2012), feeds on birch (*Betula*). In UK it has been found since 1955 only at Rannoch, Glen Affric and Deeside (Emmet & Langmaid, 2002b). The Deeside record refers to Crathie Wood (Mark Young, pers. comm.).

The northern brown argus can be a qualifying feature at up to five sites in an AOS that contains a substantial proportion of the British colonies (Bainbridge *et al*., 2013), and the Kincardine & Deeside AOS is indeed important for the species. Sufficient data do not exist to compare the relative strength of sites so a precautionary approach would be to regard the northern brown argus as a qualifying feature.

V. alpestris is regarded as Nationally Scarce (Seddon *et al*., 2014). The main part of its range is in northern England, but it is also found in mid-Wales and in the east Highlands (Kerney, 1999).

SCM in 2013 focussed on searches for the four species named in the citation, and it was successful in locating the northern brown argus and *V. alpestris* (Cathrine *et al*., 2015) In addition, a single dark-bordered beauty moth (*Epione vespertaria*) was recorded. This is a RDB3 species with known Deeside colonies in just two sites. Both are within 2 km of the site where the moth was recorded in 2013 and there was no indication in the report as to whether suitable habitat existed (Cathrine *et al*., 2015). Thus it is not known whether the record reflects a potential breeding site or a wandering individual. In the absence of further information, *E. vespertaria* should not be regarded as a qualifying feature.

3.48.4 Recommendations

Of the species listed, just *E. ciniflonella* is classed as Rare and, given the importance of Crathie Wood for the species, it may be a qualifying feature in its own right. The northern

brown argus may also be a qualifying feature. Both could be monitored directly by daytime searches around the larval food plant. There is insufficient evidence to consider the whole invertebrate assemblage as a qualifying feature.

3.49 Creag nan Gamhainn

3.49.1 SSSI citation (reviewed 31 March 2010)

"The site includes many insects associated with the calcicole plants and in particular the rare northern brown argus butterfly *Aricia artaxerxes*, the larvae of which feed on rockrose."

3.49.2 Notified invertebrate feature(s)

Biological: Butterflies: Northern brown argus (*Aricia artaxerxes*).

3.49.3 Discussion

The northern brown argus can be a qualifying feature at up to five sites in an Area of Search that contains a substantial proportion of the British colonies (Bainbridge *et al*., 2013). Although “a substantial proportion” is not quantified, the Moray & Nairn Area of Search probably does meet this criterion as it holds 12 tetrads with post 1980 records out of 43 in the whole of Highland and Moray combined (Barbour *et al*., 2008). However, the strength of the population at Creag nan Gamhainn is unclear, and it appears that no SCM review has yet been carried out for the species. If a strong colony does exist at the site, it may be a qualifying feature. In absence of data to compare colony strengths between different sites, it would best be regarded as such. Direct monitoring through surveys of adults and eggs on the larval food plant, common rock-rose (*Helianthemum nummularium*), should be carried out to determine the status and relative abundance of the species at the site.

The ISR lists two RDB cranefly species, *Dicranota simulans* (RDB3) and *Gonomyia edwardsi* (RDBK). *D. simulans* occupies upland stream sides in northern parts of Britain (Falk, 1991b). *G. edwardsi* was found new to Britain by a riverbank in East Ross in 1976. The Creag nan Gamhainn record is dated at 1981. At the time that the review was compiled, those records represented the only ones in the Area of Search for both species. Thus, both could be considered together as key elements of a cranefly qualifying feature. Both species were sought during SCM in 2003 but neither was found (Godfrey, 2004). Direct monitoring may, therefore, be challenging and indirect monitoring of habitat resources may be more appropriate.

3.49.4 Recommendations

The northern brown argus may be a qualifying feature but direct survey or monitoring would be required to determine if the site holds a strong colony.

The craneflies *D. simulans* and *G. edwardsi* are a qualifying feature though they are not a notified feature. Indirect monitoring of habitat resources is probably the most appropriate approach for these species.

3.50 Culbin Sands, Culbin Forest and Findhorn Bay

3.50.1 SSSI citation (reviewed 2 June 2011)

"The site is of national importance for its exceptionally diverse entomological interest including several rarer species of fly, beetle, moth and butterfly."

3.50.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.50.3 Discussion

Extensive entomological recording has been carried out across this site to reveal a wide range of species, including at least 14 Rare and 33 Scarce species (Table 4).

Table 4. Rare and Scarce invertebrates listed in the Invertebrate Site Review for Culbin Sands, Culbin Forest and Findhorn Bay SSSI. The figures include species provisionally assigned to the respective RDB category.

	RDB1	RDB2	RDB3	RDBK	RDBI	Notable A	Notable B
Coleoptera		1	2	1	1	2	10
Diptera	1		6				14
Hymenoptera			2				
Lepidoptera						2	5

The RDB species, excluding the sawflies *Pontania tuberculata* and *Bledius arcticus*, for which Benson (1958) gives scant information, fall into three categories that might each be treated as assemblages (Falk, 1991b). The beetle *Thanasimus rufipes* and the flies *Chamaesyrphus caledonicus*, *Laphria flava* and *Rhadiurgus variabilis* are associated with pinewoods. The beetles *Ochthebius lenensis* and *Bledius erraticus* and the flies *Calobata stylifera* and *Tetanocera freyi* are associated with wetland habitats, including saltmarsh. The beetle *Bledius arcticus* and the flies *Tipula nodicornis* and *Tipula juncea* are associated with sand or shingle.

Some of the species may be qualifying features in their own right. For example, the hoverfly *C. caledonicus* is regarded as Vulnerable. There are records from just three post1980 hectads, with most of them from Culbin (Ball & Morris, 2014). The saltmarsh water beetle *O. lenensis* is endangered and has been recorded in just four hectads since 1980 (Foster, 2010a) and is probably also a qualifying feature.

A direct search took place for the hoverfly *C. caledonicus* as part of a SCM round in 2003 (Godfrey, 2004). Four individuals of the species were located, along with one of *Chamaesyrphus scaevoides*, a Nationally Scarce species associated with Caledonian pine forests (Ball & Morris, 2014). A further SCM visit in 2010 focussed primarily on indirect monitoring of fly features, with just limited direct monitoring, and no Rare species were recorded (Wilkinson, 2010). The success of the 2003 monitoring shows that direct monitoring could be appropriate, especially considering that Culbin is the best known site for those species in the UK. Such monitoring could be combined with general survey of pinewood species, especially flies.

A SCM visit in 2003 focussed on a search for *O. lenensis*, although it was not located (Eyre, 2003b). The visit did result in a record of the water beetle *Acilius canaliculatus*, which is classed as Nationally Scarce (Foster, 2010a). *O. lenensis* was found during a subsequent SCM visit in 2010, at a part of the SSSI from which it had not previously been recorded (Foster, 2010b). If monitoring of this species is to continue, direct monitoring of occupied water bodies would be appropriate.

A total of 47 spider, 47 beetle and 27 Hymenoptera species were identified during 2015 SCM survey, including four Nationally Scarce and seven on the Scottish Biodiversity List (Cathrine *et al.,* 2017b).

3.50.4 Recommendations

The invertebrate assemblage is a qualifying feature.

Within this feature, assemblages associated specifically with pinewoods, wetland features and with sand and shingle, could each be a qualifying feature and are best each treated separately for monitoring purposes.

Several species may be qualifying features in their own right. These include, especially, the hoverfly *C. caledonicus* and the beetle *O. lenensis*. Both have been successfully located during previous SCM visits so continued direct monitoring may be appropriate.

3.51 Dalkeith Oakwood

3.51.1 SSSI citation (reviewed 10 March 2010)

"The Oakwood supports a species-rich beetle fauna, the majority of which is dependent upon deadwood habitats, and includes several nationally scarce species."

3.51.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.51.3 Discussion

The ISR lists two Nationally Notable A beetle species, one of which, *Aplocnemus nigricornis*, is known from just one other Scottish site, and six Nationally Notable B beetle species. Furthermore, *Lyctus brunneus* and *Phymatodes testaceus* (both local species) have been recorded within Scotland solely at Dalkeith Oakwood (Alexander, 2011). Records for three of these species, including one of the Nationally Notable A beetles, *Dryocoetinus alni*, are undated whilst the record of *A. nigricornis* is from 1899. The remaining Scarce species were recorded in 1994 (Sullivan, 1994). *P. testaceus* is listed with an unknown date, but it was found during a SCM visit in 2011 (Alexander, 2011).

Among the saproxylic species, *A. nigricornis* may be associated with hollow oaks (*Quercus*); *D. alni* lives in timber of freshly dead alder (*Alnus glutinosa*), beech (*Fagus sylvatica*), grey willow (*Salix cineraria*) and hazel (*Corylus timber*); *Ptinus subpilosus* is mainly found under bark in old hollow oaks and pines (*Pinus*); *Hallomenus binotatus* develops in polypore fungi fruiting bodies in ancient wood pastures; *Ctesias serra* is found under bark or in rotting trees or stumps of mainly broad-leaved, over mature trees; *L. brunneus* develops in dead hard timber and *P. testaceus* develops in dead branches, boles and logs of broadleaved tree (Alexander, 2002).

Two further Scarce saproxylic beetles were found during SCM in 2003 (Eyre, 2003a), namely *Gyrophaena angustata,* which is associated with bracket fungi, and *Cerylon fagi,* which is found under bark of deadwood and within decaying heartwood, especially oak (Alexander, 2002).

The saproxylic beetle fauna, although represented by a mix of old and recent records, is of considerable interest and forms the most important part of the beetle assemblage. Although the guidelines for selecting SSSIs do not set strict thresholds, the number of Scarce species recorded is probably sufficient to consider the saproxylic beetle assemblage as a qualifying feature.

The three remaining Scarce beetles listed do not fit within the saproxylic assemblage. *Philonthus mannerheimi* is a rove beetle of wetland habitats (Hyman & Parsons, 1994), *Leiodes rugosa* is associated with sand and chalky areas (Hyman & Parsons, 1994) and *Carabus nitens* is a species of wet upland heath and moors with *Sphagnum* (Hyman & Parson, 1992; Luff, 1998). Given their diverse habits, these do not fit well with monitoring of the saproxylic fauna.

3.51.4 Recommendations

The beetle assemblage, especially the saproxylic beetle assemblage, is a qualifying feature. SCM should be carried out by indirect assessment of dead wood resources though supplemented by periodic species surveys.

3.52 Dam Wood

3.52.1 SSSI citation (reviewed 2 November 2007)

"The site also supports the narrow-bordered bee hawk moth, a nationally rare species, and the chestnut-coloured carpet, a moth whose larvae feed on juniper."

3.52.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moths.

3.52.3 Discussion

The citation describes the narrow-bordered bee hawk-moth (*Hemaris tityus*) as “rare”, but it is not Rare in the formal RDB definition. It is now considered Nationally Notable B (Waring & Townsend, 2003). Its larvae feed on devil’s-bit scabious (*Succisa pratensis*) among wet grassland, such as within the site’s notified Habitats, lowland wet heath and Fen. The chestnut-coloured carpet (*Thera cognata*) is likewise classed as Nationally Notable B. It feeds as a larva on juniper (*Juniperus communis*). The site is a Special Area of Conservation, with “Juniper on heaths or calcareous grasslands” being one of the two listed European habitats. Both moths are still present at the site (Prescott, 2015) but it is doubtful that they form an assemblage of sufficient quality to be regarded as a qualifying feature. The habitat resources of the named species may best be monitored through notified habitats.

Medetera melancholica, a RBD3 fly, is listed from 1983. However, as a single RDB species from one of the less well monitored invertebrate groups, it also may not meet JNCC's qualifying feature guidance.

3.52.4 Recommendations

The moth assemblage is not a qualifying feature.

3.53 Den of Airlie

3.53.1 SSSI citation (reviewed 17 November 2010)

"There is a rich invertebrate fauna with notable species of beetles, flies and molluscs, including the fungus gnat *Gnoriste bilineata*, the snail *Malacolimax tenellus* and the beetle of dead or decaying wood *Dendrophagus crenatus*."

3.53.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.53.3 Discussion

The citation mentions three species from different invertebrate orders and occupying rather different ecological niches. All are Nationally Notable B species. There are further records of three Nationally Notable B fly species.

During SCM in 2015, seven beetle species were collected, but not *D. crenatus* (Cathrine *et al.,* 2017b). There were also records for 107 Diptera species, including *Palloptera laetabilis* (RDB2) and *Tipula laetabilis* (RDB2). *P. laetabilis* has not been recorded in the UK since 1907 and was thought to be extinct. A total of 21 terrestrial mollusc species were recorded, including *M. tenellus* and three Scottish Biodiversity List species: *Arion hortensis*, *Cochlodina laminata* and *Oxychilus navarricus*. The mollusc assemblage is typical of old woodland and contains several new hectad records. None of the finds were unexpected, and most of the previously known malacofauna was found.

3.53.4 Recommendations

The invertebrate assemblage is a qualifying feature. Monitoring should focus on woodland fly and mollusc species.

3.54 Doire Donn

3.54.1 SSSI citation (reviewed 30 July 2008)

"In addition to its woodland, the site is also of national importance for its invertebrates and supports two rare species of beetle, *Bolitophagus reticulatus* and *Schizotus pectinicornis*, and also a significant breeding colony of the nationally scarce chequered skipper butterfly."

3.54.2 Notified invertebrate feature(s)

Biological: Butterflies: Chequered skipper (*Carterocephalus palaemon*).

Invertebrates: Beetles.

3.54.3 Discussion

The chequered skipper has been recorded at Doire Donn from 1961 to 1988 at least and it is classified as endangered (Fox *et al*., 2010). The site lies within the South Lochaber Area of Search, and it is one of four that encompasses the whole UK range of this species. From 1993 to 2001, butterfly transects were walked on the site, with peak annual counts ranging from 2 to 26 butterflies. Four were recorded on a SCM visit in 2013 (Prescott, 2015). The five strongest colonies in each Area of Search qualify for protection through the SSSI network (Bainbridge *et al*., 2013). Sites in the Area of Search have not been ranked, and until any such assessment is made, the chequered skipper should continue to be regarded as a qualifying feature.

The beetle *B. reticulatus* lives in bracket fungus on birch (*Betula*) (Hyman & Parsons, 1992). In Britain, it is confined to Scotland and assessed as being Nationally Scarce (Alexander *et al.,* 2014). The beetle *S. pectinicornis* lives in dead wood of broadleaved trees and, in Britain, is found in the Scotland Highlands and Welsh Borders (Alexander, 2002). It is a Nationally Notable A species (Hyman & Parsons, 1992). *B. reticulatus* was recorded during SCM visits in 2003 along with the Nationally Notable B species *Malthodes guttifer* and *Dendrophagus crenatus*, both also saproxylic (Eyre, 2003a). *B. reticulatus* and *S. pectinicornis* were recorded during a further SCM visit in 2010 along with the Nationally Notable B species *Cis jacquemartii* and *Cis festivus*, both of which are also saproxylic. In addition, the Nationally Scarce *Traumoecia picipes* was recorded. Whilst not generally regarded saproxylic, this species is often recorded in dead wood (Telfer, 2011). Although the list of beetles contains no species that are now classed as Rare, the presence of seven Scarce species, at least six of which are saproxylic, indicates the site's potential to support an important assemblage of saproxylic beetles.

The ISR refers to a record of the cranefly *Limonia aperta* from 1982, the only post-1980 British record. The species is classed as RDB1, and although its biology is unknown, it probably inhabits boggy ground (Falk, 1991b).

3.54.4 Recommendations

The chequered skipper should be regarded as a qualifying feature and should be monitored directly.

The beetle assemblage, especially the saproxylic beetle assemblage, should be regarded as a qualifying feature. SCM should be carried out by indirect assessment of dead wood resources, supplemented by periodic species surveys.

The cranefly *L. aperta* is probably a qualifying feature in its own right, though is not a notified feature. Attempts should be made to establish its current status at the site.

3.55 Dollar Glen

3.55.1 SSSI citation (reviewed 26 January 2011)

"The fauna includes *Stenus glacialis*, a beetle of mountains and high altitude. It is a species of restricted occurrence and is only known from two localities in Scotland."

3.55.2 Notified invertebrate feature(s)

Biological: Invertebrates: A beetle (*Stenus glacialis*).

3.55.3 Discussion

The RDBK rove beetle *S. glacialis* is a montane species occupying wet moss areas. (Hayman & Parsons, 1994). In Britain and Ireland, it has been recorded in five Scottish hectads, one at the England/Scotland border and one in Wales (Denton, 2013). Given its montane habitat, more records might be expected in the Highlands (Horsfield, 1992). The occurrence at Dollar Glen dates from 1960 to 1982. The species was not found during a SCM visit in 2003 and the surveyor reported that it was hard to determine where the species had been recorded, as most of the habitat was well drained grass moor, with few wet areas and moss (Eyre, 2004). *S. glacialis* was also not recorded during SCM survey in 2013. However, through communication with the original recorder of the species, Richard Lyszkowski, the authors reported that the record refers to a single specimen collected at the sheltered slopes of King's Seat Hill (Cathrine *et al*., 2015). Given the beetle's rarity status, it may be a qualifying feature.

Other species listed include the Nationally Scarce B rove beetle *Omalium laticolle,* a woodland species (Hyman & Parsons, 1994), and the Nationally Scarce B ground beetle *Patrobus septentrionis*, a montane species found primarily in Scotland (Luff, 1998) and recorded in 2013 (Cathrine *et al*., 2015). These species could be considered alongside *S. glacialis* as part of a beetle assemblage, although only the latter could be combined with *S. glacialis* for monitoring.

The ISR also lists a 1992 record of the cranefly *Lipsothrix ecucullata*, a species of seepages in damp woods in highland districts listed as RDB2 by Shirt (1987) but revised to RBD3 by Falk (1991b), and it is a UK Priority Species. It was not recorded from Dollar Glen during visits to a number of sites in 1999 and 2000 to collect cranefly larvae for rearing (Rotheray, 2000).

3.55.4 Recommendations

The beetle *S. glacialis* may be a qualifying feature. Efforts should be made to confirm its presence, although indirect monitoring of upland habitat features is likely to be more instructive for SCM purposes.

As a Rare species at probably its only known site in the Area of Search (Littlewood & Stockan, 2013), the cranefly *L. ecucullata* probably meets the JNCC qualifying feature criteria, although it is not a notified feature. Efforts should be made to confirm its presence and assess its status.

3.56 Dundonald Wood

3.56.1 SSSI citation (reviewed 15 April 2010)

"The site supports a variety of uncommon invertebrates, mostly associated with dead and/or decaying wood or associated habitats such as fungi or sap runs. Among these are a number of Nationally Scarce beetles including the fungus beetle *Colon latum*; the bark beetle *Rhizophagus nitidulus*; the shining fungus beetle *Scaphisoma boleti* and the rove beetle *Xylostiba monilicornis*."

3.56.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.56.3 Discussion

Four beetle species are named in the citation, all of which are classed as Nationally Notable B and are included on the strength of records from between 1959 and 1964. The citation implies that the named species are saproxylic, though *C. latum* is not associated with dead wood. No other Rare or Scarce species are listed in the ISR. However, *Atomaria longicornis*, an RDBK species that in Britain is known just from a few Scottish sites, has also been recorded (Alexander, 2011).

Twenty species were recorded during a SCM visit in 2003 focussed on saproxylic beetles (Eyre, 2003a). These did not include any of the species named in the citation, though they included the Nationally Notable B species *Gyrophaena angustata*. The contractor reported that resources required by saproxylic species were limited across much of the site. A one-day SCM visit in 2010 produced records of just 13 beetle species, which did not include any of those named in the citation (Alexander, 2011). All species recorded are widespread.

Whilst the lack of recent records of Rare or Scarce species may be due to the relative brevity of SCM surveys, there is scant evidence that the beetle assemblage is of sufficient quality to be regarded as a qualifying feature. *A. longicornis* may be a qualifying feature though there is insufficient knowledge of its true status.

3.56.4 Recommendations

The beetle assemblage may not be a qualifying feature, However as the relative value of the site for saproxylic beetles has been recognised previously, it would be desirable to survey the fauna more comprehensively over a longer time period before confirming such an assessment.

3.57 Dunhog Moss

3.57.1 SSSI citation (reviewed 5 August 2010)

"The moss and fen pools of this site have a diverse assemblage of aquatic beetles with over thirty species recorded. It is one of only a few sites in the Scottish Borders to have such a high diversity. Amongst these, *Hydroporus glabriusculus* and *Laccornis oblongus* are Red Data Book species, with the latter having an extremely localised British distribution."

3.57.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.57.3 Discussion

The citation refers to two Rare water beetle species. *H. glabriusculus* is confined to undisturbed, relict fen and bog systems, and is classed as Vulnerable in the latest review (Foster, 2010a). *L. oblongus* is restricted to shallow, mossy areas of temporary base-rich fen and is classed as Near Threatened (Foster, 2010a).

SCM in 2002 produced a list of 20 water beetle species, taking the total for the site to 44 species (Eyre, 2003c). Species recorded included *L. oblongus* and *Enochrus ochropterus*, a species at the time classed as Nationally Notable B but later found not to meet Nationally Scarce criteria (Foster, 2010a). A SCM visit in 2010 produced records of 35 species, including the Rare species, *H. glabriusculus* and *L. oblongus* (Foster, 2010b). A SCM visit in 2015 produced records of 25 species, three of which were new for the site, although *H. glabriusculus* and *L. oblongus* were not located (Foster *et al*., 2017).

The extensive species list (56 following the 2015 visit) and the presence of two Rare species demonstrates an important assemblage that should be regarded as a qualifying feature. The ISR suggests that *H. glabriusculus* might be a qualifying feature as all its Scottish sites are in the Border Mires. However, as monitoring can be effectively combined with monitoring of other species in the assemblage, it is most useful simply to regard the water beetle assemblage as a whole.

The ISR lists a 1988 record of a Rare snail-killing fly, *Tetanocera freyi*. This RDB3 species is listed for 11 sites by Falk (1991b) of which five are in Scotland, although Dunhog Bog is not one of the listed sites. Selection of single species from less well recorded groups such as flies is generally not encouraged (Bainbridge *et al*., 2013), though there may be merit for reconsidering if an assemblage of Rare or Scarce species is discovered.

3.57.4 Recommendations

The water beetle assemblage is a qualifying feature and should be monitored directly.

3.58 Earlshall Muir

3.58.1 SSSI citation (reviewed 23 February 2011)

"The invertebrate fauna is diverse including the Grayling butterfly *Hipparchia semele* and several rare beetle species including *Arena tabida* and *Pissodes validirostris*."

3.58.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
	Butterflies:	Grayling (*Hipparchia semele*).

3.58.3 Discussion

The beetles *A. tabida* and *P. validirostris* are classed as RDBK and RDB3, respectively. *A tabida* is a coastal rove species and, though very local in distribution, has been recorded from a wide scatter of locations in Britain (Hyman & Parsons, 1984). *P. validirostris* is a weevil of conifer woodlands and, within Great Britain, has only been recorded in Scotland (Hyman & Parsons, 1992). Records for both species are listed for the date range 1960-1982 in the ISR.

A further six Scarce beetle species are listed in the ISR. Three are Nationally Notable A; *Tropiphorus obtusus* is a species of open ground, including sand dunes, while *Megdalis duplicata* and *Megdalis phlegmatica* occupy conifer woodlands (Hyman & Parsons, 1992). Three are Nationally Notable B: *Baeckmanniolus dimidiatus* occupies strandlines and dune, *Leiodes cinnamomea* occupies woodland and pasture wood, and *Cleonus piger* is a sand dune and unstable cliff species (Hyman & Parsons, 1992; Hyman & Parsons, 1994).

The two Rare beetle species were not recorded during SCM in 2013 though *Cercyon littoralis* was noted (Cathrine *et al.,* 2015). This is a Nationally Scarce water beetle (Foster, 2010a) associated with strandlines.

The Rare and Scarce beetles recorded are sufficient to be a qualifying Assemblage. The species fall neatly into one group associated with coastal habitats and another of woodlands, especially conifer woodland. Thus, it would be efficient to direct future monitoring at these two elements of the assemblage. Direct monitoring should be attempted but if the species

concerned prove to be difficult to locate, this should be supplemented by indirect monitoring of habitat resources.

The two strongest colonies of grayling butterfly within an Area of Search should be considered for selection in the SSSI network (Bainbridge *et al*., 2013). The Area of Search (North East Fife) has two hectads with post-2000 records of the species (Fox *et al*., 2006a; http://www.eastscotland-butterflies.org.uk/butterflydistribution.html - html accessed 05/11/2015). The ISR lists the species as being at Earlshall Muir in 1988 though it has been recorded more recently at the adjacent Tayport-Tentsmuir Coast SSSI and may still be present at Ealshall Muir. An attempt should be made to establish the relative importance of the site for Grayling.

3.58.4 Recommendations

The beetle assemblage is a qualifying feature. Monitoring should be focussed on two distinct assemblages: those associated with woodland and those associated with coastal habitats. Direct monitoring should be attempted but supplemented by indirect monitoring of habitat resources if necessary.

The grayling butterfly may be a qualifying feature but an assessment should be made of the relative importance of the colony. If it is a qualifying feature, it should be monitored directly.

3.59 Eastern Cairngorms

3.59.1 SSSI citation (reviewed 29 March 2012)

"Many invertebrate species occur in the Eastern Cairngorms including rare flies, moths, butterflies, beetles and ants. One species restricted to high ground is the fungus gnat *Macrocera zetterstedti*. The delicate craneflies *Rhabdomastix inclinata* and *R. laeta* have been recorded along the River Avon and Lui Water. Two colonies of the rare mountain burnet moth *Zygaena exulans* are found along with the northern dart *Xestia alpicola*, both of which feed on crowberry in the mountains. The nationally declining pearl-bordered fritillary *Boloria euphrosyne* is found by Glen Lui. Several beetles were first recorded in Britain from the Eastern Cairngorms: *Corticarina latipennis*, the wood-boring beetle *Ostoma ferugineum* and the dung beetle *Cercyon alpinus*. The rare ant *Formica exsecta* has been recorded in Doire Bhraghad by Glen Lui."

3.59.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.59.3 Discussion

An extensive range of invertebrate species has been recorded from this large SSSI. These include 40 species labelled as Rare in the ISR and 93 labelled as Scarce (Table 5).

Table 5. Red Data Book invertebrates at Eastern Cairngorms SSSI. The figures include species provisionally assigned to the RDB categories.

	RDB1	RDB2	RDB3	RDBK	RDBI	Notable A	Notable B
Araneae							1
Coleoptera	2		3	4	1	10	35
Diptera	3	6	16	2			31
Hemiptera							4
Hymenoptera	1						1
Lepidoptera			1			4	5
Mollusca	1						2

The invertebrate assemblage as a whole is clearly a qualifying feature. However, given the site's range of altitudes, coupled with the presence of woodlands, freshwater and upland habitats, these species can be broken down into smaller assemblages associated with such features. Basic habitat information was assembled for all the rare species except four of the fly species, for which information could not be found (Falk, 1991a, b; Hyman & Parsons, 1992, 1994; Kerney, 1999; Falk & Chandler, 2005; Falk & Crossley, 2005).

Twenty-three of the Rare species are associated with woodland habitats, of which 15 are particularly associated with conifer woods, primarily Caledonian pinewoods. Five of the Rare species are associated mostly with upland habitats ranging from bog and heather moor to mountain tops. Eight of the Rare species are linked to wetland features, in all cases streams or rivers. These range from fast-flowing upland streams and rivers. Each of these can be considered to be a qualifying Assemblage, although the constituent species will have a wide range of specific resource requirements.

Given the extensive ranges of species involved, monitoring would have to be carried out primarily by indirect monitoring of habitats. However, the RDB1 species in particular warrant special attention. These comprise the beetles *Atomaria hislopi* and *Ostoma ferrugineum*, both of which are associated with pinewoods, the fly *Heleodromia irwini*, associated with streams, the flies *Phronia caliginosa* and *Sciophila limbatella*, associated with pinewoods, the narrow-headed ant (*F. exsecta*), found in boggy areas within open pinewoods, and the snail *Vertigo geyeri,* from bogs and fens. Most of these species have recent records (1999 or 2000) and should be considered for direct monitoring. Other more readily located species in each broad habitat type could be chosen for direct monitoring.

Only two SCM reports were available for this review. One was a one-day visit in 2003 focussed on the RDB2 cranefly *R. inclinata*, though the species was not found (Godfrey, 2004). The other SCM work, in 2013 and 2014, focussed on a range of species, namely the beetle *Bolitophagus reticulatus*, the narrow-headed ant, the Scotch burnet moth (*Zygaena exulans*), and the snail *V. geyeri*. A single specimen *of B. reticulatus* was found, as were 16 nests of narrow-headed ant (all of which were previously known). The Scotch burnet and *V. geyeri* were not located (Cathrine *et al.,* 2015). However, the Scotch burnet had been found in good numbers during a comprehensive survey in 2009, when six colonies were located across the known range of the species. Two were within the SSSI, including at Ben Avon (the largest colony found) and one straddled the SSSI boundary (Moore, 2009). This species thus provides opportunities for direct monitoring, using the 2009 survey as a baseline.

3.59.4 Recommendations

Assemblages associated with each of the notified habitats, namely woodlands, freshwater and upland habitats, are qualifying features.

Due to the range of Rare and Scarce species present on the SSSI, monitoring would need to be largely indirect monitoring of habitat resources. However, the RDB1 species warrant attempts at direct monitoring.

3.60 Ellary Woods

3.60.1 SSSI citation (reviewed 4 March 2011)

"This is an excellent site for dragonflies with 12 species recorded. These included keeled skimmer *Orthetrum coerulescens* which has a restricted distribution in Scotland and southern hawker *Aeshna cyanea* which breeds in the coastal pools enjoying the mild conditions of the west coast."

3.60.2 Notified invertebrate feature(s)

Biological: Invertebrates: Dragonfly assemblage.

3.60.3 Discussion

The ISR lists 11 species of dragonfly, which were recorded along the keeled skimmer during SCM visits in 2002, with evidence of breeding for all species (Batty, 2002). All 12 species were again recorded during SCM in 2013 (Batty, 2013a). This assemblage exceeds the required nine species (Bainbridge *et al*., 2013).

3.60.4 Recommendations

The dragonfly assemblage is a qualifying feature that should continue to be directly monitored.

3.61 Endrick Mouth and Islands

3.61.1 SSSI citation (reviewed 26 February 2010)

"The site is rich in invertebrates and there are three Red Data Book saproxylic species known from here; *Eutheia linearis*, a rove beetle *Tachinus rufipennis* and an ant beetle *Anthicus flavipes*. The endangered beetle *Eutheia linearis* lives in rotting vegetable material on Inchcailloch. In addition the Red Data Book aquatic beetle *Hydroporus rufifrons* inhabits this site. "

3.61.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.61.3 Discussion

The key species in the citation is *Eutheia linearis*. This is a saproxylic RDB1 species of ancient woodland (Hyman & Parsons, 1994). Hyman & Parsons (1994) and Alexander

(2002) regard the Loch Lomond records as unconfirmed. However, the collection of the original recorder, Roy Crowson, held in the Hunterian Museum, was checked by Geoff Hancock and found to include eight specimens of *E. linearis* from Loch Lomondside, with identification confirmed by Peter Hammond. Records at Endrick Mouth and Islands are from the early 1980s (Kirkland *et al.*, 2012). Given the species' rarity and that it has not been recorded at its former English sites since 1934 (Hyman & Parsons, 1994), it could be regarded as a qualifying feature.

Three other Rare beetles are listed in the ISR: *Anthicus flavipes* (listed in the review as *A. scoticus*) (RDB3), *Tachinus rufipennis* (RDB3) and *Hydroporus rufifrons* (RDB2). *A. flavipes,* recorded in 1983, occupies muddy sand or silted sites (Hyman & Parsons, 1992). *T. rufipennis,* listed as recording date unknown, is a woodland species found in dung, vegetable litter, fungi, dead birds and carrion (Hyman & Parsons, 1994). *H. rufifrons,* recorded in 1989, occurs in shallow and temporary pools (Foster, 2010a). The ISR lists eight further Notable B beetle species.

The citation states that *E*. *linearis*, *T*. *rufipennis* and *A*. *flavipes* are saproxylic, but in fact only the first is generally regarded as saproxylic (Alexander, 2002).

SCM in 2003 (Eyre, 2004) and 2011 (Kirkland *et al.*, 2012) did not find any of the RDB species listed above, but the latter visit did produce a record of the RDB3 species *Donacia aquatica*, which occurs in emergent aquatic vegetation at the margins of still and slow-moving water (Foster *et al*., 2007).

The range of Rare species recorded justifies considering the beetle assemblage as a qualifying feature. The habits of these species are varied, though the two Rare aquatic beetles, both also UK Priority Species, may justify monitoring the aquatic beetle fauna. The remaining species may prove to be difficult to locate.

3.61.4 Recommendations

The Rare beetle *E. linearis* is a qualifying feature. Direct monitoring should be attempted, given the importance of the site for the species, though supplemented by indirect monitoring of the quantity and quality of dead wood resources.

The beetle assemblage is a qualifying feature. Most species may be best monitored indirectly through assessment of habitat quality, although water beetles could be monitored directly, focussing specifically on the two Rare species.

3.62 Fannich Hills

3.62.1 SSSI citation (reviewed 26 May 2010)

"The Fannich Hills support a diverse assemblage of both beetles and flies, which includes a number of species confined to Scotland. Of particular interest is the leaf beetle *Phyllodecta polaris*, which is only found at a few upland sites in the UK."

3.62.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Flies.

3.62.3 Discussion

The citation is rather vague in its description of the notified features. Just one species is mentioned, the leaf-beetle *P. polaris*. The species was classed as RDB3 (Shirt, 1987) and later as Near Threatened (Hubble, 2014). It occurs at altitudes of 700 to 1100 m in north and west Scotland and is associated with dwarf willow (*Salix herbacea*) and the moss *Racomitrium lanuginosum*. The species was initially recorded on two summits in the Fannich Hills in 1987. The ISR also lists a record of the RDBK rove beetle *Stenus glacialis*. The Fannich Hills record dates from 1982/83 (Kirkland *et al.*, 2012). Three further Scarce beetles are named in the ISR; *Bryoporus rugipennis*, *Eudectus whitei* and *Nebria nivalis*. All are primarily northern, upland species (Hyman & Parsons, 1992; 1994).

Neither of the Rare species was recorded during a SCM visit in 2011 though this was hampered by bad weather. SCM fieldwork in 2015 resulted in records for *P. polaris* but not for *E. whitei* and *B. rugipennis*. A total of 22 species were recorded, including another four Nationally Scarce species: *Nebria nivalis*, *Patrobus septentrionis*, *Cymindis vaporariorum* and *Geodromicus longipes* (Cathrine *et al*., 2017a).

The ISR identifies four fly species that were RDB species at the time of notification, namely *Calliphora stelviana*, *Clinocera nivalis*, *Boletina groenlandica* and *Delia caledonica*. All were recorded in 1982. *C. stelviana* is now regarded as Notable (Horsfield & MacGowan, 1997), *C. nivalis* is now classed as Near Threatened (Falk & Crossley, 2005), *B. groenlandica* is classed as Nationally Scarce (Falk & Chandler, 2005) and *D. caledonica* is regarded as RDB2 (Horsfield & MacGowan, 1997). Thus *D. caledonica*, with records from just six hill ranges or other areas within six hectads (Horsfield & MacGowan, 1997), could be a qualifying feature in its own right. Two further species recorded were formerly classed as Rare, namely *Hydroporus rufibarbis* and *Campsicnemus compeditus*, classed as RDB2 and RDB3 respectively (Shirt, 1987), but more recently accorded Local status.

A SCM visit in 2003 recorded just one of the fly species listed above, *H. rufibarbis* (Godfrey, 2004). A SCM visit in 2010 assessed the status of the fly assemblage by indirect monitoring of habitat features and found that the features required by all current and former Rare species listed remained present (Wilkinson, 2010).

3.62.4 Recommendations

The combination of Rare and Scarce beetle species, all linked to an uncommon habitat that is likely to be relatively species-poor due to the extreme environment, suggest that the beetle assemblage is indeed a qualifying feature. As key species are difficult to locate, indirect monitoring of habitat features may be more suitable for SCM purposes.

The list of Rare and Scarce fly species that are specialists of upland and mountainous sites justifies their qualifying feature status. Regular direct monitoring may be challenging, especially given the difficulties of fieldwork in upland environments. Indirect monitoring may be most appropriate for this feature for SCM purposes.

3.63 Fiddler Gill

3.63.1 SSSI citation (reviewed 18 March 2010)

"Micro-climatic conditions in the sheltered, south-facing embayment at the western end of the site are favourable for a diverse assemblage of woodland beetles (Coleoptera). The site is especially important for saproxylic species, associated with old or dead wood and fungi growing on dead wood. The site supports the Nationally Rare minute fungus beetle *Orthoperus brunnipes* together with three Nationally Scarce beetle species, *Cerylon fagi*,

Tetratoma ancora and *Orchesia minor*. The woodland also harbours a number of species normally only found in old Caledonian pinewoods."

3.63.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.63.3 Discussion

The citation refers to one Rare and three Scarce beetle species. The Rare species, *O. brunnipes*, is classed as RDB3 and is associated with wetlands (Hyman & Parsons, 1992). The Fiddler Gill record is dated as 1961. The Scarce species, *C. fagi*, *T. ancora* and *O. minor*, are all regarded as being saproxylic (Alexander, 2002). The ISR lists three beetles classed as Nationally Notable A and 13 Nationally Notable B species additional to those in the citation. The Nationally Notable A and at least eight of the Nationally Notable B species are considered to be saproxylic (Alexander, 2002). The ISR also records five Nationally Notable B flies, including two saproxylic species. Records of Rare and Scarce species span from 1960s to 1980s.

SCM visits in 2003 focussed on surveying saproxylic beetles and produced records of 15 species (Eyre, 2003a), including *C. fagi*, *T. ancora* and *O. minor*. A one-day SCM visit in 2010, focussing on saproxylic beetles, produced records of 15 species (Alexander, 2011). These included *O. minor* and two Scarce species that were new for the site, *Cis festivus* and *Scolytus mali*. The latter was the first Scottish record.

The assemblage of Scarce beetle species does indicate that Fiddler Gill is an important site for this fauna. As most species are saproxylic, and considering that two Scarce saproxylic flies have also been recorded, it may be more appropriate to clarify whether the saproxylic invertebrate assemblage is a qualifying feature rather than solely the beetle fauna.

3.63.4 Recommendations

The qualifying feature is best defined as the saproxylic invertebrate assemblage. Surveys are desirable to update knowledge on species, but indirect monitoring of habitat resources may be more appropriate for SCM purposes.

3.64 Firth of Forth

3.64.1 SSSI citation (reviewed 29 March 2011)

"Large numbers of insects occur throughout the site, reflecting the range of habitats encountered. Several nationally scarce species of invertebrates occur, including the sand dart moth *Agrotis ripae*, and the northern brown argus butterfly *Aricia artaxerxes*, scarce and declining in Britain, which has two Fife colonies, between Burntisland and Kirkcaldy, and East Wemyss and Anstruther. Several species of beetles are rare or very local in Scotland, including *Cleonis pigra*, *Lebia* (*Lamprias*) *chlorocephala*, *Microplontus rugulosus* and *Scymnus* (*Scymnus*) *schmidti*."

3.64.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

Butterflies: Northern brown argus (*Aricia artaxerxes*).

3.64.3 Discussion

The citation lists four species of beetle: *C. pigra*, *L.* (*Lamprias*) *chlorocephala*, *M. rugulosus* and *S.* (*Scymnus*) *schmidti*. All are Scarce, and whilst some are uncommon in Scotland, they alone may not be sufficient to class the beetle assemblage as a qualifying feature. However, the ISR for this large SSSI does list three Rare beetles, *Hydraena pulchella*, *Dryops nitidulus* and *Bledius erraticus*. Records of two of them are from the first half of the twentieth century, and the third is undated. Given the age of these records, it is difficult to assess whether or not the beetle assemblage is a qualifying feature. Species surveys are necessary to update information on Rare or Scarce species before selecting species to be targeted for SCM.

Three Rare flies with records from 1992 are listed in the ISR: *Sphaerophoria loewi*, *Parhelophilus consimilis* and *Limonia* (*Dicranomyia*) *goritiensis*. *S. loewi* (RDB2) inhabits wetlands, especially brackish coastal marshes, *P. consimilis* (RDB2) is found in pools transitional between bog and fen, and *L. goritiensis* (RDB3) inhabits seepages and streamlets on coastal cliffs and rock faces (Falk, 1991b). Although the locations of these records are not known, these three species indicate an important wetland fly assemblage that may a qualifying feature.

The remaining Rare species are the spider *Dictyna major* and the nudibranch *Tenellia adspersa*. However the first record is undated and the second is from 1935. These, therefore, should not be part of monitoring unless further records come to light.

3.64.4 Recommendations

It is difficult to assess whether the beetle assemblage is a qualifying feature given the age of some of the records. The initial focus should be on clarifying the status on the site of some of the key species.

The wetland fly assemblage may be a qualifying feature, though it is not a notified feature.

It is difficult to assess whether the northern brown argus is a qualifying feature, given that the SSSI spans six Areas of Search. Carry out monitoring at what appears to be the strongest sites, Pettycur and Kincraig Point, would be a precautionary approach. These should provide a baseline for assessment of future changes.

3.65 Flanders Moss

3.65.1 SSSI citation (reviewed 5 June 2009)

"The rich invertebrate fauna is characterised by a distinct lowland element as well as many species characteristic of northern temperate regions. The very rare spider *Heliophanus dampfi* is an example of this community. In addition, the moss is particularly notable for its moths. The most conspicuous is the Rannoch brindled beauty *Lycia lapponaria*, a Red Data Book (RDB) species otherwise found only in Argyll, Perthshire and Inverness-shire, whose larvae feed on bog myrtle and heathers. Two very local moths, *Bryotropha boreella* and *Crambus pratella* and no less than eight UK BAP Priority species of moth are also found: haworth's minor *Celaena haworthii*, the crescent *Celaena leucostigma*, the argent and sable *Rheumaptera hastata*, the sallow *Xanthia icteritia*, the dark-barred twin-spot carpet *Xanthorhoe ferrugata*, the heath rustic *Xestia agathina* and the neglected rustic *Xestia castanea*."

3.65.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moth assemblage.

Biological: Invertebrates: Spider (*Heliophanus dampfi*).

3.65.3 Discussion

The Rannoch brindled beauty is the rarest moth on the Flanders Moss site list. This is a Nationally Notable A species, with records from 24 hectads in the UK up to 2010, all of them in Scotland (Hill *et al*., 2010). However, with records from 32 hectads up to 2014 (http://www.eastscotland-butterflies.org.uk/mothflighttimes.html - accessed 06/11/2015), this species should probably be now classed as Nationally Notable B. The citation was incorrect in stating that "it is otherwise found only in Argyll, Perthshire and Inverness-shire" as it is also known from Aberdeenshire and Sutherland and has since been found on Mull (Prater & Prater, 2015). Nonetheless this species remains localised and dependent on bog that supports its larval food plants, especially bog-myrtle (*Myrica gale*). The Rannoch brindled beauty shares its food plant with another UK Priority moth at the site, argent & sable. This Nationally Scarce B species has been shown in recent years to be more widespread in Scotland than was previously known (http://www.eastscotland-butterflies.org.uk/mothflighttimes.html - accessed 06/11/2015) but it remains vulnerable to habitat degradation. The flight periods of these two moths do not overlap, but their larvae could be surveyed in late July to early August.

Two micro-moths are listed in the citation: *B. boreella* and *C. pratella*. *B. boreella* is a Nationally Notable B species (Davis, 2012), primarily found in upland areas. Its life history and food plant preferences are unknown (Emmet & Langmaid, 2002a). *C. pratella* is also a Nationally Notable B species (Davis, 2012) and feeds on grasses in dry, sandy places (Goater, 1986). Seven further Nationally Notable B Lepidoptera are recorded from the site, indicating the value of its moth assemblage and perhaps also the intensity of recording that has been carried out here.

The citation further lists six UK BAP Priority Species: Haworth's minor, the crescent, the sallow, the dark-barred twin-spot carpet, the heath rustic and the neglected rustic. These are species that are mostly relatively numerous in some parts of their range but have been shown to have suffered substantial population declines across Britain (e.g. Conrad *et al*., 2006; Fox *et al*., 2006b). Their designation as UK BAP Priorities was not intended for site conservation, and focussed monitoring of these species would not be instructive in terms of assessing site condition.

Although there are no Rare species present, continue to regard the moth assemblage as a qualifying feature would be a precautionary approach. Direct monitoring is most appropriate for the Rannoch brindled beauty and argent & sable, the two species that are reliant on bog myrtle.

The spider *H. dampfi* was found at Flanders Moss in 1991 and recorded again up to 1995 (Lee, 2004). This is an RDBK species, first recorded in the UK in 1981 and recorded from four hectads (three in Scotland) (http://srs.britishspiders.org.uk/portal.php/p/Summary/s/Heliophanus+dampfi – accessed 06/11/2015). The species was not found during SCM in 2003 and 2004 but it was recorded widely across the site during SCM visits in 2013, with most specimens coming from suction sampling in purple moor-grass (*Molinia caerulea*) and cotton grass (*Eriophorum*) tussocks Cathrine *et al.,* 2015). Although the species may yet prove to be more widespread, it does appear to be restricted to blanket bog sites and so is vulnerable to habitat degradation.

3.65.4 Recommendations

The moth assemblage should be regarded as a qualifying feature. Direct monitoring is most appropriate for Rannoch brindled beauty and argent & sable.

The spider *H. dampfi* should be regarded as a qualifying feature and should be monitored directly, especially as recording methods for the species have now successfully been refined (Cathrine *et al.,* 2015).

3.66 Gannochy Gorge

3.66.1 SSSI citation (reviewed 11 March 2011)

"The gorge and woodland habitats, characterised by shaded crevices, rock overhangs, accumulated leaf mould and dead wood, also support a rich beetle fauna which includes the rare fungus beetle *Orthoperus brunnipes*."

3.66.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.66.3 Discussion

No SCM documents were available to assist with this review.

The ISR mentions just a single Rare beetle, *O. brunnipes*. This is a RDB3 wetland species that, north of Yorkshire, has been recorded only in Roxburghshire (Hyman & Parsons, 1992). No date is given for the record in the ISR though Hyman & Parsons (1992) list it as before 1970. Five other beetle species are listed, of which two are labelled as Nationally Notable B, two as Local and one as Nr in Scotland. Thus the beetle species list is insufficient to regard it as a qualifying feature. *O. brunnipes* is small and difficult to identify (Hyman & Parsons, 1992), and almost certainly under-recorded. In absence of further information about its status at Gannochy Gorge, it should not be regarded as a qualifying feature

3.66.4 Recommendations

The beetle assemblage is probably not a qualifying feature.

3.67 Garron Point

3.67.1 SSSI citation (reviewed 26 June 2009)

"The cliff grasslands are the habitat of an important population of a rare whorl snail and a rare species of butterfly.

The rare narrow-mouthed whorl snail *Vertigo angustior* is found in two small areas near the base of the cliffs, with an estimated population of tens of thousands. This is the northernmost population in the UK and one of two in Scotland.

The rare northern brown argus butterfly *Aricia artaxerxes* is found in the cliff grassland."

3.67.2 Notified invertebrate feature(s)

Biological: Invertebrates: Narrow-mouthed whorl snail (*Vertigo angustior*).

Butterflies: Northern brown argus butterfly (*Aricia artaxerxes*).

3.67.3 Discussion

The snail *V. angustior* was classed as RDB1 (Bratton, 1991) and assessed later as Vulnerable (Seddon *et al*., 2014). It is known from just two sites in Scotland, the other being on the north Solway coast (Littlewood & Stockan, 2013). At Garron Point SSSI, the snail occupies two small areas, one estimated in 2004 to hold fewer than 5,000 individuals, and the other with fewer than 100,000 individuals. Both populations were considered to be secure (Marriott, 2004). As an Annex II species of the European Habitats Directive, there is a clear responsibility to protect sites for the species. The boundaries of the populations are well known and the species can be monitored directly following guidelines from Littlewood & Stockan (2013).

The northern brown argus can be a qualifying feature at up to five sites in an AOS that contains a substantial proportion of the British colonies (Bainbridge *et al*., 2013), and the Kincardine and Deeside AOS is indeed important for the species. Within this AOS, there are two main occupied areas. Most colonies are in mid and upper Deeside with a smaller number on the coast between Aberdeen and Stonehaven. There are insufficient data to compare the relative strength of the sites, but Garron Point SSSI may be one the strongest colonies (N. Littlewood, *pers. obs*.).

3.67.4 Recommendations

The narrow-mouthed whorl snail is a qualifying feature and should be monitored directly.

The northern brown argus butterfly should be regarded as a qualifying feature and can be monitored directly by surveys of adults or eggs on the larval food plant, common rock-rose (*Helianthemum nummularium*).

3.68 Gattonside Moss

3.68.1 SSSI citation (reviewed 5 August 2010)

"The fen area of this site contains a diverse assemblage of aquatic beetles with over thirty species recorded. This is one of only a few sites in the Scottish Borders to have such a high diversity. Amongst these is *Laccornis oblongus*, a Red Data Book species, with an extremely localised British distribution."

3.68.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.68.3 Discussion

The citation refers to one Rare water beetle species, *L. oblongus*, which is restricted to shallow, mossy areas of temporary base-rich fen and is classed as Near Threatened in the latest review (Foster, 2010a). The ISR lists two further species regarded at the time as being Nationally Notable B, *Enochrus ochropterus* and *Agabus unguicularis*, though both species do not meet the criteria for Nationally Scarce status in the latest review (Foster, 2010a).

SCM in 2002 produced a list of 29 water beetle species, taking the total for the site to 36 (Eyre, 2003c). Species recorded included *L. oblongus* and also *Cyphon kongsbergensis*, a formerly Nationally Notable A species which is listed as Nationally Scarce in the latest review (Foster, 2010a). A SCM visit in 2010 produced records of 22 species (Foster, 2010b).

These included the first site record of *Hydroporus glabriusculus*. This species is classed as Vulnerable in the latest review (Foster, 2010a) and though it had been reported previously, this apparently was an erroneous statement (Foster, 2010b). Following the 2010 visit, the site list stood at 40 water beetle species.

The fairly extensive species list, the presence of two Rare species and one Scarce species, constitute an important assemblage. The ISR suggested that *L. oblongus* and *H. glabriusculus* could be qualifying features. However, as monitoring can be effectively combined with other species in the assemblage, it is most useful simply to regard the water beetle assemblage as a whole.

3.68.4 Recommendations

The water beetle assemblage is a qualifying feature. Direct monitoring should be continued.

3.69 Glen Affric

3.69.1 SSSI citation (reviewed 1 December 2010)

"The many lochs and bogs support a rich dragonfly community including the rare brilliant emerald *Somatochlora metallica*."

3.69.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.69.3 Discussion

Twelve dragonfly species were recorded on SCM visits in 2002 and 2013 (Willet, 2014); the species listed in the citation, brilliant emerald, was recorded in 2002 but not in 2013. There was breeding evidence for eight species in 2002 and ten in 2013 (Willet, 2014). The most important species in terms of rarity status (Daguet *et al*., 2008) are white-faced darter (*Leucorrhinia dubia*) (endangered), brilliant emerald (Vulnerable), azure hawker (*Aeshna caerulea*) (Vulnerable) and northern emerald (*Somatochlora arctica*) (Near Threatened).

In addition to dragonflies, the ISR lists one RDB1 fly and four RDB3 beetles. Where the date is stated, records are from the 1960s to 1981. The fly is a fungus gnat, *Mycetophila schnabli*. Among the beetles, *Euplectus punctatus* is associated with ancient broad-leaf woods and native pinewoods (Hyman & Parsons, 1994), *Rhizophagus parvulus* is a broadleaf woodland species (Hyman and Parsons, 1992), *Bolitophagus reticulatus* occupies birch (*Betula*) woodland and isolated trees (Hyman & Parsons, 1994), while *Pityophthorus lichtensteini* is a species of coniferous woodland (Hyman & Parsons, 1992). *B. reticulatus* has recently been assessed as Nationally Scarce (Alexander *et al*., 2014). Some records of *P. lichtensteini* are now known to be in error (Hyman & Parsons, 1994) and it is not clear if it has been reliably recorded from Glen Affric. Taken together, these species, along with further Scarce species listed in the ISR, indicate that the woodland invertebrate assemblage may meet qualifying feature criteria.

3.69.4 Recommendations

The dragonfly assemblage exceeds the nine species required in mainland Scotland for it to be a qualifying feature (Bainbridge *et al*., 2013). Direct monitoring should continue.

The woodland invertebrate assemblage may meet qualifying feature criteria, though is not a notified feature.

3.70 Glen Creran Woods

3.70.1 SSSI citation (reviewed 12 August 2010)

"The site is exceptional for its rich butterfly assemblage which includes at least three nationally-scarce species. The populations of two of these, chequered skipper and pearl-bordered fritillary, are amongst the most important in the Lorn and North Argyll area."

3.70.2 Notified invertebrate feature(s)

Biological: Butterflies: Chequered skipper (*Carterocephalus palaemon*).

Pearl bordered fritillary (*Boloria euphrosyne*).

3.70.3 Discussion

The Site Management Statement shows that both notified features were assessed as Unfavourable–declining in 2009 but states nonetheless that "the site remains one of the most important in Scotland for … chequered skipper and pearl bordered fritillary butterfly".

3.70.4 Recommendations

In the absence of quantitative information to compare with other sites in the Area of Search, both features should continue to be regarded as qualifying features but this should be reviewed if further information becomes available. The chequered skipper and the pearl-bordered fritillary should be monitored directly.

3.71 Glen Lochay Woods

3.71.1 SSSI citation (reviewed 16 December 2010)

"The rich habitat mosaic of Glen Lochay woods also supports a large variety of invertebrates including the Biodiversity Action Plan priority cranefly species *Lipsothrix errans* and the Red Data Book listed dragonfly *Somatochlora arctica*, stilt fly *Calobata stylifera* and fungus gnat *Mycomya clavigera* which utilise the woodland and wetland habitats within the SSSI. Several beetle species which are restricted to ancient woodland, such as *Hylecoetus dermestoides*, also occur within the SSSI highlighting the long established nature of this woodland."

3.71.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.71.3 Discussion

The citation lists three flies, a dragonfly and a beetle. Whilst the invertebrate assemblage is the notified feature, these species are not part of an ecologically coherent assemblage and exhibit a range of habitat and resource requirements.

There are two Rare fly species listed in the ISR. *Mycomya griseovittata,* listed as *Mycomya clavigera* in the ISR and the citation, it is now classed as Lower Risk (Near Threatened). It occurs on upland woodland and open moorland and was recorded at Glen Lochay in 1932 (Falk & Chandler, 2005). *C. stylifera*, an RDB3 species (Falk, 1991b), was recorded in 1992 and it is found at river and stream margins with shingle banks and rich sedge or alder carr communities. The other fly listed in the citation, *L. errans,* is a UK Priority Species classed as Notable. It occupies wooded stream sides in upland districts (Falk, 1991b). Seven other fly species are classed Nationally Notable B.

The northern emerald dragonfly (*Somatochlora arctica*) was recorded in 1983. Although classed as RDB3 by Shirt (1987), it has since been found to be more widespread than previously known (Cham *et al*., 2014). The site does not meet JNCC criteria for dragonfly assemblage.

The sole beetle listed in the citation, *H. dermestoides*, is a Nationally Scarce B species that lives in dead timber and root stumps of hardwood and softwood (Alexander, 2002). The citation suggests the occurrence of a range of additional saproxylic beetles. No SCM documents of this fauna were available, though.

Given the range of Rare and Scarce species recorded across a number of invertebrate groups, it is appropriate for the invertebrate fauna as a whole to be a qualifying feature. Most Rare or Scarce species fall species into groups dependent on two broad resource types. One, associated with old woodland and dead wood, comprises *M. griseovittata*, *Saperda scalaris*, *Trichonta vulcani*, *Abdera flexuosa*, *H. dermestoides* and *Diacanthous undulatus*. The other, associated with streams, ponds and damp woodland areas, includes *S. arctica*, *C. stylifera*, *Molophilus propinquus*, *L. errans*, *Themira gracilis* and *Ocydromia melanopleura*. These groups should form the basis for monitoring.

3.71.4 Recommendations

The invertebrate assemblage is a qualifying feature. Monitoring should focus on old woodland and saproxylic species, and species of streams, ponds and damp woodland. Monitoring should combine direct with indirect methods.

3.72 Glen Moss

3.72.1 SSSI citation (reviewed 14 October 2008)

"Glen Moss, lying approximately half a kilometre north east of Kilmacolm, is a mixed basin and valley mire with an area of shallow open water surrounded by sedge-dominated plant communities. The site is one of only four basin fens in Renfrewshire and Inverclyde and it supports an outstanding assemblage of dragonflies and damselflies of which there are 9 species breeding on the site including the azure dragonfly *Coenagrion puella*, the four-spotted chaser *Libellula quadrimaculata* and the emerald damselfly *Lestes sponsa*."

3.72.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.72.3 Discussion

No ISR or SCM reports were available. However, a spreadsheet of dragonfly records from the Scottish Wildlife Trust, who manages the site, shows nine species of dragonfly recorded between 2010 and 2014. All species recorded are classed as Least Concern (Daguet *et al*.,

2008). Although the dragonfly assemblage is not especially rich, nine species constitute a qualifying feature in mainland Scotland (Bainbridge *et al*., 2013).

3.72.4 Recommendations

On current data, the dragonfly assemblage is a qualifying feature. The feature should be monitored directly and it would be desirable to confirm breeding, especially for the less frequently recorded species.

3.73 Glen Nant Woods

3.73.1 SSSI citation (reviewed 9 December 2010)

"The varied nature of the vegetation on the site supports rich and diverse communities of woodland invertebrates. A notified feature of the site is the rare cranefly *Tipula luridorostris*, the larvae of which lives in moss found on trees in western oak woods where rainfall is relatively high. Glen Nant is one of only three sites from which *Tipula luridorostris* has been recorded in Great Britain since 1970. Additionally, the site provides suitable conditions to support a wide range of fly species including 2 nationally-scarce species, *Tetanocera phyllophora* and *Botanophila maculipes*, which were recorded at the site in 2003.

Although not a notified feature of the site there is a strong population of the nationally-scarce wood ant *Formica aquilonia*."

3.73.2 Notified invertebrate feature(s)

Biological: Invertebrates: Cranefly (*Tipula luridorostris*).

3.73.3 Discussion

The cranefly *T. luridorostris* is listed in the ISR as occurring in 1976. It is an RDB3 species of oak woods in damp situations with records in four UK hectads up to the early 1990s (Falk, 1991b; Stubbs, 1992). It was later recorded on Islay (Godfrey, 2004). The species was not found during a SCM visit in 2003 (Godfrey, 2004). It was not directly searched during a SCM monitoring visit in 2010 but the habitat was judged to remain suitable (Wilkinson, 2010). The species may meet qualifying feature criteria, although an absence of recent records may make direct monitoring difficult.

The citation also refers to two Scarce species of fly, *Tetanocera phyllophora* and *Botanophila maculipes,* which were recorded during SCM in 2003 (Godfrey, 2004). *T. phyllophora* is usually recorded from woodland, often adjacent to wetlands and carr, with records also from Caledonian pine forest (Falk, 1991b). Two Nationally Notable B craneflies are listed in the ISR as occurring in 1976, namely *Limonia aquosa* and *Lipsothrix errans*. *L. aquosa* is associated with waterfalls, wet rocks and seepages on cliffs, gullies and gorges, whilst *L. errans* occupies wooded stream sides (Falk, 1991b). If *T. luridorostris* in particular is extant on the site, there may be a case for regarding the fly assemblage as a whole as qualifying feature thus extending monitoring across this range of Scarce species.

The wood-ant *Formica aquilonia* is listed in the citation but it is not a notified or a qualifying feature.

3.73.4 Recommendations

The cranefly *T. luridorostris* is probably still a qualifying feature. It would be desirable to confirm its presence, but indirect monitoring is probably more appropriate for SCM purposes.

The fly assemblage as a whole may be a qualifying feature, especially if the presence of *T. luridorostris* is confirmed.

3.74 Glen Strathfarrar

3.74.1 SSSI citation (reviewed 23 March 2011)

"Areas of blanket bog, pools and small lochans within the woodlands support a rich dragonfly fauna. Fourteen species have been recorded here such as the white-faced darter *Leucorrhinia dubia* (a species on the edge of its range), downy emerald *Cordulia aenea*, and the brilliant emerald *Somatochlora metallica*."

3.74.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.74.3 Discussion

The ISR states that ten species of dragonfly had been recorded at Glen Strathfarrar. SCM visits in 2002 generated records of 11 species, with breeding evidence found for six of them. The site was again visited for SCM in 2010 and 2011, resulting in the recording of 11 species (including one new species), with breeding evidence found for ten (Willet & Corcoran, 2011). The Rare or scarce species (following Daguet *et al*. (2008)) were white-faced darter (endangered), brilliant emerald (Vulnerable) and northern emerald (*Somatochlora arctica*) (Near Threatened). There are also site records on the National Biodiversity Network Gateway for azure hawker (*Aeshna caerulea*), a species classed as Vulnerable (Daguet *et al*., 2008), though it is thought that the habitat within the SSSI is not suitable to hold a breeding population of this species (Willet & Corcoran, 2011). Downy emerald is listed in the citation and was reported from SCM in 2002 though some doubt has been cast on its identification (Willet & Corcoran, 2011).

3.74.4 Recommendations

The dragonfly assemblage exceeds the qualifying feature criteria. Direct monitoring of the assemblage should continue.

3.75 Glen Tanar

3.75.1 SSSI citation (reviewed 14 December 2011)

"The forest supports a wide range of invertebrates including a number of species associated with old pine woods such as the false blister beetle *Chrysanthia nigricornis* and the hoverfly *Callicera rufa*. The bumblebee robberfly *Laphria flava* and the green hairstreak butterfly *Callophrys rubi* are also found. "

3.75.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.75.3 Discussion

Glen Tanar is a well-known site for Rare and Scarce invertebrates. Of invertebrates listed in the ISR, one was classed as RDB1, one as RBD2, nine as RDB3 and one as RDBK.

As Glen Tanar is the only known site in Britain for the RDB1 beetle *C. nigricornis* (Alexander *et al*., 2014), this species is clearly a qualifying feature in its own right. It has been recorded three times, from 1971 to 1990, although the last record was just outside the SSSI (Eyre, 2004). Larvae have been found within soft heartwood of an old pine (*Pinus*) branch and adults swept from heather (*Calluna vulgaris*) in open pine woodland. *C. nigricornis* shares an association with native pinewood with most of the Rare invertebrate species recorded; it may therefore be better considered as an important part of a wider pinewood invertebrate assemblage. Among the remaining Rare species, the beetles *Thanasimus rufipes* and *Sphaerites glabratus* are associated with conifer woodland whilst the fly *Dynatosoma nigromaculatum* is associated with fungus growing on trees (Alexander, 2002). The fly *Ectinocera borealis* is found in densely shaded forests, usually coniferous. Larvae of the sawfly *Monoctenus juniperi* feed on juniper (*Juniperus communis*) (which is included in the SSSI citation as a feature of the pinewood understory) whilst the beetle *Agathidium arcticum* inhabits slime moulds under fungoid bark on pine and birch (*Betula*) (Alexander, 2002).

There are no records of the Rare fly species *L. flava*, *Physocephala nigra* and *Callicera aurata* since 1978 and of *C. rufa* since 1977. The status of these latter two hoverflies has been changed from Rare to Nationally Scarce (Ball & Morris, 2014). *C. aurata* is not mapped for the site by Ball & Morris (2014), suggesting that it may not occur at Glen Tanar. Clarity on the status of these species should be sought to fully consider their importance in the invertebrate assemblage.

The northern damselfly (*Coenagrion hastulatum*) has a 1994 record only, but it was found again in 2015 (Juliette Dinning, pers. comm*)*. The species is classed as endangered in the latest review (Daguet *et al.*, 2008), but it has been recorded from a number of sites within the same Area of Search. There is no evidence at present that Glen Tanar holds one of the stronger colonies.

The citation also makes mention of green hairstreak butterfly. In regions where substantial declines have taken place, the two sites with the strongest colonies in each Area of Search should be considered as candidates for SSSI selection (Bainbridge *et al*., 2013). There does not appear to have been a substantial decline in the range of this species in the Kincardine and Deeside Area of Search (e.g. Fox *et al*., 2006a) and, with many colonies present along the lower parts of moorland on Deeside, it is unlikely that a case can be made for singling out Glen Tanar. The green hairstreak would, therefore, not be considered a qualifying feature.

A SCM visit in 2003 focussed on monitoring *C. nigricornis*. The species was not found though several dead wood specialists were recorded (Eyre, 2004). On a SCM visit in 2013, *C. nigricornis* was again not recorded, though seven nationally scarce beetles, including four Caledonian pine forest species, were recorded (Alexander, 2014a). Direct monitoring of pinewood invertebrates should continue, focussed especially on *C. nigricornis*, but given that some of the Rare species recorded are difficult to find, it should be combined with indirect monitoring of habitat resources.

3.75.4 Recommendations

The invertebrate assemblage is a qualifying feature. The pinewood invertebrate assemblage dominates the Rare species.

The beetle *C. nigricornis* is known only from this site in Britain and meets criteria for qualifying feature. Although difficult to find, continued attempts should be made to monitor this species directly. Other pinewood invertebrates should be monitored alongside this species where possible, or through indirect habitat monitoring.

3.76 Glen Tarff

3.76.1 SSSI citation (reviewed 9 December 2009)

"The site is also important for the rare beetle, *Bolitophagus reticulatus*, which in the UK is found only in the Highlands of Scotland. The beetle larvae feed on bracket fungus in old birchwoods."

3.76.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle (*Bolitophagus reticulatus*).

3.76.3 Discussion

The notified species, *B. reticulatus,* is found in birch (*Betula*) woods and isolated trees (Hyman & Parsons, 1992) where it inhabits old bracket fungi of *Fomes fomentarius* (Alexander, 2002). *B. reticulatus* was recorded during SCM in 2003 and it may be widespread across much of the site (Eyre, 2003a). It was recorded again during SCM in 2010 (Alexander, 2011) and 2015 (Cathrine *et al*., 2017a). *B. reticulatus* was originally classed as RDB2, but reassessed as RDB3 (Shirt, 1987; Hyman & Parsons, 1992) and then further reclassified as Nationally Scarce (Alexander *et al*., 2014). As a Nationally Scarce, *B. reticulatus* could not now be a qualifying feature.

A number of additional Rare and Scarce species have been recorded at Glen Tarff. These include the flies *Ectinocera borealis*, an RDB3 species primarily of coniferous woodlands (Falk, 1991b), and *Gnoriste bilineata*, an RDB3 fungus gnat (Shirt, 1987). There are three Nationally Notable B species: the saproxylic beetle *Scolytus ratzeburgi* and the craneflies *Dactylolabis transversa* and *Lipsothrix errans*. The Nationally Notable B beetle *Harminius undulatus*, which occupies fallen birch trunks (Hyman & Parsons, 1992), was found new to the site in 2003 (Eyre, 2003a) whilst the Nationally Scarce B saproxylic beetles *Cis jacquemarti* and *Rabocerus gabrieli* were found in 2010 along with two further Nationally Scarce species, the bug *Aradus betulae* and the weevil *Anthonomus conspersus*. Two Rare saproxylic beetles were recorded newly in 2010, the fungus beetle *Ropalodontus perforatus* and the slime mould beetle *Agathidium confusum* (Alexander, 2011).

3.76.4 Recommendations

The beetle *B. reticulatus* is not a qualifying feature. However, the woodland invertebrate fauna as a whole, and the Saproxylic fauna especially, may be a qualifying feature because of the range of Rare and Scarce species. Monitoring of the saproxylic fauna should primarily be by indirect methods.

3.77 Glenmore Forest

3.77.1 SSSI citation (reviewed 30 October 2008)

"The site is also notified for its populations of Scottish crossbill *Loxia scotica*, Capercaillie *Tetrao urogallus*, and narrow-headed ant *Formica exsecta*. These species are all associated with the pinewood habitats."

3.77.2 Notified invertebrate feature(s)

Biological: Invertebrates: Narrow-headed ant (*Formica exsecta*).

3.77.3 Discussion

The narrow-headed ant is a UK Priority Species classified as RDB1 (Falk, 1991a). Glenmore lies at the heart of its UK stronghold, with the Abernethy-Glenmore-Rothiemurchus forest complex holding over 80% of the UK population (Hughes, 2006). The species has been subject of a number of monitoring and research projects over recent decades, which have confirmed its preference for open areas within the forest (Littlewood & Young, 2008; Stockan *et al*., 2010; Stockan & Littlewood, 2016). SCM fieldwork in 2013 recorded the presence of ant nests in all areas searched and concluded that the habitat was favourable in most areas (Cathrine *et al.,* 2015). As Glenmore is one of the most important sites for this rare species, if not the most important, the narrow-headed ant clearly remains a qualifying feature.

The ISR lists six further Rare species. These include *Xylophagus junki*, an RDB1 fly for which a 1913 record at Glenmore is the only British record (thus the species is now probably extinct). The RDB1 fungus gnat *Phronia mutabilis* was recorded in 1997, whilst two beetles, two flies and a sawfly have records from 1933 to 1970. *P. mutabilis* may be a qualifying feature, though it belongs to an under-recorded group. In the absence of recent records, the remaining species are probably best not regarded as qualifying features or significant parts of a qualifying assemblage.

3.77.4 Recommendations

The narrow-headed ant is a qualifying feature with Glenmore being perhaps the most important single site for the species in Britain. Direct monitoring is straightforward and should continue.

3.78 Hamilton High Parks

3.78.1 SSSI citation (reviewed 7 July 2010)

"The parkland oaks, *Quercus robur*, known as the Cadzow oaks, are over 400 years old and are possibly the best example of oak woodland with pasture in Scotland. The parkland pasture supports a rich beetle assemblage that includes a number of Nationally Scarce species such as the hairy fungus beetle *Mycetophagus populi*, which is unknown elsewhere in Scotland, and *Mycetophagus piceus*. Two species, *Ptenidium gressneri* and the cobweb beetle *Ctesias serra*, are believed to occur at only one other Scottish locality. Other Nationally Scarce beetles present include the rove beetle *Phyllodrepoidea crenata*, the pelted beetle *Thymalus limbatus* and the cerylonid beetle *Cerylon fagi*."

3.78.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.78.3 Discussion

Of the seven Scarce beetle species reported in the citation, *M. populi* is a Nationally Scarce A species and the remainder are Nationally Scarce B. The ISR gives a longer list, including the RDBK *Melolontha hippocastani*, a woodland species whose larvae are probably root-feeders (Hyman & Parsons, 1992). It also lists 14 Nationally Scarce B beetles and three Nationally Scarce B flies. Among 19 Rare or Scarce species, at least 16 are regarded saproxylic (Alexander, 2002). Most records derive from the 1960s, though a few are from the late 1990s or 2000.

Just one SCM report was available to assist this review, covering a one-day visit in 2010 (Alexander, 2011). A total of 19 saproxylic beetle species were found, including five Scarce species. Three of the species named on the citation were among them, namely *M. piceus*, *T. limbatus* and *C. serra*.

The site clearly supports a rich saproxylic beetle fauna, which has been assessed by the Index of Ecological Continuity (Alexander, 2004) and considered to have the highest value of any site in Southern Scotland (Alexander, 2011). This, together with the recorded assemblage of Scarce species, justify regarding the saproxylic beetle assemblage as a qualifying feature. However, given that the list of Scarce species recorded includes also three flies, the qualifying feature would be better defined as the saproxylic invertebrate assemblage.

3.78.4 Recommendations

The saproxylic invertebrate assemblage is a qualifying feature. Direct species surveys are desirable but should be combined with indirect monitoring of habitat resources for SCM purposes.

3.79 Inchrory

3.79.1 SSSI citation (reviewed 11 January 2012)

"Amongst many species of breeding butterfly, Inchrory is a stronghold for the rare northern brown argus *Aricia artaxerxes*, the caterpillars of which feeds on common rock-rose *Helianthemum nummularium*.

This is one of a handful of sites in Scotland to hold colonies of the rare mountain whorl snail *Vertigo alpestris*, the fossils remains of which are also found in the tufa."

3.79.2 Notified invertebrate feature(s)

Biological: Invertebrates: Mountain whorl snail (*Vertigo alpestris*).

Butterflies: Northern brown argus butterfly (*Aricia artaxerxes*).

3.79.3 Discussion

The snail *V. alpestris* is classed as Nationally Scarce (Seddon *et al*., 2014). Most of its population lies in North-East England but it has also been found in four hectads in Scotland,

all in the East Highlands (Kerney, 1999), each of them represented by a single population. SCM in 2003 revealed the snail's presence in two areas of scree at Inchrory (Marriott, 2003). Although the Scottish sites are all relatively close together, Inchrory appears to be the only site in the Moray and Nairn Area of Search. Nationally Scarce species should generally be conserved as part of rich invertebrate faunal assemblages and, where possible, represented in the SSSI series within each AOS (Bainbridge *et al*., 2013). This, though, does not appear to fully justify regarding *V. alpestris* a qualifying feature. A related species, *Vertigo genesii*, is listed in the ISR. This is classed as Nationally Rare (Seddon *et al*., 2014) though has only been recorded at Inchrory as a fossil, thus cannot be regarded as a qualifying feature.

SCM over two visits in 2003 focussed on establishing a repeatable method for assessing numbers of northern brown argus by timed searches for adults, which were found in three of eight counts, and for eggs, which were located in 11 of 18 counts (Prescott, 2015). Colonies of this species can be qualifying features at up to five sites in an Area of Search with substantial proportion of the British colonies (Bainbridge *et al*., 2013). Although "a substantial proportion" is not quantified, the Moray & Nairn Area of Search probably does meet this criterion, as it holds 12 tetrads with post-1980 records out of 43 in the whole of Highland and Moray combined (Barbour *et al*., 2008). However, the strength of the population at Inchrory relative to others in the AOS is not known. Given that the species has recently been shown to be present across several parts of the site, a precautionary approach would be to regard northern brown argus as a qualifying feature. SCM results from 2013 (Prescott, 2015) provide a suitable baseline for direct monitoring which can combine searches for adults and eggs on the larval food plant, common rock-rose (*Helianthemum nummularium*).

An additional Rare species, the RDB3 fly *Platypalpus tuomikoskii*, is listed with a 1988 record. In Scotland, the species is associated with open pine woodland and moorland with streams and boggy areas (Falk & Crossley, 2005). Given the single record listed, there is insufficient evidence to regard it as qualifying feature.

3.79.4 Recommendations

V. alpestris is not a qualifying feature.

Northern brown argus probably is a qualifying feature and should be monitored directly through timed counts of adult and eggs.

3.80 Inverpolly

3.80.1 SSSI citation (reviewed 31 March 2011)

"Beetle (*Otiorhynchus auropunctatus*)

The rare species of weevil *Otiorhynchus auropunctatus* was first recorded in the UK from Stac Pollaidh in 1964 at an altitude of just over 500m. It is often found at higher altitudes amongst dwarf shrubs and feeds on many species of plants.

Moths

Three Nationally Scarce or rare species of moth have been recorded on this site. These are the micro-moth *Acrolepiopsis betulella*, the slender-striped rufous *Coenocalpe lapidata* and the broad-bordered white underwing *Anarta melanopa*."

3.80.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle (*Otiorhynchus auropunctatus*).
Moths.

3.80.3 Discussion

The RDB1 weevil *O. auropunctatus* occupies montane habitats and, up to the time of Hyman & Parsons (1992) at least, had not been recorded anywhere in Britain other than Wester Ross (this is presumed to relate to the sole Stac Pollaidh record in 1964 as referred to in the citation). In addition to Stac Pollaidh, the species has been reported on Coinneach Mhor (Beinn Eighe) (Eyre, 2004). The nearest populations are on the east coast of Ireland where it is often common (Shirt, 1987). The beetle was looked for but not found during SCM in 2003, though habitat conditions were thought to remain suitable. Apparently the specimen for the 1964 record has since been lost and so cannot be re-examined (Tamara Lawton, *pers. comm*.). However, the record has been accepted and published by relevant authorities and should be regarded as genuine.

Another Rare beetle, *Eusphalerum sorbicola,* was recorded between 1965 and 1981. It was listed as RDB3 by Shirt (1987), then as RDBI by Hyman & Parsons (1994), who reported that it had been recorded from just two vice counties. This may also be a qualifying feature, although its RDBI status implies that it is poorly known and that confidence in its rarity status is low.

Three moth species are listed in the citation as examples for the moth assemblage: the micro-moth *A. betulella*, the slender-striped rufous and the broad-bordered white underwing. *A. betulella* feeds as a larva on ransoms (*Allium ursinum*) and has been recorded from scattered locations in Scotland and northern England (Emmet, 1996) with records from four Scottish vice counties (http://www.eastscotland-butterflies.org.uk/sm_Glyphipterigidae.html#19.012 – accessed 15/01/2016). Inverpolly is the only site to hold populations of the species in the Area of Search, and as a pRDB2 species (Davis, 2012) this might warrant a qualifying feature status. The slender-striped rufous was formerly considered to be RDB3 though with recent records from a greater range of sites, it is now regarded as Nationally Notable A (Waring & Townsend, 2003). The broad-bordered white underwing is an RDB3 moth of high moorland and mountains (Waring & Townsend, 2003).

SCM in 2010 or 2011 (year not stated in report) focussed on searching for these species along with sword-grass (*Xylena exsoleta*) a UK Priority Species, though none was located (Kirkland *et al.*, 2012). However, SCM visits in 2014 did succeed in locating *A. betulella* (the first site record in 26 years) and the broad-bordered white underwing (the first confirmed site record, as details of the earlier report could not be traced) (Prescott, 2015). Surveys for the slender-striped rufous in 2013 were not successful (Prescott, 2015) though the species has been recorded in recent years close to the SSSI (Littlewood, 2009) and its presence is to be expected. Given the presence of at least two RDB species, for one of which, *A. betulella*, Inverpolly may be the country's key site (Prescott, 2015), the moth assemblage continues to be a qualifying feature.

The ISR lists 12 species of dragonfly for the SSSI. This figure exceeds qualifying criteria (Bainbridge *et al*., 2013), but dragonflies are not a notified feature.

3.80.4 Recommendations

The weevil *O. auropunctatus* is a qualifying feature. Direct monitoring has proved to be challenging and it may best be monitored indirectly through assessment of appropriate habitat condition.

The moth assemblage continues to be a qualifying feature and is best monitored directly.

3.81 Jedwater Woodlands

3.81.1 SSSI citation (reviewed 16 June 2010)

"The site also has a good range of invertebrate species, especially beetles, several of which are indicators of ancient primary woodland including *Rhagium (Hagrium) bifasciatum*, *Malthodes marginatus* and *Athous haemorrhoidalis*. The site is near the northern limit in Britain for several species of beetle found including *Dryocoetes villosus*."

3.81.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.81.3 Discussion

The ISR lists records solely of beetles; the Nationally Notable A *Aplocnemus nigricornis*, and the Nationally Notable B *Tetratoma ancora*, *Microscydmus nanus*, *Ptinus subpilosus*, *Acalles roboris* and *Acalles ptinoides*. All were recorded in 1980 and all are saproxylic species (Alexander, 2002).

The only SCM document available to assist with this review was from a visit in 2013 that reported the finding of 22 species of saproxylic beetles, including *Orchesia minor*, a Nationally Scarce species (Alexander *et al.*, 2014). *D. villosus*, listed in the citation, was also recorded (Alexander, 2014b).

It is difficult to assess the importance of the assemblage. The contractor for the 2013 SCM visit reported that the site remains under-recorded. Pending further surveys, a precautionary approach would be to continue to regard the beetle assemblage, specifically the saproxylic beetle assemblage, as a qualifying feature.

3.81.4 Recommendations

The beetle assemblage, specifically the saproxylic beetle assemblage, should be regarded as a qualifying feature. Further surveys of the saproxylic invertebrate fauna should be carried out to better define the feature. Indirect monitoring may be more appropriate for SCM purposes.

3.82 Kenmure Holms

3.82.1 SSSI citation (reviewed 16 June 2010)

"The series of oxbow pools at the northern end of the site is important for aquatic beetles of both declining northern species such as *Hydroporus rufifrons* and southern species such as *Porhydrus lineatus*. The whole site has an outstanding assemblage of dragonflies which includes *Coenagrion puella*, the golden-ringed dragonfly *Cordulegaster boltonii* and the

emerald damselfly *Lestes sponsa*. Additionally a beetle regarded as an indicator of ancient pinewoods *Rhagonycha elongata* has been recorded."

3.82.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Dragonfly assemblage.

3.82.3 Discussion

The citation refers to *R. elongata*, a Nationally Notable A beetle. However, the record of this species falls outside the SSSI boundary.

Two water beetle species classified as Rare are listed: *Bidessus minutissimus* and *H. rufifrons*. The former is based on a record from 1908 and the latter was reported in 1977. *H. rufifrons* was formerly classed as RDB2, then as endangered in the most recent review (Foster, 2010a). Maps showing its decline were presented by Foster (2001) and Littlewood & Stockan (2013). Seven other Scarce species of water beetle are listed in the ISR, but records for most are undated.

No SCM documents were available to assist with reviewing the beetle assemblage. If still present, *H. rufifrons* may be a qualifying feature as a single species though regarding it as part of a water beetle assemblage would have the benefit of facilitating monitoring for a wider fauna. If *H. rufifrons* is not now present, it is doubtful that the water beetle assemblage justifies being a qualifying feature. Further surveys would be needed to better define the assemblage and ascertain its relative importance.

A SCM visit in 2003 or 2004 was carried out to look for the spider *Sitticus floricola*. This RDB3 species was formerly listed on the citation and Kenmure Holms was reported to be the sole Scottish site. However, the contractor considered that the report appears to be an error (Lee, 2004) as the spider was reported nearby (Harvey *et al*., 2002).

The ISR records nine dragonfly species whilst 12 are shown by the National Biodiversity Network Gateway. SCM of dragonflies took place in 2011. Only three species were recorded then, though the survey was hampered by difficult access and poor weather. The surveyor considered that the site was unlikely to have lost so much of its dragonfly fauna and that the results from the visit were anomalous (Willet & Corcoran, 2011). Further surveys would be desirable to determine if the dragonflies are still a qualifying feature.

3.82.4 Recommendations

If *H. rufifrons* is extant, it would be a qualifying feature. Surveys are required to judge the quality of the water beetle assemblage.

The dragonfly assemblage has, in the past, been a qualifying feature and may remain so but further surveys are required to determine this.

3.83 Kippenrait Glen

3.83.1 SSSI citation (reviewed 8 January 2010)

"Kippenrait Glen also SSSI supports a significant assemblage of insects, in particular beetles and craneflies. An extensive list of beetle species has been recorded, including four Red Data Book (rare) beetles, *Pityophthorus lichtensteini*, *Sphaerites glabratus*, *Bledius erraticus* and *Melolontha hippocastan*. The site also supports the cranefly *Lipsothrix ecucullata*, a UK

Biodiversity Action Plan (BAP) species. In the British Isles, this cranefly has only been recorded in Scotland."

3.83.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

Biological: Invertebrates: Cranefly (*Lipsothrix ecucullata*).

3.83.3 Discussion

The citation makes clear that the site is especially important for beetles, and lists four Rare species: *P. lichtensteini*, *S. glabratus*, *B. erraticus* and *M. hippocastani* (misspelt as *M. hippocastan* in the citation). The recording of *P. lichtensteini* may now be doubtful. Hyman & Parsons (1992) reported the species from South Aberdeenshire and Moray. They also reported it from further sites but the authors later acknowledged that these were erroneous (Hyman & Parsons, 1994). The Kippenrait Glen record is dated as 1960-1982 and so the Forth area should have been listed by Hyman & Parsons (1992) or by Owen (1994) if the record was documented and verifiable. *S. glabratus* is a RDB3 species that has been recorded in a variety of situations under bark of fallen dead wood (Hyman & Parsons, 1992). *B. erraticus,* revised to RDBK, has been recorded from river banks, sand hills and quarries (Hyman & Parsons, 1994). *M. hippocastani* is an RDB3 species of woodland with the larvae probably being root-feeders (Hyman & Parsons, 1992).

Previous monitoring of beetles has concentrated on the saproxylic species (Eyre, 2003a; Alexander, 2011). These have included searches for *P. lichtensteini* and *S. glabratus,* although this species may not actually be saproxylic (Alexander, 2011) along with a range of other species. The Rare species have not been found on these visits however, given the range of Rare and Scarce species recorded, the site is clearly sufficiently important for beetles.

Presence of the cranefly *L. ecucullata* was demonstrated by rearing of larvae collected in 1999-2000 (Rotheray, 2000) and collecting of adults in 2002 (Littlewood & Stockan, 2013). This is an RDB3 species occurring in seepages in damp woods (Falk, 1991b). SCM in 2010 confirmed the suitability of the habitat but direct searches were not carried out (Wilkinson, 2010). Although JNCC criteria place less emphasis on less well recorded groups, such as flies, the craneflies are relatively well recorded so it would be appropriate to continue to recognise *L. ecucullata* as a qualifying feature. Direct monitoring would be desirable, at least periodically, though may be time-consuming and require rearing of larvae collected on site. Indirect monitoring may, therefore, be more appropriate for at least some rounds of SCM and this could potentially be combined with indirect monitoring for the saproxylic beetle fauna. Indeed, as the site is long recognised for the importance of its saproxylic fauna (Alexander, 2011), consideration of the saproxylic fauna as a whole though indirect monitoring of deadwood may be appropriate.

3.83.4 Recommendations

The beetle assemblage is a qualifying feature. A combination of direct surveys and indirect monitoring of habitat resources should be employed.

The saproxylic invertebrate assemblage, including beetles and the cranefly *L. ecucullata*, may itself be a qualifying feature. Indirect methods are likely to be most appropriate for SCM purposes though should be supplemented with direct searches for species.

3.84 Knapdale Woods

3.84.1 SSSI citation (reviewed 28 February 2011)

"The site supports a dragonfly assemblage of ten species: the nationally-scarce hairy dragonfly *Brachytron pratense*, highland darter *Sympetrum nigrescens*, black darter *S. danae*, golden-ringed dragonfly *Cordulegaster boltonii*, four-spotted chaser *Libellula quadrimaculata*, large red damselfly *Pyrrhosoma nymphula* emerald damselfly *Lestes sponsa*, blue-tailed damselfly *Ischnura elegans*, common blue damselfly *Enallagma cyathigerum*, and azure damselfly *Coenagrion puella*."

3.84.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.84.3 Discussion

The citation lists ten dragonfly species. During SCM surveys in 2002, all were found in addition to the beautiful demoiselle (*Calopteryx virgo*) and common hawker (*Aeshna juncea*), while the southern hawker (*Aeshna cyanea*) was recorded just outside the SSSI (Batty, 2002). The Highland darter (*Sympetrum nigrescens*) is referred to in that report as *Sympetrum striolatum*, of which it is now normally considered to be a form (e.g. Cham *et al*., 2014). The same 13 species were recorded, all on the SSSI, all breeding, during SCM surveys in 2013 (Batty, 2013a). The site exceeds the nine species threshold required for dragonflies to be a qualifying feature in mainland Scotland (Bainbridge *et al*., 2013).

3.84.4 Recommendations

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.85 Lindean Reservoir

3.85.1 SSSI citation (reviewed 14 October 2010)

"More than 50 species of water beetle have been recorded within the site from loch, fen, marsh and pond communities. Among the more notable beetles are three species listed in the Red Data Book with category RDB3 (rare), namely: *Hydroporus glabriusculus* (the first British specimen was recorded here), *Laccornis oblongus* and *Hydrochus brevis*. "

3.85.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.85.3 Discussion

The ISR refers to the list of over 50 species of water beetle, including *H. glabriusculus*, *L. oblongus*, *A. canaliculatus* and *H. brevis,* which were all regarded as RDB3 at the time. In the latest review, *H. glabriuscus* is classed as Vulnerable, *L. oblongus* and *H. brevis* as Near Threatened, and *A. canaliculatus* was downgraded to Nationally Scarce (Foster, 2010a). An SCM visit in 2002 generated records of 26 species, though this did not include any of the Rare or Scarce species (Eyre, 2003c). The next SCM visits took place in 2010, when 18 species were recorded, including two new for the site and a complete list of 84 water beetle

species recorded at the site was presented. Again none of the Rare or Scarce species was recorded (Foster, 2010b). Further SCM visits occurred in 2015. These resulted in 42 species being recorded, including five new for the site, and an overall species list of 94 species. The species recorded on these 2015 visits included *H. glabriusculus* (Foster *et al*., 2017).

The 2010 contractor reported that there appeared to have been a change to the reservoir that had resulted in loss of fen features and that this was likely to explain the lack of recent records of the Rare and Scarce species (Foster, 2010b). The site is adjacent to important water beetle sites at Nether Whitlaw or Lang Moss. Whilst Lindean Reservoir may be considered a less important site, results from SCM in 2015 clearly show that it has a rich fauna and can host Rare species.

3.85.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring should continue.

3.86 Lismore Lochs

3.86.1 SSSI citation (reviewed 14 January 2011)

"Lismore is recognised as having one of the most important meta-populations of marsh fritillary butterfly *Euphydryas aurinia* in North Argyll. The terrestrial land within Lismore Lochs SSSI provides this regionally-important meta-population with excellent habitat, with an abundance of devil's-bit scabious, and therefore contributes to the maintenance of the population.

The lochs and associated fens support a rich and varied invertebrate assemblage. The assemblage includes a rare species of water beetle *Donacia aquatica* which is only known to exist in three separate populations across Scotland. The open water transition fen also provides excellent habitat for a wide range of Diptera species including a species of fly, *Cnemacantha muscaria*. Lismore Lochs SSSI appears to be the only recorded location for this species in Scotland. Other invertebrate interests include 19 species of aquatic mollusc, making this one of the richest aquatic mollusc sites in west Scotland."

3.86.2 Notified invertebrate feature(s)

Biological:	Butterflies:	Marsh fritillary butterfly (*Euphydryas aurinia*).
	Invertebrates:	Invertebrate assemblage.

3.86.3 Discussion

Lismore Lochs SSSI lies within the Lorne Area of Search, which is one of four Areas of Search in Scotland especially important for the marsh fritillary. A Scotland-wide marsh fritillary survey in 2003 found that larval webs were relatively abundant on parts of Lismore (Ravenscroft, 2003). It is not clear how these records relate to the SSSI boundaries, but the species was found at all three lochs that make up the SSSI during a SCM survey in 2013 (Cathrine *et al.,* 2015).

The RDB3 water beetle *D. aquatica* occurs in emergent aquatic vegetation at the margins of still and slow-moving water (Foster *et al*., 2007). It was still present at Loch Fiart on Lismore in 2003 (Eyre, 2003b), which is one of only three Scottish and eight British sites with recent confirmed records at the time of a survey in 2005 (Foster, 2005). It was then also recorded

during SCM visits in 2013 from two further lochs on Lismore, Loch Baile a'Ghobhainn and Loch Kilcheran (Cathrine *et al.,* 2015). An additional Scottish site was discovered in 2011 (Kirkland, *et al*., 2012).

The fly *C. muscaria* has RDB3 status (Falk, 1991b) and was recorded in 1978 at Loch Baile a'Ghobhainn. Its habitat requirements are unclear though adults have been found from waterside vegetation, scrub, upland grassland and ancient broadleaved woodland. A SCM visit in 2010 concluded that the habitat is suitable for the species (Wilkinson, 2010). With just one record, monitoring may be difficult.

The citation refers to 19 species of aquatic mollusc from a survey in 1998. These results suggest a high diversity for Western Scotland. However, it is difficult to assess whether this assemblage meets the criteria for being a qualifying feature in its own right.

The invertebrate assemblage as a whole is a notified feature and, given the diverse range of Rare and Scarce species recorded, remains a qualifying feature. The most important elements of the feature can be more specifically referred to as the aquatic invertebrate assemblage. Management prescriptions for the associated species will vary, with *D. aquatica* and potentially *C. muscaria* relying on maintenance of emergent vegetation (Cathrine *et al.,* 2015), while the mollusc assemblage will be shaped by water quality and bottom sediments.

3.86.4 Recommendations

Marsh fritillary is a qualifying feature and should be monitored directly.

Among the invertebrate assemblage, monitoring should concentrate on the aquatic invertebrate and be carried out by a combination of direct monitoring of species that are more readily located, such as *D. aquatica*, and indirect monitoring of habitat quality.

3.87 Loch a' Mhuilinn

3.87.1 SSSI citation (reviewed 3 June 2010)

"Nine species of dragonfly and damselfly are present, representing a rich assemblage of species at this northern location. Dragonflies recorded include the black darter *Sympetrum danae*, common darter *S. striolatum*, the four-spotted chaser *Libellula quadrimaculata*, golden-ringed dragonfly *Cordulegaster boltonii* and common hawker *Aeshna juncea*. Damselflies recorded include the emerald damselfly *Lestes sponsa*, large red damselfly *Pyrrhosoma nymphula*, blue-tailed damselfly *Ischnura elegans* and common blue damselfly *Enallagma cyathigerum*."

3.87.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.87.3 Discussion

The citation lists nine species of dragonfly, which is a high number for such a northern site. These nine species were recorded, mostly as adults, during SCM visits in 2002, and with three species recorded as breeding (Hewitt & Moran, 2002). During SCM visits in 2010, eight species were recorded with breeding evidence found for seven. The surveyor was of the opinion that all nine species recorded in 2002 were likely still to be present and breeding at the site (Willet, 2011). It is likely, therefore, that the dragonfly assemblage continues to be a qualifying feature.

3.87.4 Recommendations

The dragonfly assemblage probably continues to be a qualifying feature. Direct monitoring should continue.

3.88 Loch an Duin

3.88.1 SSSI citation (reviewed 20 August 2009)

"The SSSI contains some of the best examples of saline lagoons and tidal rapids in Scotland. The lagoons of the northern and central basin of the site contain widespread populations of unique algal plants called Charophytes whilst the southern basin supports the nationally rare brackish water cockle *Cerastoderma glaucum*. The tidal rapids at the small island of Cliasay Beg are particularly species-rich."

3.88.2 Notified invertebrate feature(s)

Biological: Invertebrates: Brackish water cockle (*Cerastoderma glaucum*).

3.88.3 Discussion

C. glaucum is a filter-feeding bivalve found submerged in saline lagoons or more rarely on the low shore of estuaries (White, 2002). It has been recorded from 22 of the 51 sea areas around the British Isles and adjacent parts of north-east Europe (Seaward, 1990; 1993). The status of the species is unclear, and there are no JNCC criteria for the selection of SSSIs based on intertidal invertebrate fauna.

3.88.4 Recommendations

C. glaucum should be regarded as a qualifying feature, at least until there is more information on the species' status or SSSI selection criteria for intertidal invertebrate fauna are available.

3.89 Loch Bee

3.89.1 SSSI citation (reviewed 31 March 2011)

"Loch Bee is the largest saline lagoon in the Western Isles. The loch is connected with the sea at its north-west and south-east extremities and salinity varies throughout the loch, reflecting the distribution of marine, brackish and freshwater plants and animals found in the loch. The saline lagoon is an important habitat for the brackish water cockle *Cerastoderma glaucum*. Loch Bee and its margins support internationally important numbers of non-breeding mute swans and a diverse assemblage of breeding birds."

3.89.2 Notified invertebrate feature(s)

Biological: Invertebrates: Brackish water cockle (*Cerastoderma glaucum*).

3.89.3 Discussion

See discussion for Loch an Duin. Note that the species is referred to as *Cerastoderma lamarchi* in the ISR, but that this is usually regarded as a synonym of *C. glaucum* (Seaward, 1990).

3.89.4 Recommendations

C. glaucum should be regarded as a qualifying feature, at least until there is more information on the species' status or SSSI selection criteria for intertidal invertebrate fauna are available.

3.90 Loch Bran

3.90.1 SSSI citation (reviewed 5 September 2007)

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

3.90.2 Notified invertebrate feature(s)

Biological: Dragonflies: Dragonfly assemblage.

3.90.3 Discussion

The ISR lists nine species of dragonfly for Loch Bran SSSI. Ten species were recorded during SCM visits in 2002 with breeding evidence found for all of these (Smith, 2002). SCM visits in 2013 produced records of nine species, with breeding evidence found for seven of these (Willet, 2014). The only Rare species (following Daguet *et al*., 2008) is the brilliant emerald, which is classed as Vulnerable.

3.90.4 Recommendations

With ten species (one of them classed as Vulnerable), the dragonfly assemblage is a qualifying feature, to be monitored directly.

3.91 Loch Leven

3.91.1 SSSI citation (reviewed 29 June 2012)

"The loch also is home to a variety of rare beetles, most of which live around the shoreline. The rarest beetle, *Thanatophilus dispar*, is a specialist feeder on carrion, such as dead fish or birds."

3.91.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.91.3 Discussion

The beetle *T. dispar* was classed as RDB3 by Shirt (1987) but this was changed to RBD1 by Hyman & Parsons (1992) due to a decline in the number of records. In Britain, the species has only been known since 1970 from Loch Leven and from South Uist. The species was reported at least four times from Loch Leven between 1853 and 1994 (MacGowan, 2010). SCM visits in 2003 produced further records from pitfall traps along the southern edge of the loch (Eyre, 2004) whilst a study in 2010 produced records in May and from July to September with 49 individuals captured. Most were on the southern edge of the loch but a single specimen was found at the northern end. The species is a qualifying feature in its own right and can be monitored directly through pitfall trapping, with the 2010 study providing a benchmark for future comparison of numbers.

The 2003 SCM visit generated a record of the RDBK species *Ilyobates nigricollis,* which is found in leaf litter and *Sphagnum* moss mixed with litter. Two further RDB3 beetles are listed in the ISR, *Macroplea appendiculata* and *Anthicus scoticus*. The *M. appendiculata* record is undated, and Foster (2001) reported that this water beetle can no longer be found at Loch Leven. *A. scoticus* is associated with mud at lake margins (Hyman & Parsons, 1992) and was recorded at Loch Leven in 1974. Three Nationally Notable B beetles are listed in the ISR, *Bembidion bipunctatum*, *Bembidion pallidipenne* and *Cercyon tristis*. All are associated with water side or shallow water habitats.

The ISR lists the fly *Chersodromia cursitans* as RDB3. However, its status has since been changed to Notable (Falk, 1991b) and so it is not a qualifying feature.

3.91.4 Recommendations

The beetle assemblage, especially the aquatic and water side beetle assemblage, is a qualifying feature. Direct monitoring should be carried out of *T. dispar* alongside other Rare and Scarce species.

3.92 Loch Lubnaig

3.92.1 SSSI citation (reviewed 30 September 2010)

"The rich invertebrate fauna includes two notable species of cranefly and a large number of water beetle species. A rare Red Data Book species of snail killing fly is here, *Tetanocera freyi*. The azure damselfly *Coenagrion puella* and the lake limpet *Acroloxus lacustris* reach their northern distribution limit here.

Freshwater pearl mussels are present in the river. The freshwater pearl mussel is listed as an endangered species as a result of its dramatic decline throughout its European range. Scotland is seen as a stronghold for this species."

3.92.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Flies
	Invertebrates:	Freshwater pearl mussel (*Margaritifera margaritifera*).

3.92.3 Discussion

The citation refers to two Scarce and one Rare fly species. The Rare species (RDB3) *T. freyi* inhabits wetlands, possibly requiring some base enrichment (Falk, 1991b). It is listed as occurring in 1992, and it was recorded during SCM in 2013 (Cathrine *et al.,* 2015). That

visit also confirmed the presence of the Scarce species, *Cordilura atrata*, which is associated with sedge swamps, and the Scarce hoverfly, *Platycheirus podagratus*, which is associated with bogs and boggy ground (Stubbs & Falk, 2002).

Three other Scarce flies are listed on the ISR. The cranefly *Pedicia lucidipennis* is associated with streams and flushes in upland areas, and the cranefly *Limnophila glabricula* is associated with carr and shaded streams or seepages, sometimes found in more open wetland habitat (Falk, 1991b). The third species is a hoverfly, *Xylota jakutorum* (named as *X. coeruleiventris* in the ISR), which is associated with conifer woodlands and plantations (Stubbs & Falk, 2002).

Rare and Scarce flies noted at the site clearly occupy a variety of habitats, though all except *X. jakutorum* have at least some link with wetland habitats. *T. freyi* may meet JNCC's qualifying feature criteria in its own right, though, where possible, Rare species should be part of an assemblage. Hence it seems logical to define and monitor a wetland fly assemblage as a qualifying feature.

The freshwater pearl mussel is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC and is also listed in the IUCN 1996 Red Data List as endangered. However its status at Loch Lubnaig SSSI has previously been unclear. The ISR states that it "was recorded outside the SSSI at the other end of the loch" and a review of management of the species on SSSIs concluded that it status at the site was the least clear of all SSSIs from which the species is known (Langan *et al*., 2007). Other surveys of the SSSI and in the wider catchment have recorded its status as being unfavourable due to a lack of successful recruitment (Watt *et al*., 2015).

3.92.4 Recommendations

The fly assemblage appears to be a qualifying feature. The key species are largely associated with wetlands, forming a more coherent assemblage for monitoring than the currently defined fly assemblage. A combination of direct and indirect monitoring methods should be employed.

Direct monitoring of freshwater pearl mussel in the SSSI, and in the wider catchment, should continue.

3.93 Loch Maree

3.93.1 SSSI citation (reviewed 24 February 2010)

"The native pinewood, the lochans and fens on the islands and the shingle shores of the loch support diverse insect communities that include a number of beetle species that are considered to be amongst the rarest and most threatened species of insect in Great Britain. Of particular importance is the occurrence of the nationally rare ground beetle *Bembidion virens* and a number of nationally scarce species including *Byrrhus arietinus* a pill beetle and *Paracymus scutellaris* a water beetle.

With 12 species recorded, the islands contain a nationally outstanding assemblage of dragonflies. Of particular note are the Northern Emerald *Somatochlora arctica*, Azure Hawker *Aeshna caerulea* and White Faced Darter *Leucorrhinia dubia*."

3.93.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Dragonfly assemblage.

3.93.3 Discussion

The ground beetle *B. virens* was recorded in 1949 and 1986. This is an RDB3 species of shingle by lakes and estuaries (Hyman & Parsons, 1992). In Britain, it has been recorded just from seven hectads in northern Scotland (Luff, 1998). Three of these hectads encompass the shore of Loch Maree, so it is possible that the site is the most important locality for the species in the country. It may, therefore, meet qualifying feature criteria in its own right. SCM visits in 2003 did not produce records of *B. virens* though six Nationally Notable B beetle species were recorded (Eyre, 2004) including the pill beetle *B. arietinus* and the water beetle *P. scutellaris*. The other Scarce species recorded were *Bembidion bipunctatum*, a ground beetle of water edges; *Stenus carbonarius*, a wetland rove beetle; *Otiorhynchus scaber*, a weevil of woodlands, sand dunes and wetlands (Hyman & Parsons, 1992; 1994); and the water beetle *Paracymus scutellaris*, which occurs in acid flushes and bogs (Foster, 2001). Taking these recently recorded species together, species of wetlands or damp places appear to be an important element of the beetle assemblage, although this may be at least in part a product of the 2003 SCM, which focussed on searches for *B. virens*. The Nationally Notable A click beetle *Fleutiauxellus maritimus,* with a 1986 record, further adds to this assemblage of river and lakeside shingle (Hyman & Parsons, 1992). The recent records of most of these species suggest that direct monitoring may be appropriate though repeated visits will be required.

Eleven species of dragonfly are present at the site. SCM fieldwork recorded ten species in 2002 (Smith, 2002) and 11 in 2013, with breeding evidence for ten of them (Willet, 2014). A total of 13 species have reportedly now been reliably found at the site. Of these, the white-faced darter (endangered), azure hawker (Vulnerable) and northern emerald (Near Threatened) have the highest rarity statuses (Daguet *et al*., 2008).

3.93.4 Recommendations

The beetle assemblage is a qualifying feature, in particular species associated with wetlands or shingle alongside water. Direct monitoring may be appropriate.

The dragonfly assemblage is a qualifying feature. Direct monitoring should continue.

3.94 Loch Moidart

3.94.1 SSSI citation (reviewed 31 March 2010)

"The site's invertebrate fauna includes the notable scarce cardinal beetle *Schizotus pectinicornis*, a nationally scarce species dependent on deadwood for its larvae."

3.94.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle (*Schizotus pectinicornis*).

3.94.3 Discussion

The cardinal beetle *S. pectinicornis* was formerly classified as RDB3 (Shirt, 1987) though it was later reassessed as Nationally Notable A (Hyman & Parsons, 1992). It is a saproxylic species whose larvae live under bark of recently dead birch (*Betula*), oak (*Quercus*), willow (*Salix*) and alder (*Alnus glutinosa*). It is found in the Scottish Highlands and Welsh Borders (Alexander, 2002). A SCM visit in 2013 originated the first site record of *S. pectinicornis* since 1983 (Alexander, 2013b). Other Nationally Scarce species recorded on this visit included the soldier beetle *Malthodes pumilus*, the false darkling beetle *Orchesia minor,* the

click beetle *Paraphotistus impressus* and the hoverfly *Brachypalpus laphriformis* (the second Scottish record). The saproxylic fauna was noted to be of moderate quality. The ISR lists records of chequered skipper (*Carterocephalus palaemon*).

3.94.4 Recommendations

As a Scarce species, *S. pectinicornis* is not a qualifying species in its own right, and the assemblage of species reported is probably not sufficiently remarkable to be a qualifying feature either.

The chequered skipper butterfly may be a qualifying feature, though formal surveys would be required to determine this. It is not a notified feature.

3.95 Loch Shiel

3.95.1 SSSI citation (reviewed 15 July 2010)

"The woodlands are a valuable habitat for many invertebrate species including the nationally scarce chequered skipper butterfly. This species is only found in the North West of Scotland and can be found in forest glades or paths and where its favoured larval food plant, purple moor grass is found."

3.95.2 Notified invertebrate feature(s)

Biological: Butterflies: Chequered skipper (*Carterocephalus palaemon*).

3.95.3 Discussion

Loch Shiel SSSI lies in the South Lochaber Area of Search, which holds a high proportion of UK range of this butterfly (Fox *et al*., 2006a). The northern end of Loch Shiel supports one of the five strongest concentrations of recent records in the Area of Search, therefore the SSSI meets JNCC's criteria for the chequered skipper (Bainbridge *et al*., 2013). The Site Management Statement for the SSSI reports that the feature was found to be Favourable - Maintained in 2006.

3.95.4 Recommendations

Chequered skipper is a qualifying feature and should be monitored directly.

3.96 Loch Stack and River Laxford

3.96.1 SSSI citation (reviewed 21 October 2009)

Freshwater pearl mussel

"The freshwater pearl mussel is listed as an endangered species (by the International Union for Conservation of Nature) as a result of its dramatic decline throughout its range in northern continents. The River Laxford supports a viable population of freshwater pearl mussel which is slowly recovering from historical exploitation at this site. The populations of Atlantic salmon *Salmo salar* and trout *Salmo trutta*, the river bed substrates and the high

water quality of the River Laxford are all important for the long term survival of freshwater pearl mussel in this river."

3.96.2 Notified invertebrate feature(s)

Biological: Invertebrates: Freshwater pearl mussel (*Margaritifera margaritifera*).

3.96.3 Discussion

The freshwater pearl mussel is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC and is also listed in the IUCN 1996 Red Data List as endangered. The feature was assessed as being in an Unfavourable condition in 2004, 2008 and 2014. The Site Management Statement reports that this was principally due to heavy and prolonged pearl fishing during the twentieth century. However, this pressure has been reduced (Langan *et al*., 2007) and further follow-up investigative work is underway to better understand the poor recruitment recorded in the population (Watt *et al*., 2015).

3.96.4 Recommendations

Given the conservation designations of the species, the freshwater pearl mussel is a qualifying feature and should be monitored directly.

3.97 Loch Vaa

3.97.1 SSSI citation (reviewed 11 March 2009)

"The marshy areas and the small ephemeral pools around the loch support a diverse assemblage of aquatic beetles including nationally scarce and notable species such as *Berosus luridus*, *Hydrochus brevis*, *Cyphon punctipennis* and *Agabus labiatus*."

3.97.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.97.3 Discussion

Whilst the notified feature is “beetles”, the citation focusses on aquatic beetles. At least 44 species of aquatic beetle have been reported, including two species regarded as RDB3. These are *Acilius canaliculatus*, which is found at a number of sites across southern and eastern Scotland (Foster, 2001), and *H. brevis,* known from Loch Vaa since 1911 but with most records from southern Scotland (Foster, 2001). The status of *A. canaliculatus* has been downgraded to Nationally Scarce, and *H. brevis* is classified as Near Threatened (Foster, 2010a).

In a 2003 SCM visit, there were records for 58 species, including *H. brevis, A. labiatus* and other three Nationally Notable B species: *Ilybius aenescens*, *Gyrinus minutes* and *Enochrus affinis* (Eyre, 2003b). A further SCM visit took place in 2010, and 27 water beetles were recorded (Foster, 2010b). These included *A. labiatus*, *B. luridus* and *H. brevis*, all reassessed as being Near Threatened (Foster, 2010a).

As Loch Vaa is the only reported site in the Area of Search for *H. brevis,* this species is probably a qualifying feature in its own right. However, given the richness of the water

beetle assemblage and the range of Rare and Scarce species recorded, it is appropriate to regard the water beetle assemblage as a qualifying feature.

Other Rare insects have been reported from Loch Vaa. These include the fungus gnat *Bolitophila bimaculata*, formerly RDB2 (Falk, 1991b) and now classed as Near Threatened (Falk & Chandler, 2005), and three beetles: *Bolitophagus reticulatus*, an RDB3 species of bracket fungus (Hyman & Parsons, 1992), *Acilius canaliculatus*, an RDB3 species found under bark in dead conifer trees (Hyman & Parsons, 1992), and *Hygropora cunctans*, an RDBK rove beetle of marshes (Hyman & Parsons, 1994). No records are listed for these after 1986 and no further information was available to assess their current status at the site. Although each may potentially be a qualifying feature, they are best regarded as part of the Notified feature. The fungus gnat was reported in 1981 and further information is needed on its status at Loch Vaa and the Area of Search. In absence of recent information on the status of these Rare species, they are best monitored indirectly through assessment of habitat quality.

3.97.4 Recommendations

The beetle assemblage is a qualifying feature. The water beetles meet qualifying feature criteria in their own right, although several other Rare species should be regarded as part of the feature. Monitoring of water beetles should be done directly: other Rare species should be monitored indirectly.

3.98 Lochmaben Lochs

3.98.1 SSSI citation (reviewed 14 October 2010)

"The site supports a rich cranefly *Tipulidae* assemblage, with 47 species recorded including seven Nationally Scarce species. Other flies which can be regarded as part of a loch, fen and carr assemblage including three (proposed) Red Data Book species and two Nationally Scarce species occur. The rare water beetles Coleoptera (*Hydroporus elongatulus*, *Acilius canaliculatus*) and Nationally Scarce (*Agabus unguicularis*) are also recorded from on the site."

3.98.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
	Invertebrates:	Fly assemblage.

3.98.3 Discussion

The ISR lists records (dated 1986) of two water beetles regarded at the time as Rare, namely *A. canaliculatus* and *H. elongatulus*. In the most recent review (Foster, 2010a), *A. canaliculatus* is classed as Nationally Scarce and *H. elongatulus* is classed as Vulnerable. *A. unguicularis*, reported in the citation as a Nationally Scarce species, is now considered to be too widely distributed to meet the criteria. *Hygrotus quinquelineatus*, recorded is currently regarded as Nationally Scarce (Foster, 2010a).

SCM in 2002 produced a list of 15 water beetle species, taking the total for the site to 53 (Drake, 2004). Species recorded included *A. canaliculatus* and *H. elongatulus*. A SCM visit in 2010 produced records of 33 species (Eyre, 2003c). These again included *H. elongatulus*. Following the 2010 visit, the site list stood at 59 species.

The fairly extensive species list, coupled with the presence of one Rare and two Scarce species, constitutes an important assemblage that should be regarded as a qualifying feature. The ISR suggests that *H. elongatulus* could be a single species qualifying feature. However, as monitoring can be effectively combined with monitoring of other species, it is most useful simply to regard the water beetle assemblage as a whole. Direct monitoring is appropriate with previous SCM visits providing a baseline from which changes to the assemblage can be assessed.

The citation refers to three pRDB fly species, although does not state what these are. Just one Rare fly is listed in the ISR, the cranefly *Limonia magnicauda*, a species of quaking bog that is classed as Vulnerable and with records from just three sites. *Pilaria meridiana* was formerly regarded as RDB3, but reassessed as Notable by Falk (1991b). Just one other Scarce fly is listed in the ISR, the cranefly *Pilaria scutellata*.

Seven Nationally Scarce cranefly species were recorded during a SCM visit in 2002, including *P. meridiana; L. magnicauda* was not found (Drake, 2004). This visit also resulted in records of the horsefly *Chrysops sepulcralis* and the snail-killing flies *Antichaeta analis* and *Tetanocera freyi*. *C. sepulcralis* is an RDB1 species (Falk, 1991b) from bogs in southern England and southern Scotland (Stubbs & Drake, 2014). *A. analis* and *T. freyi* are each RDB3 species (Falk, 1991b). A SCM visit took place in 2011, but focussed solely on indirect monitoring of habitat quality for *L. magnicauda* (Wilkinson, 2010).

3.98.4 Recommendations

The water beetle assemblage is a qualifying feature. Direct monitoring should be continued.

Craneflies had been the site's primary interest, but the discovery of three Rare fly species in 2002 justifies a qualifying feature status for the whole fly assemblage. Most craneflies occur infrequently (Drake, 2004), which reduces the effectiveness of direct monitoring. SCM should primarily be by means of indirect monitoring of habitat quality.

3.99 Lochs of Harray and Stenness

3.99.1 SSSI citation (reviewed 20 December 2011)

"The site is also notified for its nationally important invertebrates, namely the caddis fly *Ylodes reuteri* and the freshwater nerite snail *Theodoxus fluviatilis*. The caddis fly is very rare in the UK and has only previously been recorded in a few coastal marsh sites in England. The snail is commonly found in chalky (calcareous) rivers in England but the only extant record for Scotland is in the Loch of Harray."

3.99.2 Notified invertebrate feature(s)

Biological: Invertebrates: Caddis fly (*Ylodes reuteri*).

Freshwater nerite snail (*Theodoxus fluviatilis*).

3.99.3 Discussion

The RDB2 caddisfly *Y. reuteri* was originally recorded at Lochs of Harray and Stenness in 1980 and again in 1986. It was found to be present during SCM in 2003, when five males were recorded from a single sampling site out of four (Godfrey, 2004). *Y. reuteri* is a species of saline pools, and Wallace (2010) considered that Loch Harray probably holds its largest UK population. However, none was found during SCM fieldwork in 2013 (Knight, 2014). Given its national status *Y. reuteri*, is a qualifying feature.

The freshwater nerite snail *T. fluviatilis* has been known from Loch of Harray since 1931. It was also formerly present at Loch of Stenness. Although the species occurs commonly in the south of England, and more sparingly in the north, the Lochs of Harray and Stenness is the only confirmed Scottish site. The species was recorded during SCM fieldwork in 2013 at all four sampling points, and the population was described as stable and widespread (Knight, 2014). *T. fluviatilis* is not a rare species in the UK and was assessed as Least Concern, though possibly declining (Seddon *et al.,* 2014). It is doubtful that the species can be regarded as a qualifying feature as a single species. However, given that this SSSI remains its only Scottish site, it may be appropriate to combine it with *Y. reuteri* and refer to the freshwater invertebrate assemblage as the qualifying feature.

3.99.4 Recommendations

The caddisfly *Y. reuteri* is a qualifying feature. Attempts should be made to determine whether the species is still present at the site.

The snail *T. fluviatilis* may not be a qualifying feature as a single species. The species could be combined with *Y. reuteri* in a freshwater invertebrate assemblage and monitored directly.

3.100 Lochwood

3.100.1 SSSI citation (reviewed 15 May 2008)

"Lochwood lies 5km south of Beattock and is an area of old parkland Oakwood of a type rare in the Scottish lowlands. Many of the oaks are ancient, the oldest being mainly hollow pollards. On lower ground to the north, the Oakwood grades into birch-willow-alder carr. In addition to interesting mosses and liverworts, the site is also of considerable importance for invertebrates, specifically beetles Coleoptera and butterflies Lepidoptera and for its lichen communities which are unique to Scotland."

3.100.2 Notified invertebrate feature(s)

Biological: Butterflies: Purple hairstreak (*Neozephyrus quercus*).

3.100.3 Discussion

The ISR reference to the species appears doubtful. There are no site records in the Butterfly Conservation database, and searches during a number of visits in 2003 and 2004 did not generate any records (Prescott *et al.*, 2006). This species can be difficult to detect, but even if it is present, the lack of records suggest that any possible colony would not be a strong one.

The ISR lists a RDBI beetle, *Procas granulicollis.* There are British records from northwest England, southwest Scotland and Wales (Hyman & Parsons, 1992; 1994). It may be a qualifying feature, but monitoring, either directly or indirectly, would be difficult as little is known about the species' ecology.

3.100.4 Recommendations

Purple hairstreak is not a qualifying feature.

3.101 Logierait Mires

3.101.1 SSSI citation (reviewed 9 February 2010)

"Logierait Mires is situated 4 km south of Pitlochry and 1.5 km north west of Logierait village. It is important for its breeding population of the northern blue damselfly *Coenagrion hastulatum*.

The site includes an old curling pond and a series of basin mires within coniferous and other woodland which are breeding and feeding areas for the northern blue damselfly. It is the only known location for this nationally rare species in east Perth & Kinross."

3.101.2 Notified invertebrate feature(s)

Biological: Dragonflies: Northern blue damselfly (*Coenagrion hastulatum*).

3.101.3 Discussion

The northern blue damselfly is the only feature described in the citation. It is listed as RDB2, but was regarded by Daguet *et al*. (2008) as endangered. SCM in 2002 showed that the species was present in good numbers at the curling ponds, but it was not found on ponds nearby (Smith, 2002). Six additional dragonfly species were recorded. Further SCM visits in 2013 showed northern damselfly to remain present in good numbers, and the surveyor reported that the curling ponds were one of the best sites for the species in Scotland (Batty, 2014a). The total number of dragonfly species recorded was six.

As a RDB2 species, the northern damselfly could be a qualifying feature in its own right at a site containing the largest or only population in the Area of Search. Until recently, Logierait Mires was considered the only site for this species in the East Perth and Kinross Area of Search. However, it has been found near Ballinluig in 2010, and there was also a casual record from Loch of the Lowes in 2006 (Cham *et al*., 2014). Nonetheless, it is likely that Logierait Mires is the strongest colony, with records from four water bodies.

3.101.4 Recommendations

The northern damselfly is a qualifying feature as a single species and should be monitored directly; the number of species is insufficient to qualify the whole dragonfly assemblage.

3.102 Lurgie Loch

3.102.1 SSSI citation (reviewed 21 March 2011)

"Lurgie Loch Site of Special Scientific Interest (SSSI) is located approximately 6 km north-west of Kelso in the Scottish Borders. The site is notified for its basin fen, which is unusual in this area, and its exceptional beetle assemblage.

A basin fen is a peatland that has formed in a hollow of land underlain by base-rich rock. Both the vegetation and invertebrates of this basin fen are very unusual for the area and show stronger affinities to continental and Eastern English wetlands than to other wetlands in the Scottish Borders. Some of the plant and invertebrate species found at Lurgie Loch are nationally or locally rare, including; slender sedge *Carex lasiocarpa*, bladder sedge *Carex vesicaria*, bog pondweed *Potamogeton polygonifolius*, marsh stitchwort *Stellaria palustris*, coralroot orchid *Corallorhiza trifida*; and beetles such as *Agabus uliginosus* and *Ilybius chalconatus*."

3.102.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.102.3 Discussion

The citation refers to two water beetle species by name: *A. uliginosus* and *I. chalconatus. A. uliginosus* was labelled as Nationally Notable B, but was classed as Near Threatened in the most recent review; *I. chalconatus* did not meet the Nationally Scarce criteria (Foster, 2010a). The ISR lists three species regarded as RDB3, namely *Hydroporus glabriusculus*, *Hydrochus brevis* and *Dryops anglicanus*. In the latest review, *H. glabriusculus* was classed as Vulnerable, and *H. brevis* and *D. anglicanus* as Near Threatened (Foster, 2010a).

SCM in 2002 produced a list of 31 species of water beetle, taking the total for the site to 51 (Eyre, 2003c). Species recorded included *A. uliginosus,* and also *Agabus unguicularis* and *Helophorus strigifrons,* which at the time were classed as Nationally Notable B. In the latest review, *A. unguicularis* was retained as a Nationally Scarce Species but *Helophorus strigifrons* was found not to meet Nationally Scarce criteria (Foster, 2010a). A SCM visit in 2010 produced records of 33 species, including *A. uliginosus* and *D. anglicanus*. The cumulative list reported after that visit stood at 60 species (Foster, 2010b). A 2015 SCM visit produced records of 26 species, which did not include any of conservation concern (Foster *et al*., 2017).

The extensive list of water beetle species (60), coupled with the presence of four Rare species, indicate an important assemblage. Some of the Rare species may be single species qualifying features, especially *D. anglicanus* for which Lurgie Moss is the only Scottish site (Foster, 2010b). However, as monitoring can be effectively combined with monitoring of other species in the assemblage, it is most useful to regard the water beetle assemblage as a whole.

SCM reports following the 2010 and 2015 visits state that the site was rather dry with little open water. The report following the 2002 visit also stated that the fauna was changing from a moss-related assemblage to one associated with carr and temporary running water (Eyre, 2003c). Such factors underline the importance of regular SCM visits to assess changes in the site.

3.102.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring should continue, especially as the site appears to have changed in nature over recent years.

3.103 Maidens to Doonfoot

3.103.1 SSSI citation (reviewed 31 March 2011)

"There are several interesting invertebrate species associated with the maritime cliff habitat, including a nationally rare cranefly *Orimarga virgo*, and three nationally scarce species: the weevil *Tropiphorus elevatus* and the water beetles *Cercyon depressus* and *Ochthebius lejolisii*."

3.103.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.103.3 Discussion

The citation names one Rare and three Scarce species. The RDB3 cranefly *O. virgo* is associated with seepages (Falk, 1991b). Of the Scarce species, *T. elevatus* is associated with broad leaf and pasture woodland (Hyman & Parsons, 1992). The two water beetles, *C. depressus* and *O. lejolisii*, are Nationally Scarce (Foster, 2010a).

The only SCM document relating to flies is from indirect monitoring of habitat features and the site was thought to be suitable for *O. virgo* (Wilkinson, 2010). This species was first reported in 1969 and most recently recorded in 1995. SCM fieldwork for beetles took places on several dates in 2015 (Cathrine *et al*., 2017a). The water beetles *C. depressus* and *O. lejolisii* were recorded.

3.103.4 Recommendations

The invertebrate assemblage is not sufficiently rich to be regarded as a qualifying feature. The cranefly *O. virgo* may be a qualifying feature, depending on its status at other sites in the Area of Search.

3.104 Meall na Samhna

3.104.1 SSSI citation (reviewed 25 November 2010)

"The upland fauna includes the Northern Emerald dragonfly *Somatochlora arctica*, a Red Data Book species."

3.104.2 Notified invertebrate feature(s)

Biological: Dragonflies: Northern emerald dragonfly (*Somatochlora arctica*).

3.104.3 Discussion

The northern emerald dragonfly was classed as RDB3 by Shirt (1987) but has since been found to be more widespread than previously thought (Cham *et al*., 2014). Daguet *et al*. (2008) classified it as Near Threatened. Given this relatively wide distribution, it probably does not meet current JNCC criteria for a qualifying feature. During two visits for SCM in 2013, the northern emerald and eight other species were recorded, although three of the damselflies were only noted from a newly created pond adjacent to the SSSI (Batty, 2014b). Strictly speaking, the six species recorded within the SSSI boundary do not meet the criteria for a qualifying feature, although the presence of species adjacent to the SSSI indicates that they may occur in the site.

3.104.4 Recommendations

The dragonfly assemblage as a whole should be regarded as the qualifying feature, to be monitored directly.

3.105 Merrick Kells

3.105.1 SSSI citation (reviewed 21 March 2011)

"The mix of granite, sedimentary rocks and morainic deposits provides a high diversity of upland habitats, which, along with the extremely humid oceanic climate, support a number of higher plant species and bryophytes not normally found south of the Highland Boundary Fault. These include a rare hawkweed *Hieracium holosericeum*, downy willow *Salix lapponum*, alpine saw-wort *Saussurea alpina*, purple saxifrage *Saxifraga oppositifolia*, and the localised liverwort *Pleurozia purpurea* and moss *Campylopus setifolius*. The blue aeshna (or azure hawker) dragonfly *Aeshna caerulea*, is recorded at its most southerly location in Scotland.

The bogs also contain a number of rare or locally scarce beetles, including the Nationally Scarce beetles *Cyphon kongsbergensis*, *Hydroporus longicornis* and *Enochrus ochropterus*, and spiders *Clubiona norvegica* and *Zora nemoralis*."

3.105.2 Notified invertebrate feature(s)

Biological: Dragonflies: Blue aeshna dragonfly (*Aeshna caerulea*).

Invertebrates: Beetles.

3.105.3 Discussion

The dragonfly listed as blue aeshna dragonfly (*Aeshna caerulea*) in the citation, otherwise known as the azure hawker, is one of just two UK dragonflies restricted to Scotland. Most of its known range is in the west and north Highlands, with four hectads in Dumfries and Galloway. Only two of these records south of the Central Belt are post 2000 (Cham *et al*., 2014). The species is regarded as Vulnerable in the latest review (Daguet *et al*., 2008).

SCM visits in 2003 produced records of nine species, which included two adult azure hawkers (Hewitt, 2004). SCM visits in 2010 and 2011 produced records of eight species, with breeding evidence for seven. The azure hawker was not seen during these visits (Willet & Corcoran, 2011).

Populations of azure hawker are qualifying features if they are on the edge of the species' geographical range (Bainbridge *et al*., 2013). The lack of recent records means that evidence of a strong population is lacking. However, the dragonfly assemblage as a whole may be a qualifying feature. Merrick Kells is a large site (over 8,000 ha), although most dragonfly records have come from a much smaller area known as the Silver Flowes. Surveys in 1982/83 produced ten species whilst the nine on the SCM visit in 2003 also met the qualifying feature threshold. Although only eight species were found in 2010/11, the weather was not ideal for surveying (Willet & Corcoran, 2011). Therefore, as a precautionary approach, the dragonfly assemblage, rather the azure hawker alone, should be regarded as a qualifying feature.

The citation lists three water beetle species referred to as Nationally Scarce. In the latest review, *H. longicornis* is classed as Near Threatened, *C. kongsbergensis* as Nationally Scarce, whist *E. ochropterus* does not meet the criteria for Nationally Scarce (Foster, 2010a).

A SCM visit in 2002 produced a list of 23 water beetle species, taking the total for the site to 49 species (Eyre, 2003c). Species recorded included *C. kongsbergensis, H. longicornis*, *Enochrus affinis* and *Enochrus ochropterus*, each then classed as Nationally Notable B. However they no longer meet Nationally Scarce criteria (Foster, 2010a). A SCM visit in 2010 produced records of 19 species, including again *H. longicornis*. The cumulative list

reported after that visit stood at 51 species (Foster, 2010b). A SCM visit in 2015 produced records of 20 species, again including *H. longicornis* (Cathrine *et al*., 2017a).

The number of species (51) is lower than some other important sites in the region, although an impoverished fauna is typical of raised bogs (Foster, 2010b). However, the continued presence of one Rare and one Scarce species indicates an important assemblage that should be regarded as a qualifying feature.

Two spiders, *C. norvegica* and *Z. nemoralis*, are referred to in the citation. Both are classed as Nationally Scarce B and do not therefore qualify.

3.105.4 Recommendations

The azure hawker may not be a qualifying feature as a single species but the dragonfly assemblage should be regarded as a qualifying feature. This assemblage should be monitored directly.

The beetle assemblage, specifically the water beetle assemblage, should be regarded as a qualifying feature. This assemblage should be monitored directly.

3.106 Methven Woods

3.106.1 SSSI citation (reviewed 20 January 2010)

"The invertebrate assemblage present is characteristic of deciduous woodlands and includes rare and notable species of beetles, moths, spiders and flies, some of which are particularly associated with dead and dying wood."

3.106.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.106.3 Discussion

The ISR lists four fly species considered to be Rare, all with records from the 1990s. *Allodia czernyi*, now classed as Near Threatened, is associated with fungi in pine woods (Falk & Chandler, 2005). *Palloptera usta* feeds at pine sap (Alexander, 2002), and *Mycetophila immaculata,* which is now regarded as Nationally Scarce, has larvae associated with fungi in broadleaf woodland (Falk & Chandler, 2005). *Medetera excellens* was classed as RDB3 (Shirt, 1987), then RDB2 (Falk, 1991b), and now Near Threatened (Falk & Crossley, 2005). This species is associated with pines (*Pinus* spp.), with larvae found under bark, and most records are from Scotland (Falk & Crossley, 2005).

The presence of three fly species regarded as Rare, and one formerly so, does highlight the quality of the site. There is a clear link of this fauna with dead wood, which was the focus of a SCM visit in 2010 (Wilkinson, 2010). Among the Scarce species listed in the ISR, the flies *Brachyopa insensilis*, *Lonchaea peregrina* and *Oedalea zetterstedti*, and the beetles *Phyllodrepoidea crenata*, *Abdera flexuosa* and *Tetratoma ancora,* are all regarded as saproxylic (Alexander, 2002). Thus it appears that the saproxylic invertebrate fauna is of particular importance.

A total of 34 beetle species were identified during 2015 SCM, including the Scottish Biodiversity List *Megasternum concinnum*. Eight of these species are saproxylic: *Malthodes minimus, Salpingus planirostris*, *Rhagium bifasciatum, Cerylon ferrugineum*, *C. histeroides* and *Orchesia undulata*. A total of 189 species of fly was recorded, including *Tipula laetabilis*

(RDB2), for which Methven Woods SSSI is one of only six known British localities, and the Nationally Scarce species *Calliphora loewi, Mydaea deserta, Thricops sudeticus* and *Tetanocera phyllophora* (Cathrine *et al.,* 2017b).

3.106.4 Recommendations

The invertebrate assemblage is a qualifying feature, in particular the saproxylic invertebrate assemblage. This feature should primarily be monitored indirectly.

3.107 Milton Loch

3.107.1 SSSI citation (reviewed 4 December 2009)

"The loch contains populations of declining northern species of water beetles and relict southern species which are typical of the north Solway area, including the Nationally Scarce species *Hygrotus quinquelineatus*, *Ilybius fenestratus*, *Oulimnius troglodytes* and *Gyrinus aeratus*."

3.107.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.107.3 Discussion

Of the four water beetle species referred to in the citation as Nationally Scarce, *I. fenestratus* does not now meet the criteria (Foster, 2010a).

A SCM visit in 2002 produced a list of 7 water beetle species, taking the total for the site to 50 species, including *H. quinquelineatus* (Eyre, 2003c). A SCM visit in 2010 produced records of 32 species (Foster, 2010b). These included *Acilius canaliculatus*, classed as Nationally Scarce (Foster, 2010a), and *Donacia thalassina*, classed as Nationally Notable B (Hyman & Parsons, 1992). The cumulative list reported after that visit stood at 63 species.

Although no species is now regarded as Rare are on the list, Milton Loch was assessed as holding the best assemblage of water beetles in lochs and ponds with bare substratum and poorly developed vegetation in southern Scotland (Foster & Eyre, 1992).

3.107.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, should be regarded as a qualifying feature. Direct monitoring of this assemblage should continue, with previous SCM visits providing a baseline from which changes to the assemblage can be assessed.

3.108 Milton-Lockhart Wood

3.108.1 SSSI citation (reviewed 18 June 2009)

"Milton-Lockhart Wood lies on the bank of the River Clyde approximately 3km west of Carluke and is an area of steep, south-facing policy woodland. This is one of the most important sites for woodland beetles (Coleoptera) in south central Scotland, especially for saproxylic species living in dead wood and in fungi growing on dead wood.

The beetle fauna includes a number of nationally rare and nationally scarce species in Great Britain and species scarce or rare in Scotland. These include the Red Data Book listed beetles *Atomaria procerula* and *Melolontha hippocastani*; the nationally scarce saproxylic beetles *Abdera flexuosa*, *Cerylon fagi* and *Orchesia micans*; and the regionally scare saproxylic beetles *Cis fagi*, *Dacne bipustulata* and *Mycetophagus quadripustulatus*.

The entomological (insect) value of the site is related to topography and the occurrence of a range of ecological niches including over-mature and decaying beech and oak suitable for the larvae of dead wood beetles. Milton-Lockhart Wood complements and forms a significant link between other entomologically important sites in the upper and lower Clyde Valley. "

3.108.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.108.3 Discussion

The Scarce species named in the citation are stated to be saproxylic. The ISR also lists two Rare flies, eight additional Scarce beetles and two Scarce flies. The Rare flies, *Platypalpus carteri* and *Mycomya fuscata,* are classed as Near Threatened in later reviews (Falk & Chandler, 2005; Falk & Crossley, 2005). The reports of both species are dated as 1980, and the record of *M. fuscata* is unconfirmed (Falk & Chandler, 2005).

SCM visits in 2003, focussed on the saproxylic beetle fauna, produced records of 18 such species (Eyre, 2003a). These included the Scarce and regionally scarce species listed in the citation. A one-day SCM visit in 2010 resulted in just six saproxylic beetle species recorded, which did not include any of the Rare or Scarce species (Alexander, 2011). This last report makes reference to a range of species recorded during more detailed surveys in 2009, including *Hypulus quercinus*, a RDB2 saproxylic species previously unrecorded in Scotland and associated with ancient broadleaved woodland (Hyman & Parsons, 1992). The Nationally Scarce *Orchesia minor* was also recorded as new for the site.

Saproxylic beetles have been the primary interest in the site. *H. quercinus*, discovered in 2009, could be a qualifying feature as a single species though is better treated as part of an assemblage. Typically of saproxylic species, recording a wide range of species on short visits is difficult or impossible, hence the list of Rare and Scarce species span a number of decades. However, the saproxylic beetle assemblage clearly contains sufficient specialities to be considered as a qualifying feature.

The fly *P. carteri* may be a qualifying feature, as Falk & Crossely (2005) listed Milton Lockhart Wood as one of just three Scottish sites, although it is not a notified feature. It is not a saproxylic species, so it cannot be combined with the saproxylic fauna. However the two Scarce flies, *Mycetobia pallipes* and *Brachyopa insensilis*, each recorded in 1996, are saproxylic.

3.108.4 Recommendations

The beetle assemblage, specifically saproxylic beetles, is a qualifying feature. Direct surveys should be combined with indirect monitoring of habitat features for SCM purposes.
The fly *P. carteri*, may be a qualifying feature. Given this cross-over between groups, combining the Rare and Scarce fly species with the beetles and regard the invertebrate assemblage as the qualifying feature would be a pragmatic approach.

3.109 Minto Craigs

3.109.1 SSSI citation (reviewed 20 January 2011)

"The woodland habitat supports an important invertebrate fauna and the nationally rare and notable rove beetle *Sepedophilus immaculatus* has been found on the site, as have two other locally rare beetles (*Habrocerus* sp. and *Tachyporus* sp.)."

3.109.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.109.3 Discussion

Of the beetle listed in the citation, *S. immaculatus* and *H. capillaricornis* are Local, and *T. chrysomelinus* is Common. None of them can be considered to be qualifying features. *S. immaculatus* was not found during SCM carried out in 2015, although four saproxylic species were found (Cathrine *et al*., 2017a).

3.109.4 Recommendations

On currently available information, the beetle assemblage is not a qualifying feature.

3.110 Moine Mhor

3.110.1 SSSI citation (reviewed 8 March 2011)

"Western Scotland is a stronghold for the nationally-scarce UK BAP protected marsh fritillary butterfly *Euphydryas aurinia*, and there is a population at Moine Mhor. Its food source is the devil's-bit scabious *Succisa pratensis* which grows on the higher ground at the edges of the bog."

3.110.2 Notified invertebrate feature(s)

Biological: Invertebrates: Marsh fritillary (*Euphydryas aurinia*).

3.110.3 Discussion

Ravenscroft (2003) reported that larval webs were found in good numbers on two parts of the Moine Mhor NNR and that the site was a stronghold of the species, with 960 webs counted in 1996. Moine Mhor SSSI lies within the Mid Argyll and Cowal Area of Search.

Moine Mhor holds a range of other butterflies species, including large heath, purple hairstreak, dark green fritillary and Scotch argus. The first of these is a UK Priority Species that has suffered a significant loss of populations, although it still occurs widely in western and northern Scotland. Whilst marsh fritillary remains the key notified feature, there may be merit in including the large heath and the purple hairstreak in any monitoring program, especially as their adults can be on the wing in mid-August, when larval searches for marsh fritillary take place.

3.110.4 Recommendations

Although information is not available to rank the importance of sites in the Area of Search, Moine Mhor is clearly an important site and marsh fritillary should be regarded as a qualifying feature and monitored directly.

Large heath and purple hairstreak should be considered for inclusion in any butterfly monitoring program implemented at the site.

3.111 Monadhliath

3.111.1 SSSI citation (reviewed 25 March 2011)

"The nationally scarce black mountain moth *Glacies coracina* occurs in the site and has only been recorded in the Central Highlands of Scotland. It is a high-mountain species, usually occurring above 600 m, and the larvae feed on crowberry *Empetrum nigrum*."

3.111.2 Notified invertebrate feature(s)

Biological: Invertebrates: Black mountain moth (*Glacies coracina*).

3.111.3 Discussion

The black mountain moth is now classed as Nationally Scarce A (Waring & Townsend, 2003) and has been recorded from scattered locations across the Scottish Highlands (Hill *et al*., 2010). A SCM visit in 2014 produced 43 black mountain moths during a daytime search, which were the first records from the SSSI in 39 years (Prescott, 2015).

Being a Scarce species, the black mountain moth may not now be a qualifying feature. However, several other Rare and Scarce moths have been recorded, such the broad-bordered white underwing (*Anarta melanopa*), an RDB 3 species (Waring &Townsend, 2003), recorded in 1970 and *Olethreutes obsoletana*, a pRDB3 species (Davis, 2012) recorded in 2014 (Prescott, 2015). Scarce species include Lepidoptera associated with northern upland or mountainous areas such as the northern dart (*Xestia alpicola*) and the pyralid moths *Eudonia alpina* and *Udea uliginosalis* (Prescott, 2015). Most of these species can be monitored directly and many of the montane species are detectable during daytime searches. It would, therefore, be opportune and efficient to combine monitoring of black mountain moth with a wider upland moth assemblage and to regard this assemblage as a qualifying feature.

The listed fly *Hydrophorus rufibarbis* is now classed as Nationally Scarce (Falk & Crossley, 2005) and so is not a candidate for a qualifying feature.

3.111.4 Recommendations

The black mountain moth is not now a qualifying feature as a single species but the upland moth assemblage probably does meet qualifying feature criteria. This feature can be effectively monitored by direct survey.

3.112 Morrich More

3.112.1 SSSI citation (reviewed 8 December 2010)

"The range of habitats within the site is also reflected in a rich invertebrate community. Populations of the Grayling butterfly *Hipparchia semele* and Galium carpet moth *Epirrhoe*

galiata are present on this site and are close to their northern limit. The wide range of other nationally rare and scarce invertebrate species includes the fungus gnat *Mycomya lambi*, a species of cranefly *Tipula nodicornis*, several water beetles and the water flea *Eurycyrus glacialis* in its only Scottish location."

3.112.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.112.3 Discussion

The notified feature is the invertebrate assemblage, so it encompasses species from a range of invertebrate groups. The citation refers specifically to butterflies and moths, flies, beetles and a water flea. The invertebrate assemblage is clearly a qualifying feature though some more clearly defined elements within it may also be qualifying features as described below.

Two Lepidoptera species are listed in the citation, grayling butterfly and the moth gallium carpet. Both are listed in the Species Dossier as having been recorded in 1977, in common with most other Lepidoptera listed. Grayling has suffered a significant decline in the UK with a range loss of 62% between 1976 and 2014 though it remains widespread, with records from 542 hectads between 2010 and 2014 (Fox *et al*., 2015). Galium carpet is classed as Local (Waring & Townsend, 2003). No records of the species are shown north of the Great Glen by Hill *et al*. (2010), possibly indicating that the record at the site is no longer reliable. Three Nationally Notable B Lepidoptera are listed in the Species Dossier, chestnut-coloured carpet (*Thera cognata*), Scotch annulet (*Gnophos obfuscata*) and thyme pug (*Eupithecia distinctaria constricta*), and should, perhaps, take precedent in any targeted butterfly or moth monitoring.

Three RDB3 Diptera are listed in the Species Dossier with records from 1975 and 1976. The cranefly *Tipula nodicornis* and the fungus gnat *Mycomya lambi* are referred to in the citation. *T. nodicornis* is associated with river banks, coastal dunes and shingle. In Britain, it is found just in eastern Scotland (Falk, 1991b). *M. lambi* has British records from sites just in Argyll, Inverness and Rannoch. The third RDB3 Diptera, not listed in the citation, is *Lispocephala rubricornis*, a sand dune species with records from England, Scotland and Wales (Fonseca, 1968). Morrich More is, apparently, the only known Scottish site (Wilkinson, 2010). A SCM visit planned in 2003 could not be carried out due to safety issues (Godfrey, 2004). A SCM visit did take place in 2010 to assess the Diptera assemblage indirectly through monitoring of habitat features (Wilkinson, 2010). On the basis of records of the three RDB3 flies, the Diptera assemblage is probably a qualifying feature. However, no recent Diptera records appear to be available for this site so field surveys would be desirable to determine the current status of Rare and Scarce species. Notably, of the 13 Diptera recorded from Morrich More SSSI, nine are considered to be wetland species (Wilkinson, 2010) and so such areas could be specific targets for direct monitoring. Fly species at the site may be challenging subjects for direct monitoring.

The water flea *Eurycyrus glacialis* was recorded in three small pools at Morrich More in 1998 following an earlier record in 1957 (Duigan, 1991). The citation states that Morrich More is the only Scottish location for the species though this is not the case, as it is also found at Ronas Hill SSSI, in Shetland. Morrich More is, though, the only recorded site in mainland Britain (Duigan, 1991). As such, the species is a qualifying feature in its own right.

No water beetles are listed directly in the citation though three species listed in the species dossier are labelled as Nationally Notable B: *Gyrinus minutus*, *Agabus uliginosus* and

Agabus labiatus. Although probably not a qualifying feature themselves, they contribute to the invertebrate assemblage as a notified feature.

3.112.4 Recommendations

The water flea *E. glacialis* is a qualifying feature whilst the Diptera assemblage is probably also a qualifying feature. Scarce Lepidoptera and water beetles contribute towards the invertebrate assemblage as a whole. *E. glacialis* can be monitored directly, though the fly assemblage SCM should include an element of indirect monitoring.

The condition of wetland features should be monitored indirectly, but as few recent species data are available for the site, entomological field surveys are also desirable.

3.113 Morrone Birkwood

3.113.1 SSSI citation (reviewed 14 June 2011)

"The invertebrate fauna is an important one, with a high proportion of northern and montane species and a number of national rarities. These include the flies *Dorylomorpha beckeri* and *Spilogona griseola* and the moths *Kessleria saxifragae* and *Dichomeris juniperella*. Other rare invertebrate species include the beetle *Scolytus ratzeburgi*, the pearl bordered fritillary butterfly *Boloria euphrosyne* and Geyer's whorl snail *Vertigo geyeri*."

3.113.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.113.3 Discussion

An extensive range of Rare and Scarce species has been recorded from this site. These include 28 species labelled as Rare in the ISR and 41 labelled as Scarce (Table 6).

Table 6. Morrone Birkwood SSSI Red Data Book invertebrates listed in the Invertebrate Site Review. The figures include species provisionally assigned to RDB categories and the micro-moth Coleophora pappiferella*, assigned to the RDB1 category following Davis (2012). The fly* Miltogramma germari, *recorded in 1873, was excluded as published records are from sandy areas in southern England and Wales (van Emden, 1954).*

	RDB1	RDB2	RDB3	RBDK	Notable A	Notable B
Coleoptera		1		1	1	6
Diptera	3	2	10			18
Hemiptera					1	1
Hymenoptera						1
Lepidoptera	4		6		4	9
Mollusca	1					

Invertebrates as a whole are clearly a qualifying feature. However, to assist with defining important assemblage sub-sets, basic habitat information was assembled for all the Rare species except two fly species for which habitat information could not be found (Emmet &

Langmaid, 2002a; Hyman & Parsons, 1992; Hyman & Parsons, 1994; Falk & Chandler, 2005; Kerney, 1999; Sterling & Parsons, 2012; Stubbs & Falk, 2002). These sources identify two broad assemblages, woodland and upland/montane.

Five Rare flies, *Blera fallax*, *Callicera rufa*, *Chamaesyrphus scaevoides*, *Melangyna ericarum* and *Xylophagus cinctus* are associated with pine woods. All are represented by old records (the most recent is *M. ericarum* in 1971). The only notified woodland habitat is upland birch woods, suggesting that these species may not have actually been recorded within the SSSI boundaries, or at least that the SSSI is not important for them. Similarly, the *B. fallax* record, from 1873, is thought to refer to nearby Braemar (Wilkinson, 2011).

Other Rare woodland invertebrates comprise the beetle *Cryptocephalus decemmaculatus*, the flies *Bicellaria halterata*, *Tachypeza truncorum*, *Boletina silvatica* and *Parasyrphus nigritarsis,* and the moths *Dichomeris juniperella* and cousin German (*Paradiarsia sobrina*). The moth *Rhigognostis incarnatella* is likewise associated with woodlands but also with gardens from where it is thought that the records originate (Prescott *et al.*, 2006). The Rare woodland species have a variety of specific niche requirements with, for example, *D. juniperella* feeding as a larva on juniper (*Juniperus communis*) and cousin German requiring birch (*Betula*) with a bilberry (*Vaccinium myrtillus*) understorey.

Rare species of upland and montane habitats are the beetle *Gabrius scoticus,* the flies *Cheilosia sahlbergi* and *Platycheirus melanopsis*, the snail *Vertigo geyeri*, and the moths *Coleophora pappiferella*, *Scrobipalpa murinella*, broad-bordered white underwing (*Anarta melanopa*), Scotch burnet (*Zygaena exulans subochracea*) and the netted mountain (*Macaria carbonaria*). Again the habitat requirements of these species vary considerably, ranging from base-rich bogs and fens for *V. geyeri* to flat mountain tops with crowberry (*Empetrum nigrum*) for the Scotch burnet.

Two Rare species, the fly *Platypalpus confinis* and the moth *K. saxifragae* are especially associated with riverside habitats, whilst the fly *Opomyza punctella* and the moth *Elachista orstadii*, are grassland species.

Several of the species recorded will be qualifying features as single species. These include the moth *C. pappiferella,* which was discovered here in 2000 and has been recorded nowhere else in the UK (Prescott *et al.*, 2006). The snail *V. geyeri* is listed as Near Threatened and conservation-dependent in the latest review (Seddon *et al*., 2014). Morrone Birkwood is one of its two sites in the Kincardine and Deeside Area of Search. Both are considered marginal, although Morrone Birkwood yielded slightly more specimens and has a larger area of suitable habitat than the other site, Glen Lui (Killeen, 2013). Thus the species should probably be considered a qualifying feature. Among the three RDB1 flies, there is a post-1960s record only for *B. silvatica* and, as this species is considered data deficient (Falk & Chandler, 2005), it may not be a qualifying feature.

There are recent records for nine of the ten moths species listed as Rare in the ISR, although the statuses of some have been downgraded, e.g., *Elachista orstadii*, RDB1 to pRDB3, and *Scrobipalpa murinella*, RDB1 to pRDB2 (Davis, 2002).

The fly *D. beckeri*, the beetle *S. ratzeburgi* and pearl-bordered fritillary are listed in the citation despite not being Rare species. Records of *D. beckeri* and *S. ratzeburgi* date from 1980 and 1981 respectively. Searches for them during a SCM visit in 2013 were not successful (Alexander, 2015). Only the pearl-bordered fritillary may be a qualifying feature in itself, with the Kincardine and Deeside Area of Search holding a substantial proportion of the British colonies. Data do not exist to judge if Morrone Birkwood fulfils the criteria, but consideration should be given to monitoring this species alongside other Lepidoptera at the site.

For a large number of Rare species, especially the Rare flies, most records are old, with some from the nineteenth century. It would be desirable to establish to current status of

these species. In the absence of more information, monitoring should be carried out indirectly, focussed on habitat requirements among the notified habitat features.

3.113.4 Recommendations

The invertebrate assemblage is a qualifying feature, with key sub-sets associated with woodland and upland/montane species.

The micro-moth *C. pappiferella* is a qualifying feature as is the moth assemblage as a whole, and should be directly monitored.

V. geyeri is a qualifying feature and should be monitored directly.

Other species should be monitored indirectly, although field surveys should be commissioned or facilitated to update information on Rare species, especially flies.

3.114 Mount Bog

3.114.1 SSSI citation (reviewed 14 October 2010)

"The variety of open water habitats within the site, including a system of slow running ditches and deep pools, supports a diverse assemblage of water beetles with 38 species recorded to date. These include two species listed in the Red Data Book with category RDB3 (rare), namely *Laccornis oblongus* and *Hydroporus elongatulus*, which was first recorded in Britain at this site in 1974."

3.114.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.114.3 Discussion

L. oblongus and *H. elongatulus* are listed in the ISR as RDB3. In the most recent review, *L. oblongus* is classed as Near Threatened while *H. elongatulus* is classed as Vulnerable (Foster, 2010a). Another water beetle, *Agabus unguicularis*, is listed as Nationally Notable B, although it does not now meet the criteria for Nationally Scarce status (Foster, 2010a).

SCM in 2002 produced a list of 27 species water beetle, including *H. elongatulus,* taking the total for the site to 55 species (Eyre, 2003c). The contractor reported that the absence of *L. oblongus* was due to its early season phenology. A SCM visit in 2010 produced records of 33 species, including *L. oblongus* and *H. elongatulus* as well as *Hydroporus longicornis*, listed as Near Threatened by Foster (2010b). The cumulative list reported after that visit stood at 57 species (Foster, 2010b). In 2015 SCM, there were records of 35 species, including the target species *H. elongatulus*, and the Nationally Scarce *Helophorus strigifrons* (Foster *et al*., 2017).

The species list, coupled with the presence of three Rare species, suggests an important assemblage that should be regarded as a qualifying feature. Some of the Rare species may be single species qualifying features, especially *H. elongatulus*, for which there are only five post-1980 hectads in Scotland (Foster, 2001). However, as monitoring can be effectively combined with monitoring of other species in the assemblage, it is most useful simply to regard the water beetle assemblage as a whole.

3.114.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring should be continued.

3.115 Mugdock Wood

3.115.1 SSSI citation (reviewed 13 May 2010)

"The site is rich in deadwood which supports a number of rare invertebrates, notably beetles, including several such as *Acritus nigricornis* and *Cerylon histeroides* which are restricted to ancient deciduous woodland and one which occurs nowhere else in Scotland, *Geostiba armata*."

3.115.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.115.3 Discussion

The citation lists three beetles. *A. nigricornis* is listed as date unknown in the ISR and is described as a common species, found in rotten vegetation (Halstead, 1963). *C. histeroides* was recorded between 1954 and 1983. It is classed as Local and is found under dead bark of broadleaved trees in old woodland. *G. armata* is a little known species of rove beetle and is listed on the ISR simply as date unknown. However the ISR suggests that the species described in the former SSSI citation as "one which occurs nowhere else in Scotland" should in fact be *Phyllobrotica quadrimaculata*, a species described as widespread (Hubble, 2014). None of these appears to be sufficiently well-known or of sufficient rarity to meet JNCC criteria.

The site does host 17 Scarce beetles. These are varied in habitat associations, do not form an ecologically coherent assemblage and are simply dated in the ISR as 1954-1983. The number of species thus recorded may be sufficient for the beetle assemblage to remain a qualifying feature.

The ISR also lists a 1992 record of the sawfly *Brachythops wuestneii*, stated to be RDB3. Larvae of this species feed on *Carex lasiocarpa* (Benson, 1952). The ISR states that at that time, the species was only known from five British localities, all in Scotland, although it is not listed as exclusively Scottish by Liston *et al.* (2010).

3.115.4 Recommendations

The beetle assemblage is probably a qualifying feature. It should primarily be monitored by indirect assessment of habitat condition though species surveys are also desirable.

The status of the sawfly *Brachythops wuestneii* should be assessed to determine whether it meets qualifying feature criteria.

3.116 Muir of Dinnet

3.116.1 SSSI citation (reviewed 16 November 2011)

"Many rare invertebrates are recorded and this is the richest site for Lepidoptera (butterflies and moths), Odonata (dragonflies and damselflies) and aquatic Coleoptera (beetles) in south

Aberdeenshire. These include the rare northern damselfly *Coenagrion hastulatum*, the rare netted mountain moth *Semiothisa carbonaria*, the nationally declining pearl-bordered fritillary *Boloria euphrosyne* and the rare water beetle *Acilius canaliculatus*."

3.116.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Invertebrate assemblage.
	Dragonflies:	Dragonfly assemblage.

3.116.3 Discussion

The species labelled as Rare are dominated by seven species of moth. The pRDB1 *Levipalpus hepatariella* (Davis, 2012) has been recorded from three UK vice counties, all in Scotland, with the Dinnet record dating from 1971 (Emmet & Langmaid, 2002b). *Depressaria silesiaca*, a pRDB2 species (Davis, 2012), is likewise recorded from three UK vice counties, all in Scotland (Emmet & Langmaid, 2002b), and the most recent Muir of Dinnet record is from 1995 (Prescott *et al.*, 2006). The cousin German (*Paradiarsia sobrina*) is now classed as Nationally Notable A, whilst the netted mountain (*Macaria carbonaria,* although the older name *Semiothisa carbonaria* is used in the citation) remains classed as Rare (Waring & Townsend, 2003). *P. sobrina* and *M. carbonaria* have records from the 1970s in the ISR, but both have since been recorded after 2000 (Prescott *et al.*, 2006). Two Nationally Notable A moths, the small dark yellow underwing (*Coranarta cordigera*) and Kentish glory (*Endromis versicolora*), are UK Priority Species.

The moth assemblage is clearly a qualifying feature and most species can be monitored directly. *L. hepatariella* was looked for in 2003 and not found, with the surveyor believing that the habitat was no longer suitable (Prescott *et al.*, 2006). Monitoring should also include the pearl-bordered fritillary, which is listed in the citation. With the Kincardine and Deeside Area of Search holding a substantial proportion of the British pearl-bordered fritillary colonies, this butterfly can be a qualifying feature at up to five sites. Data do not exist to judge if Muir of Dinnet fulfils this criterion, but the species is well known from the site and could be monitored directly alongside other Lepidoptera. The netted mountain moth and small dark yellow underwing rely on bearberry (*Arctostaphylos uva-ursi*) as a larval food plant, thus with changes to upland management elsewhere, Muir of Dinnet may become increasingly important in Deeside. Thus it would be desirable to carry out direct monitoring of these species also.

The citation lists the water beetle *A. canaliculatus,* which was classed as Nationally Scarce in the most recent review (Foster, 2010a). SCM for water beetles was carried out in 2003 (Eyre, 2003b) and 2010 (Foster, 2010b). The 2003 visit yielded 32 species, including *A. canaliculatus* and three other Nationally Notable B species. The 2010 visit yielded 38 species, again including *A. canaliculatus* and five Notable species. In total, 63 water beetle species have been recorded, including 11 that have been classed as Rare or Scarce. As such, the assemblage is probably a qualifying feature.

No SCM documents were available to assist with reviewing the dragonfly assemblage. However ten species have been recorded from the site, including the northern damselfly and the white-faced darter (*Leucorrhinia dubia*), both of which are regarded as endangered (Daguet *et al*., 2008). As such, the site exceeds the threshold of nine species required.

One further Rare species, the beetle *Cryptocephalus decemmaculatus,* has been recorded twice at Muir of Dinnet, most recently in 1986 (Littlewood & Stockan, 2013), although is now known solely from single sites in Perthshire and Cheshire (Hubble, 2014).

3.116.4 Recommendations

The invertebrate assemblage is a qualifying feature. Most rare species are from the moth assemblage, which is a qualifying feature in its own right. It should be monitored directly, along with pearl-bordered fritillary.

The water beetle assemblage is also probably a qualifying feature and should be monitored directly.

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.117 Nethan Gorge

3.117.1 SSSI citation (reviewed 6 January 2010)

"The rich invertebrate fauna within the site includes a number of uncommon beetles which are associated with leaf litter, underground fungi and dead and decaying wood. They include the nationally scarce *Cerylon fagi*, *Tetratoma ancora* and *Ptinomorphus imperialis*."

3.117.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.117.3 Discussion

The citation lists three Scarce species and no Rare species. One of these, *C. fagi*, is now classed as Nationally Scarce B (Hyman & Parsons, 1992). The ISR additionally lists a Nationally Notable A beetle, *Trox sabulosus*, and three Nationally Notable B flies. *T. sabulosus* is listed as having been found in a glasshouse immediately adjacent to the SSSI. The three beetles named in the citation and two of the three fly species are regarded as being saproxylic (Alexander, 2002).

SCM in 2003 concentrated on saproxylic beetles. A total of 14 such species was recorded, including two of the species named in the citation, *C. fagi* and *T. ancora* (Eyre, 2003a). A one-day SCM visit in 2010, again focussing on the saproxylic fauna, produced records of 15 saproxylic beetle species including *T. ancora*, and another Nationally Scarce B beetle, *Cis festivus*, which was new for the site (Alexander, 2011).

3.117.4 Recommendations

Based on the above evidence, the beetle fauna is not especially rich. It lies in the Clydesdale and South East Glasgow Area of Search along with other sites with richer assemblages of Rare and Scarce species, such as the nearby Milton-Lockhart Wood. The beetle assemblage at Nethan Gorge therefore probably does not now meet qualifying feature criteria.

3.118 North Rothiemurchus Pinewood

3.118.1 SSSI citation (reviewed 30 March 2009)

"The site is also an SSSI for its assemblages of invertebrates, lichens, fungi, and vascular plants. These assemblages are particularly rich and diverse and include populations of many rare species associated with native pinewoods such as *Leptura sanguinolenta* one of

the longhorn beetle species, the lichen *Bryoria furcellata*, 'tooth' fungi (*Bankera*, *Phellodon*, *Hydnellum* and *Sarcodon* genera) and twinflower *Linnaea borealis*."

3.118.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.118.3 Discussion

This is a well-recorded site with a rich list of Rare and Scarce invertebrates. The ISR lists 33 species labelled in RDB categories, though British records of one of these species, the fly *Medetera striata*, are now considered doubtful (MacGowan, 2001). The remaining 32 species are dominated especially by beetles and flies (Table 7).

Table 7. North Rothiemurchus Pinewood SSSI Red Data Book invertebrates listed in the Invertebrate Site Review. The figures include species provisionally assigned.

	RDB1	RDB2	RDB3	RDBK
Araneae		2		
Coleoptera	1		7	4
Diptera	3	1	8	
Hymenoptera	2			
Lepidoptera	1		2	
Odonata		1		

From basic habitat information for 30 of the species from the ISR (Falk, 1991a, 1991b, 2015; Hyman & Parsons, 1992, 1994; Foster, 2001; Alexander, 2002; Waring & Townsend, 2003; Falk & Chandler, 2005; Sterling & Parsons, 2012), 26 are woodland species, of which 14 are specifically associated with conifers. Of these, ten are mostly found in pine woodland. Eleven of the woodland species are associated with dead wood (Alexander, 2002). The four remaining species are associated with wetland features.

Although not listed in the ISR, North Rothiemurchus Pinewood is also now a site for the RDB1 hoverfly *Blera fallax*. Searches here in the 1980s and 1990s failed to locate the species (Rotheray & MacGowan, 2000), but a species recovery program, commencing in 2007, has resulted in establishment of a reintroduced population (Rotheray & Rotheray, 2012).

Indirect SCM of flies was carried out in 2010, and a recommendation was made to increase the quantity of dead wood (Wilkinson, 2010). SCM visits in 2013 were targeted at the spider *Clubiona subsultans*, the narrow-headed ant (*Formica exsecta*), the bee *Osmia uncinata*, the northern damselfly (*Coenagrion hastulatum*), and the water beetles *Dryops nitidulus* and *Hydrochus brevis* (Cathrine *et al.*, 2015). Of these, *C. subsultans*, the narrow-headed ant and the northern damselfly were located.

Many of the Rare species could be qualifying features in their own right. Some are extremely localised and rarely found in Britain. Sensible subsets within the assemblage are woodland species and wetland species. Many of the invertebrates are difficult to find and, given the size of the assemblage of Rare species, indirect monitoring of habitat features may be appropriate for most SCM rounds. However some species, such as the narrow-headed ant, can more easily be monitored directly.

The ISR lists nine species of dragonfly, while more recent collation of data indicated that 12 species have been recorded (Cathrine *et al*., 2015), thus exceeding the threshold of nine species for mainland Scotland.

3.118.4 Recommendations

The invertebrate fauna is a qualifying feature. Most rare species are associated with woodland, though four are wetland species. Direct monitoring of most of the rare species may be impractical, so monitoring should focus on habitat condition.

The dragonfly assemblage is also a qualifying feature in its own right and can be monitored directly.

3.119 Ochtertyre Moss

3.119.1 SSSI citation (reviewed 18 September 2009)

"The invertebrate fauna is nationally important for the population of the jumping spider *Heliophanus dampfi*, which is known from only two other sites in GB. This salticid is confined to raised bogs in northern and eastern Europe."

3.119.2 Notified invertebrate feature(s)

Biological: Invertebrates: Spider (*Heliophanus dampfi*).

3.119.3 Discussion

The spider *H. dampfi* was found at Ochtertyre Moss in 1992. It is an RDBK species, first found in the UK in 1981, and now recorded from four hectads (three in Scotland) (http://srs.britishspiders.org.uk/portal.php/p/Summary/s/Heliophanus+dampfi – accessed 06/11/2015). SCM in 2003-04 (Lee, 2004) and in 2011 (Kirkland *et al.*, 2012) have shown that the species was present at Ochtertyre Moss.

The ISR lists one Rare and three Scarce beetles. These include *Pityophthorus lichtensteini*, an RDB3 species that is found on dead pine twigs (Alexander, 2002). Hyman & Parsons (1992) reported the species from South Aberdeenshire and Moray; other reported sites have been shown to be erroneous (Hyman & Parsons, 1994). The Ochtertyre Moss record is dated as pre-1983 and so the Forth area should have been listed by Hyman & Parsons (1992) or Owen (1994) if the record is documented and verifiable. Two Scarce beetles, *Abdera triguttata* and *Abdera flexuosa*, are associated with dead wood (Alexander, 2002) and thus management for these may not be compatible with management for raised bog. The remaining Scarce species, *Agonum ericeti*, is associated with *Sphagnum*, and so may benefit from optimal raised bog management but is not a qualifying feature.

3.119.4 Recommendations

Given *H. dampfi* rarity and its dependence on a small and decreasing habitat resource, raised bog, this spider is a qualifying feature and should be monitored directly.

3.120 Pass of Killiecrankie

3.120.1 SSSI citation (reviewed 16 November 2011)

"The varied habitats in the gorge are also reflected in a rich fauna, in particular a number of nationally rare fly species including the fungus gnats *Boletina silvatica* and *Ectrepesthoneura colyeri*, the exceptionally rare cranefly *Tipula laetabilis*, the rare Scottish cranefly *Molophilus czizeki* and the flower fly *Pegohylemyia flavisquama*."

3.120.2 Notified invertebrate feature(s)

Biological: Invertebrates: Fly assemblage.

3.120.3 Discussion

The ISR lists six fly species regarded at that time as Rare. These are the five listed in the citation and also *Oxycera dives*. *B. silvatica* was classed as RDB1 (Falk, 1991b) but then reassessed as Data Deficient (Falk & Chandler, 2005). It was reported in 1997, although Pass of Killiecrankie is not among site records listed by Falk & Chandler (2005). *E. colyeri*, recorded in 1997, was regarded as RDB2 (Falk, 1991b) but is listed as Nationally Scarce in the latest review (Falk & Chandler, 2005). *T. laetabilis* is an RDB2 species (Falk, 1991b) that was new to Britain in 1975 (the year of the recorded at Pass of Killiecrankie) and is mapped in four hectads by Stubbs (1992). *M. czizeki* is an RDB3 species (Falk, 1991b), recorded from Pass of Killiecrankie in 1982. *P. flavisquama* is listed as RDBK (Falk, 1991b) and was recorded in 1964. *O. dives* is an RDB3 species (Falk, 1991b) that was recorded most recently from Pass of Killiecrankie in 1975 and has been discovered in recent years in an increasingly wide range of sites (Stubbs & Drake, 2014).

Several of the Rare species may be qualifying features in their own right but, especially as all are essentially woodland flies, some with a particular preference for damp woodland habitats, treatment of them as an assemblage is entirely appropriate. Given the list of Rare species, this fly assemblage is certainly a qualifying feature.

SCM was carried out in 2003 but none of the rare species was recorded, although the Nationally Scarce cranefly *Ormosia staegeriana* was found (Godfrey, 2004). A SCM visit in 2010 focussed on indirect monitoring of habitat resources and found suitable conditions for those Rare species for which habitat requirements are known (Wilkinson, 2010). Direct monitoring for most or all of the Rare species is likely to be challenging.

3.120.4 Recommendations

The fly assemblage is a qualifying feature with most Rare species being associated with damp woodland. Indirect monitoring of habitat is likely to remain the most instructive approach, though it should be supplemented by periodic direct searches for species.

3.121 Perchhall Loch

3.121.1 SSSI citation (reviewed 20 May 2008)

"The site has a rich water beetle fauna which includes one Red Data Book species, *Hydroporus elongatulus*, known only from the Scottish borders and the Breckland, along with seven other nationally notable water beetle species."

3.121.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

3.121.3 Discussion

The citation refers to one water beetle species by name, *H. elongatulus*, listed in the ISR as RDB3. In the most recent review, *H. elongatulus* is classed as Vulnerable (Foster, 2010a). The citation also states that seven other Nationally Notable species were found. However, the ISR lists two species as RDB3 in addition to *H. elongatulus,* and five as Nationally Notable B. Of these, *Laccornis oblongus* and *Hydroporus longicornis* are classed as Near Threatened in the latest review, with *Acilius canaliculatus* and *Chaetarthria seminulum* as Nationally Scarce. *Agabus unguicularis*, *Ilybius guttiger* and *Cercyon ustulatus* do not meet the criteria to be regarded as Nationally Scarce (Foster, 2010a).

SCM in 2002 produced a list of 19 water beetle species, taking the total for the site to 50 (Eyre, 2003c). Species recorded included *H. elongatulus* and *A. canaliculatus*. A SCM visit in 2010 produced records of 32 species, again including *H. elongatulus* and *A. canaliculatus*. The cumulative list reported after that visit stood at 56 species (Foster, 2010b). A further SCM visit in 2015, produced records of 33 species including *H. elongatulus*, which the contractor reported as probably being more common here than at any other UK site. Three species were additions to the site list (Foster *et al*., 2017).

The species list (59 species), coupled with the presence of three Rare species, constitutes an important assemblage. The contractor in 2010 reported that the site has remained almost unaltered over the past 31 years and remains the most important site for water beetles in Annandale. Some of the Rare species may be single species qualifying features, especially the declining species *H. elongatulus* for which just five post-1980 hectads in Scotland were mapped by Foster (2001). However, as monitoring can be effectively combined with monitoring of other species, it is most useful simply to regard the water beetle assemblage as a whole.

3.121.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring is appropriate, with previous SCM visits providing a baseline from which changes to the assemblage can be assessed.

3.122 Pitmaduthy Moss

3.122.1 SSSI citation (reviewed 9 February 2011)

"The site supports the nationally rare cranefly *Erioptera sordida* and is the only site for this species outwith Strathspey. Also present are several other important flies associated with bogs such as the nationally scarce hoverflies *Orthoneura geniculata* and *Platycheirus podagratus* and the cranefly *Gonomyia edwardsi*."

3.122.2 Notified invertebrate feature(s)

Biological: Invertebrates: Flies.

3.122.3 Discussion

All records of Rare and Scarce species listed in the ISR date from 1976. Three flies are listed as RDB species. Two of these, both listed in the citation, are craneflies. *E. sordida* is an RDB3 species associated with eutrophic areas such as marsh and fen and, in Britain, is restricted to the Scottish Highlands (Falk, 1991b). *Erioptera edwardsi* (named as *Gonomyia edwardsi* in the citation) is associated with barren upland stream sides, and Pitmaduthy Moss was the only known recorded site in Britain (Falk, 1991b), in which the location was given simply as Strath Rory. The third fly, *Rymosia armata*, is a broadleaved woodland species, reassessed as being Nationally Scarce (Falk & Chandler, 2005). The citation names two hoverflies. *Orthonevra geniculata* (misspelled as *Orthoneura geniculata* in the citation) was formerly classed as RDB3 (Shirt, 1987) but was later reassessed as Notable (Ball & Morris, 2014). *P. podagratus* is a Notable species of northern and western parts of Britain (Ball & Morris, 2014).

None of the named species was recorded during a SCM visit in 2003, though a number of further uncommon species were recorded (Godfrey, 2004). A SCM visit in 2010 investigated the notified feature indirectly though habitat features and found that features required by the Rare species were still present (Wilkinson, 2010).

As Pitmaduthy Moss is the only site outside Speyside for *E. sordida*, this species may be a qualifying feature in its own right. Furthermore, *E. edwardsi* may also be a qualifying feature. The contractor for the SCM in 2010 reported that there is insufficient information to interpret whether the fly species recorded constitute a rich fauna in comparison with other similar sites. However, given the records of the Rare species and other Scarce flies, the fly assemblage as a whole should continue to be regarded as a qualifying feature. All species named in the citation are associated with wetlands (Wilkinson, 2010).

3.122.4 Recommendations

The fly assemblage appears to be a qualifying feature. The four species named in the citation are all associated with wetlands. As demonstrated by the 2003 SCM visit, direct monitoring may prove to be difficult, so indirect monitoring of wetland features may be more appropriate for SCM purposes.

3.123 Rannoch Moor

3.123.1 SSSI citation (reviewed 9 February 2009)

"The SSSI also supports a particularly diverse invertebrate fauna with three nationally scarce beetles: *Gyrinus opacus*, *Bembidion bipunctatus*, *Dytiscus lapponicus*; uncommon flies including two nationally rare species: *Brevicornu kingi* (Mycetophilidae) and *Tasiocera fuscescens* (Tipulidae); and several notable moth species including: *Apamea zeta* (Noctuidae), *Carsia sororiata*, *Eurois occulta* (Noctuidae), *Ectoedemia weaveri* (Nepticulidae) and *Coleophora genistae*."

3.123.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moths.

Invertebrates: Flies.

Invertebrates: Beetles.

3.123.3 Discussion

Among the moths, northern arches (*A. zeta*) is a Nationally Scarce A species whilst Manchester treble-bar (*C. sororiata*) and great brocade (*E. occulta*) have Nationally Scarce B status (Waring & Townsend, 2003). All are predominantly northern species in the UK, so may be prone to under-recording. The micro-moth *E. weaveri* is classed as Nationally Scarce B, and *C. genistae* is Nationally Scarce A (Davis, 2012). Although information about historical records was, in some cases, vague, all five species were present over 2013-14 (Prescott, 2015). These species appear to be appropriate for defining an assemblage of Scarce species as a qualifying feature in accordance with JNCC guidelines. Furthermore, all have at least broadly similar habitat requirements, utilising open bog or heathland sites, so can be monitored directly as part of an ecologically coherent assemblage.

Two flies are listed in the citation. *B. kingi* is a fungus gnat of pine woodland and open moor. Although formerly considered as RBD3, its range has been found to be more widespread and its status has been reclassified to Nationally Scarce (Falk & Chandler, 2005). The RDB1 *T. fuscescens* occupies wet areas in woodland, especially acidic sites. It was recorded in 1976. Unless its status has changed markedly since Falk (1991b), *T. fuscescens* may be a qualifying feature as a single species. However, it may be difficult to demonstrate the importance of the site for the species. Thus, it is more appropriate to continue to consider the fly assemblage as a whole to be a qualifying feature. No relevant SCM documents were available for this review, but the constituent elements may be difficult to locate without intensive fieldwork.

Three beetle species are listed as part of the citation. The whirligig beetle *G. opacus* was last recorded in 1980 and was not found during surveys in 2013. It is now thought to no longer be present on the SSSI (Knight, 2014). *Bembidion bipunctatum* (misspelled in the citation as *Bembidion bipunctatus*) is a widely distributed Nationally Scarce B ground beetle (Luff, 1998). *D. lapponicus* is a Near Threatened water beetle that was recorded in 1972 (Knight, 2014) but can no longer be found at Rannoch Moor (Foster, 2010a). Although a number of Scarce beetles have been found at Rannoch Moor, the absence of the Rare species and apparent local extinction of two of three named species in the citation may call into question whether the beetles are now a qualifying feature. However, with 14 Scarce species listed, the site does appear to host a rich fauna. Of the 14 Scarce beetles, nine are water beetles, which could provide a focus for direct monitoring. In the absence of recent information regarding the remaining species, surveys to assess their status are desirable, though indirect monitoring may be most appropriate for SCM purposes.

The ISR lists nine dragonfly species, a figure that meets qualifying feature criteria for mainland Scotland. However, the dragonfly assemblage is not a notified feature.

3.123.4 Recommendations

The assemblage of Scarce moths is a qualifying feature. The key species occupy bog or heath habitats and should be monitored directly.

The fly assemblage should be regarded as a qualifying feature and probably be monitored indirectly.

The beetle assemblage should be regarded as a qualifying feature. Water beetles are of particular note and should be monitored directly. Indirect monitoring is likely to be more appropriate for the remaining species.

3.124 Rassal

3.124.1 SSSI citation (reviewed 30 March 2011)

"The variety of microhabitats associated with this site means it supports a diverse assemblage of invertebrates. Of particular note are the saproxylic flies including *Xylophagus ater* associated with dead wood and the rare cranefly *Orimarga virgo* and the nationally scarce cranefly *Gonomyia conoviensis* associated with the calcareous seepages."

3.124.2 Notified invertebrate feature(s)

Biological: Invertebrates: Flies.

3.124.3 Discussion

The cranefly *O. virgo* is an RDB3 species that occupies seepages and has been recorded from widely scattered locations in England, Scotland and Wales (Falk, 1991b). The cranefly *G. conoviensis* was formerly classed as RDB3 (Shirt, 1987) but is now regarded as a Notable species. It is also associated with seepages and also occurs at widely dispersed locations in England, Scotland and Wales (Falk, 1991b). *X. ater* is saproxylic on a wide variety of dead broadleaved trees (Alexander, 2002) and classed as Local. During a SCM visit in 2010, flies were assessed by indirectly monitoring, and the site was found to retain resources required for the species of conservation interest (Wilkinson, 2010). Although there is a long list of invertebrates recorded from this site, it does not feature any Rare or Scarce fly species other than those mentioned in the citation and one species presumed to be recorded in error. Whilst *O. virgo* may be a qualifying feature in its own right, it may be more appropriate to continue to regard the fly assemblage as a whole despite scant evidence of its richness.

The ISR cites an undated record of the micro-moth *Stigmella dryadella*. This species, which is associated with mountain avens (*Dryas octopetala*) (Heath, 1983), has recently been assessed as pRDB1 (Davis, 2012). Thus, if extant at the site, the moth may be a qualifying feature. However, there are now records from nine Scottish vice counties (http://www.eastscotland-butterflies.org.uk/sm_Nepticulidae.html#4.050 – accessed 28/03/2016) so it may prove to more widely distributed than previously thought.

3.124.4 Recommendations

The fly assemblage should be regarded as a qualifying feature. Direct monitoring should be carried out to better define this assemblage.

The micro-moth *S. dryadella* could be a qualifying feature as a single species if still extant at the site.

3.125 Rhidorroch Woods

3.125.1 SSSI citation (reviewed 15 July 2010)

"False click beetle *Microrhagus pygmaeus*

Rhidorroch Woods SSSI is the only known Scottish site for the nationally rare false click beetle *Microrhagus pygmaeus*. This species occurs mainly in ancient broadleaved

woodland and is dependent on the availability of fallen and standing deadwood to complete its life-cycle."

3.125.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle (*Microrhagus pygmaeus*).

3.125.3 Discussion

The false click beetle (*M. pygmaeus*) is classed as RDB3 and is known from scattered sites in England and from East Inverness & Nairn, East Ross and West Ross (where Rhidorroch Woods is located), although records for the latter two areas are prior to 1970 (Hyman & Parsons, 1992). It is a saproxylic species with larvae inhabiting well-decayed wood of broadleaved trees, especially in oak woods (Alexander, 2002). There are records at Rhidorroch Woods from 1955 and 1956. A SCM visit in 2003 recorded 11 species of saproxylic beetle. These did not include *M. pygmaeus* but another species, *Bolitophagus reticulatus*, was recorded (Eyre, 2003a). This beetle is an inhabitant of old bracket fungi *Fomes fomentarius* on dead birch trunks (Alexander, 2002) and has more recently been assessed as being Nationally Scarce (Alexander *et al*., 2004). The Nationally Notable B species *Dendrophagus crenatus* was also found (Eyre, 2003a). During a further SCM visit in 2010, 25 species of saproxylic beetles were recorded (Telfer, 2011). These again did not include *M. pygmaeus* but did include one Nationally Notable A species, *Xylita laevigata*, and four Nationally Notable B species, *Diacanthous undulatus*, *Cis jacquemartii*, *Magdalis carbonaria* and *Placusa depressa*. Additionally, the Nationally Notable B woodland beetle *Paraphotistus impressus* was found. There were records for 17 beetle species during 2015 SCM, but the target species *M. pygmaeus* was not found. Two of the beetle species found are saproxylic but common (*Cis boleti* and *Anaspis rufilabris*) (Cathrine *et al*., 2017a).

The citation reports that Rhidorroch Woods is the only known site for *M. pygmaeus* in Scotland, though this statement is not supported by Hyman & Parsons (1992). It appears that the species has not been found at the site since 1956. If the species is indeed present, then it is a qualifying feature in the area of search.

3.125.4 Recommendations

M. pygmaeus meets the criteria for qualifying feature, although difficulties in locating it make direct monitoring challenging.

The saproxylic beetle fauna as a whole should be considered a qualifying feature. The feature should be monitored indirectly for SCM purposes.

3.126 Rickle Craig - Scurdie Ness

3.126.1 SSSI citation (reviewed 6 October 2010)

"These areas are also noted for their rich snail fauna, with over 30 species recorded including the lesser bulin *Merdigera obscura*, which is relatively scarce in Scotland."

3.126.2 Notified invertebrate feature(s)

Biological: Invertebrates: Mollusc assemblage.

3.126.3 Discussion

The ISR lists records solely of molluscs, with 32 species having been found between 1979 and 1982. A SCM visit in 2013, in very dry conditions, resulted in records of 15 species of terrestrial mollusc (Alexander, 2014c). None of the species recorded are Rare. The snail listed in the citation, *M. obscura*, is widely recorded in England and Wales and also relatively widely recorded in Scotland (Kerney, 1999). *Vallonia pulchella*, listed in the ISR, is a rarer species in Scotland, with post 1965 records from seven hectads (Kerney, 1999). However, it is listed as Least Concern in the latest review (Seddon *et al*., 2014).

3.126.4 Recommendations

None of the species recorded are classed as Rare or Scarce and, as such, the mollusc assemblage is not a qualifying feature.

3.127 Rinns of Islay

3.127.1 SSSI citation (reviewed 24 March 2011)

"The nationally important beetle assemblage includes 37 different beetle species. Loch Corr is the single most important site on the island for the water beetle family Coleoptera within a western 'Atlantic lake' assemblage. Two species are of particular note: the leaf beetle *Macroplea appendiculata* has its first confirmed record for Scotland here, and a whirligig beetle *Gyrinus distinctus* found here is known from only two other Scottish sites."

3.127.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.127.3 Discussion

The leaf beetle *M. appendiculata* is currently classed as Nationally Scarce (Hubble, 2014). It was recorded at Rinns of Islay in 1984 (Eyre, 2003b; Foster, 2010a). The whirligig beetle *G. distinctus* is now classed as Nationally Scarce (Foster, 2010a). It is a species of low-lying western lochs in Scotland and has now been recorded in four Scottish hectads (Foster, 2001). *G. distinctus,* originally recorded at Rinns of Islay in 1984, was recorded again during SCM in 2003 along with *Dytiscus lapponicus* (Eyre, 2003b), a Near Threatened diving beetle (Foster, 2010a). *M. appendiculata* was not recorded. *G. distinctus* was recorded during a SCM visit in 2010, but again there was no record of *M. appendculata* (Foster, 2010b). Similar results were reported from SCM in 2015 (Foster *et al*., 2017).

Foster (2010b) listed 73 species of water beetle at Rinns of Islay. Whilst there do not appear to be any Rare species on the list, the range of species recorded is extensive and, in the Site Management Statement, it is reported that the assemblage in Loch Còrr is peculiar to extreme western "Atlantic" lakes. This is probably sufficient for it to be a qualifying feature.

The ISR also refers to the presence of the marsh fritillary (*Eurodryas aurina*) and lists a series of records from the 1990s. It is not clear if these refer solely to records within the SSSI. The Rinns of Islay SSSI lies within the Islay and Jura Area of Search. This is one of four Areas of Search in Scotland that are especially important for marsh fritillary, and so up to five sites may qualify for protected for the species through the SSSI network.

3.127.4 Recommendations

The beetle assemblage, in particular the water beetle assemblage, is a qualifying feature and should be monitored directly.

Marsh fritillary may be a qualifying feature, though an assessment of its status is needed, with a particular focus on the 2003 survey of the Scottish range (Ravenscroft, 2003). It is not, though, a notified feature.

3.128 River Ayr Gorge

3.128.1 SSSI citation (reviewed 29 September 2009)

"The combination of topography and vegetation has produced microclimatic and habitat conditions favourable for an important fauna of beetles, especially saproxylic species associated with rotting wood and fungi growing on dead wood. The site supports a number of Nationally Scarce beetles including *Microscydmus nanus*, which occurs in rotting wood, leaf litter and moss, and *Phloiophilus edwardsii* and *Tetratoma ancora*, which occur in fruiting bodies of the fungus *Phlebia radiata*. Other beetle species, which are not saproxylic, also occur, including some Nationally Scarce species that feed on oak foliage, and the Red Data Book rove beetle *Ilyobates nigricollis*, which occurs in woodland leaf litter."

3.128.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.128.3 Discussion

The citation lists by name three Scarce saproxylic beetles and one Rare beetle, which is not saproxylic. The Rare species, *I. nigricollis* (RDBK), is associated with leaf litter (Hyman & Parsons, 1994). The record at the site has no date, and no Scottish sites are listed by Hyman & Parsons (1994), implying that the occurrence of the species at River Ayr Gorge requires confirmation.

The saproxylic beetle fauna has been relatively well studied. A SCM visits in 2003 yielded records of 16 such species (Eyre, 2003a). Two were reported to be regionally scarce. A survey in June 2007 yielded 41 species, taking the site total to 67 species (Burns, 2007). Results from previous surveys were also comprehensively summarised. Two of six recorded Scarce species, *T. ancora* and *Orchesia minor*, were found during that survey, along with four Scarce saproxylic beetles: *Ptinus subpilosus*, *Epuraea terminalis*, *Anaspis thoracica* and *Malthodes guttifer*. A one-day SCM visit undertaken in 2010 yielded 14 species of saproxylic beetle (Alexander, 2011). These included *O. minor* as well as two Scarce species that were new to the site, *Gyrophaena manca* and *Cis festivus*. The contractor reported that site conditions had declined for saproxylic beetles and that the status of the feature should be Unfavourable-Declining.

Given the lack of details for the single Rare species of beetle and failure of contractors to locate some of the Scarce species, the status of beetles as a qualifying feature is not clear. An assemblage lacking Rare species needs to be one of the best in the Area of Search to be considered a qualifying feature. River Ayr Gorge lies within the Cumnock and Kyle Area of Search. The only other site there with a saproxylic beetle interest is Dundonald Wood, but its saproxylic beetle fauna is a borderline qualifying feature. Based on current knowledge, the assemblage at River Ayr Gorge may not be classed as a qualifying feature. However as the relative value of the site for saproxylic beetles has been recognised previously, it would

be desirable for the fauna to be more comprehensively surveyed before confirming such an assessment.

3.128.4 Recommendations

The beetle assemblage may not be a qualifying feature, although comprehensive surveys of the fauna, especially of the saproxylic fauna, are required to enable such assessment.

3.129 River Borgie

3.129.1 SSSI citation (reviewed 23 April 2009)

"The River Borgie Site of Special Scientific Interest (SSSI) lies on the north coast of Sutherland between Bettyhill and Tongue. The site has been designated as an SSSI for its nationally important population of freshwater pearl mussel.

Freshwater pearl mussels have been declining in numbers across their European range and Scotland is seen as a stronghold for this species. The River Borgie has been ranked as one of the top three sites in Scotland for this species.

The populations of Atlantic salmon *Salmo salar* and trout *Salmo trutta*, river bed substrates and high water quality of the River Borgie are all crucial to the long-term survival of freshwater pearl mussels. Young freshwater pearl mussels depend on juvenile salmon and trout for their survival and require high water quality and suitable river bed substrates in which to live. The riverside habitats such as areas of birch *Betula pubescens*, alder *Alnus glutinosa* and willow *Salix* spp. provide shaded stretches of water, a supply of leaf litter and insects that are beneficial to salmon and trout, and therefore to the freshwater pearl mussel population in the River Borgie. "

3.129.2 Notified invertebrate feature(s)

Biological: Invertebrates: Freshwater pearl mussel (*Margaritifera margaritifera*).

3.129.3 Discussion

This SSSI was designated solely for freshwater pearl mussel, which is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC, and in the IUCN 1996 Red Data List as endangered. The ISR reports that, at that time, the species had most recently been recorded in 1995. The River Borgie has supported a healthy population of freshwater pearl mussels (Birkeland, 2003). However since then it has been damaged and the feature was assessed as being in a Unfavourable–No change condition in 2014.

3.129.4 Recommendations

Given the conservation designations of the species, freshwater pearl mussel is a qualifying feature and should be monitored directly.

3.130 River Dee (Parton to Crossmichael)

3.130.1 SSSI citation (reviewed 23 April 2010)

"The site supports an outstanding assemblage of dragonflies including the common darter *Sympetrum striolatum* and the azure damselfly *Coenagrion puella*."

3.130.2 Notified invertebrate feature(s)

Biological: Invertebrates: Dragonfly assemblage.

3.130.3 Discussion

No ISR was available to assist with this review.

The citation specifically names two species. Both are widely recorded and are classed as Least Concern in the latest review (Daguet *et al*., 2008).

Nine dragonfly species were recorded during three visits in 2002, all common species. A SCM visit was carried out on one day, in suboptimal weather conditions, in 2011. Just three species were recorded, with proof of breeding noted for two. It was also noted that the National Biodiversity Network Gateway shows records for the site for 12 species. The 2011 contractor considered that the site was unlikely to have lost so much of its dragonfly fauna and that the results from the visit were anomalous (Willet & Corcoran, 2011).

3.130.4 Recommendations

The dragonfly assemblage has in the past been a qualifying feature and may remain so, but further survey is required. The feature should be monitored directly.

3.131 River Kerry

3.131.1 SSSI citation (reviewed 19 August 2009)

"The lower 3.5 kms of the river below the hydroelectric power station are designated as the River Kerry Site of Special Scientific Interest (SSSI) on account of its nationally important population of the freshwater pearl mussel *Margaritifera margaritifera*.

The River Kerry is of outstanding importance because it holds one of the largest known populations of the freshwater pearl mussel in Britain and unlike many rivers it has a high level of recruitment and a healthy juvenile population. Pearl mussels are found throughout the river with many large dense beds occurring particularly in the middle and lower reaches.

Freshwater pearl mussels have a complex life cycle which is dependent on high water quality and suitable river bed substrates, as well as the presence of juvenile salmonids, to which mussel larvae attach for a short period before becoming buried within the gravel beds of the river. Riparian vegetation is also important in providing shade and a supply of leaf litter and invertebrates."

3.131.2 Notified invertebrate feature(s)

Biological: Invertebrates: Freshwater pearl mussel (*Margaritifera margaritifera*).

3.131.3 Discussion

The freshwater pearl mussel is the only invertebrate species mentioned in the ISR. The species is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC, and in the IUCN 1996 Red Data List as endangered. The ISR reports that the river supports an outstanding population of freshwater pearl mussels. The Site Management Statement reports that the feature was assessed as being Favourable-Maintained in 2005.

3.131.4 Recommendations

Given the conservation designations of the species and the strong population at this site, the freshwater pearl mussel is a qualifying feature and should be monitored directly.

3.132 River Moidart

3.132.1 SSSI citation (reviewed 12 December 2008)

"The River Moidart drains the hills of Moidart, in the west of Lochaber, into the sea at Loch Moidart. The lower 4 kms of the river below Loch nan Lochan are designated as the River Moidart Site of Special Scientific Interest (SSSI). The river's invertebrate fauna includes a nationally important population of the freshwater pearl mussel *Margaritifera margaritifera*.

The River Moidart is of outstanding importance because it holds one of the largest known populations of the freshwater pearl mussel in Britain. Pearl mussels are abundant but distributed patchily throughout the site, with many large individuals occurring.

Freshwater pearl mussels have a complex life cycle which is dependent on high water quality and suitable river bed substrates, as well as the presence of juvenile salmonids, to which mussel larvae attach for a short period. Riparian vegetation provides shade and a supply of leaf litter and invertebrates, which is important to the overall health of the river system, including the freshwater pearl mussel and its host salmonid populations."

3.132.2 Notified invertebrate feature(s)

Biological: Invertebrates: Freshwater pearl mussel (*Margaritifera margaritifera*).

3.132.3 Discussion

The freshwater pearl mussel is the only invertebrate species mentioned in the ISR. The species is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC and in the IUCN 1996 Red Data List as endangered. The river supports one of the largest known populations of freshwater pearl mussels in Britain. The Site Management Statement reported that the feature was assessed as being Unfavourable. The sites's considion was last reported in 2014 because it did not reach the target for mussel population density and because only a small proportion of the population was of juvenile mussels.

3.132.4 Recommendations

Given the conservation designations of the species and importance of this site, the freshwater pearl mussel is a qualifying feature and should be monitored directly.

3.133 River Spey

3.133.1 SSSI citation (reviewed 23 March 2011)

"Freshwater pearl mussel

The River Spey has one of the largest populations in Scotland of the freshwater pearl mussel *Margaritifera margaritifera*, including both adults and juveniles.

The freshwater pearl mussel is a long-lived species requiring water of good quality and areas of fine sandy gravels in which to live and complete its life cycle. This species' complex life cycle is dependent on salmonid fish as an intermediary host. The glochidial (larval)

stage of the mussel lodges and develops within the gills of salmonid fish before dropping off as a juvenile mussel into areas of suitable substrate where it will continue to grow. The river's healthy population of salmonids, in particular Atlantic salmon, is essential for the continued survival of the freshwater pearl mussel."

3.133.2 Notified invertebrate feature(s)

Biological: Invertebrates: Freshwater pearl mussel (*Margaritifera margaritifera*).

3.133.3 Discussion

The freshwater pearl mussel is the only invertebrate species mentioned in the ISR. The species is listed in Annexes II and V of the European Habitats and Species Directive 92/43/EEC and in the IUCN 1996 Red Data List as endangered. The river has one of the largest populations of freshwater pearl mussels in Scotland, including of juveniles.

3.133.4 Recommendations

Given the conservation designations of the species and the importance of this site, the freshwater pearl mussel is a qualifying feature and should be monitored directly.

3.134 River Spey - Insh Marshes

3.134.1 SSSI citation (reviewed 29 June 2010)

"This is the best site in Scotland for rare wetland invertebrates but also has an outstanding fauna associated with riverine habitats and woodland. The rare species includes flies (Diptera), beetles (Coleoptera), moths (Lepidoptera) and at least one species of spider (Araneae). Species include the aquatic beetle *Donacia aquatica*, the marshland fly *Tipula marginella* and other cranefly species, the horse-fly *Hybomitra lurida* and the snipe-fly *Thereva inornata*. The wetland spider *Wabasso replicatus* is known only at this site in Britain. Riverine flies include species associated with shingle such as the empid *Tachydromia acklandi* and the robber fly *Rhadiurgus variabilis*. Species of sandy river banks include the craneflies *Limonia omissinervis* and *Rhabdomastix laeta*. The outstanding fly fauna also includes rare species found in woodland fringing the marshland including the aspen hoverfly *Hammerschmidtia ferruginea*, part of an exceptional saproxylic fauna living on aspen. The moths Rannoch sprawler *Brachionycha nubeculosa* and Cousin German *Protolampra sobrina* both feed on birch foliage in the woodlands above the marshes."

3.134.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.134.3 Discussion

River Spey - Insh Marshes SSSI supports the highest recorded number of Rare insect species from any Scottish site. In total, 35 species are listed with RDB categories and a further 78 as Nationally Notable (Table 8).

Table 8. River Spey - Insh Marshes SSSI Red Data Book invertebrates listed in the Invertebrate Site Review. The figures include species provisionally assigned.

	RDB1	RDB2	RDB3	Notable A	Notable B
Araneae					1
Coleoptera	1	1	3	4	12
Diptera	4	1	22		40
Hemiptera					1
Hymenoptera					2
Lepidoptera			3	5	13

Assessing basic habitat information for 31 of the Rare species (Fonseca, 1968; Falk, 1991b; Hyman & Parsons, 1992; Stubbs, 1992; Emmet & Langmaid, 2002b; Falk & Crossley, 2005), 18 can be classed as wetland species and eight as woodland species. Assemblages from these broad habitats would be qualifying features although they overlap. For example, three species appear to have a particular affinity with aspen (*Populus tremula*), a tree often found alongside waterways.

One of the RDB1 flies, the aspen hoverfly, has been subject to considerable research and conservation effort in recent years (Rotheray *et al*., 2015). Invertromie, an aspen wood within the SSSI, was one of only three Speyside sites where the species was recorded in surveys in 2003, 2005 and 2006 (Rotheray *et al*., 2009). This hoverfly is clearly a qualifying feature as a single species as would be many of the other Rare species.

A one-day SCM visit in 2003 did not produce records of any of the Rare species (Godfrey, 2004). Further SCM visits in 2010 focussed primarily on indirect assessment of habitat for flies though some sampling was also carried out. This produced records of aspen hoverfly and of three Rare species that were not listed in the ISR; *Cordilura picticornis* (RDB3), *Meiosimyza laeta* (RDB3) and *Lonchaea hackmani* (RDBK) (Wilkinson, 2010). SCM visits in 2013 focussed on the beetle *D. aquatica* and on moths, especially the cousin German. *D. aquatica* was recorded on both dates that it was searched for, with 40 individuals found. The cousin German was not recorded though two individuals of dark-bordered beauty (*Epione vespertaria*) were caught (Godfrey, 2004). This latter species is classed as RDB3 though is now thought to be extant at just four sites in the UK. It was discovered at Insh Marshes in 2010 whilst fieldwork was underway to prepare for a possible introduction of the species to the site (Moore, 2011).

The invertebrate fauna is clearly outstanding and is certainly a qualifying feature. Flies dominate among the Rare and Scarce species and should be the major focus for monitoring, though the moth and beetle assemblages are also qualifying features. Any indirect monitoring of the invertebrate assemblage should focus especially on wetland and woodland features. Direct monitoring of all Rare species is likely to be impractical and previous SCM visits have shown that many are difficult to locate. Direct monitoring should, therefore, be carried out on some of the more readily recorded Rare species that can be regarded as proxies for a habitat or specific resource supply. Examples include *D. aquatica* as a representative of the aquatic fauna, for which Insh Marshes is one of just eight remaining sites for this species in Britain (Foster, 2005), the aspen hoverfly, which relies on a regular supply of dead aspen and is a key species among the saproxylic fauna, and the dark-bordered beauty, which utilises low aspen suckers and hence is sensitive to woodland structure.

3.134.4 Recommendations

The invertebrate assemblage is a qualifying feature. The fly, moth and beetle assemblages would also qualify in their own right, as would a number of individual species.

Habitat monitoring should focus especially on wetland and woodland habitats. Direct monitoring should focus on a sub-set of species.

3.135 River Tweed

3.135.1 SSSI citation (reviewed 28 March 2011)

"The invertebrate fauna of the Tweed is diverse and contains many species of limited distribution. The most important invertebrates are the beetles Coleoptera, especially those which live in the marginal shoals of silt, gravel and shingle. The Tweed system has been known for some time as an important location for this species group, containing a number of nationally important sites on the Yarrow Water and tributaries. The mayfly Ephemeroptera list contains over half the British species and the caddisflies Trichoptera have a list of 53, which is one quarter of the UK total. Other groups with species of restricted distribution include stoneflies Plecoptera, soldier flies Stratiomyidae, long-legged flies Dolichopodidae, craneflies Tipulidae, and dance flies Empididae. In total, 13 invertebrate species listed on the Red Data List and 45 invertebrate species classed as notable (occurring in less than 100 of the 10km squares of the national grid) are recorded from the Tweed."

3.135.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

Invertebrates: Fly assemblage.

3.135.3 Discussion

The citation describes a diverse fauna though only limited resources were available to inform this review. Just one SCM document was available, detailing indirect monitoring of habitat resources for flies (Wilkinson, 2010).

Ten species with RDB classifications are listed in the ISR, comprising seven beetles and three flies. All were recorded in 1996 or 1997. Five of the beetles are rove beetles, namely *Atheta ebenina*, *Brachygluta pandellei*, *Colon viennense*, *Neohilaria subterranea* and *Stenus incanus*. All are classed as RDBK. The other two are the pill beetle *Simplocaria maculosa* (RDBI) and the water beetle *Dryops nitidulus* (RDBI). Of these species, *B. pandellei*, *C. viennense*, *D. nitidulus*, *S. maculosa* and *S. incanus* are associated to some extent with riverine shingle (Hyman & Parsons, 1992; 1994). *Atheta ebenina* and *N. subterranea* are more generalist in their habitat preferences, but both tend to be ground-dwelling so could potentially also be associated with riverbanks or river shingle.

The Rare flies are *Tachydromia connexa*, now classed as Vulnerable (Falk & Crossley, 2005), *Tachydromia woodi*, now classed as Near Threatened (Falk & Crossley, 2005) and *Thereva lunulata*, classed as RDB3 (Falk, 1991b). All are associated with shingle, including riverine shingle.

The citation refers to 13 Rare invertebrates, although it is unclear what the remaining three species are. However the ten listed species show a remarkable coincidence of habitat requirements, as they are all associated with riverine shingle. Thus monitoring should focus on exposed riverine sediments, especially shingles. However, it would also be desirable to

carry out direct surveys in order to confirm the current status of Rare species and to establish a baseline by which future changes can be measured.

3.135.4 Recommendations

The beetle assemblage and the fly assemblage would be better regarded as a riverine shingle invertebrate assemblage, which is a qualifying feature.

Habitat resources for this feature should be monitored indirectly but direct monitoring should be carried out also to establish a baseline.

3.136 Ronas Hill - North Roe

3.136.1 SSSI citation (reviewed 25 February 2011)

"The Ronas Hill area has considerable invertebrate interest. Notably, the Arctic water flea occurs in lochans on the hill. It has only been found at one other site in Britain."

3.136.2 Notified invertebrate feature(s)

Biological: Invertebrates: Arctic water flea (*Eurycercus glacialis*).

3.136.3 Discussion

The presence of Arctic water flea was confirmed in 1988, when 73 females were recovered from samples taken from a small lochan on Ronas Hill (Duigan, 1991). The species was recorded again at the same lochan during SCM fieldwork in 2003 and was recorded newly at an additional lochan on Ronas Hill (Eyre, 2003b). The only other British site for the species is near Tain (Duigan, 1991). Although listed as Nationally Scarce, the paucity of locations suggests that a higher rarity status may be appropriate and that the species should be considered to be a qualifying feature.

In addition to the notified feature, there are a number of records of Rare and Scarce beetles. These include *Pelophila borealis* and *Athous subfuscus*, both RDB3 species with records from the site dated as 1998. *P. borealis* lives alongside water and there are confirmed British records just from Inverness-shire northwards (Hyman & Parsons, 1992). *A. subfuscus* occurs on grassland and heathland and is known only from Orkney, Shetland and Surrey (Hyman & Parsons, 1992). Two Nationally Notable B aquatic beetles have also been reported from the site; *Stictotarsus multilineatus* (listed in the ISR under the old name of *Potamonectes griseostriatus*) and *Dytiscus lapponicus*. Both were recorded during SCM in 2003 (Eyre, 2003b). The ISR refers to a further Rare beetle species, *Chrysolina crassicornis*, though without citing any details of its occurrence. This species was assessed as RDB2 by Hyman & Parson (1992), who reported that it occurs in cliff top grassland in maritime situations. The beetle assemblage appears to be a qualifying feature, especially as no other SSSI in the Shetland Isles Area of Search has notified features that include invertebrates.

3.136.4 Recommendations

The arctic water flea should continue to be regarded as a qualifying feature. Given that the species is readily located, direct monitoring is appropriate.

The beetle assemblage appears to be a qualifying feature though is not a notified feature.

3.137 Rossie Moor

3.137.1 SSSI citation (reviewed 10 September 2010)

"A large number of water beetles species have been recorded, including nationally scarce species such as *Agabus unguicularis* and *Enochrus affinis*. The national rare snail-killing fly *Tetanocera freyi* has been recorded, as have a number of other nationally scarce fly species."

3.137.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
	Invertebrates:	Fly assemblage.

3.137.3 Discussion

The ISR lists a single beetle species, *A. labiatus*. SCM for water beetles was carried out in 2003. Together with species recorded previously, a list of 49 species for the site was presented (Eyre, 2003b). The contractor reported that "the site apparently has a long list of water beetles which are nationally rare" though no details of Rare species were made available. Five species among these 49 were labelled as Nationally Notable B. Of these, *A. unguicularis*, *E. affinis* and *Hydroporus longulus* are now considered to be too widespread to qualify as Nationally Scarce. *Chaetarthria seminulum* is still considered to be Nationally Scarce and *A. labiatus* is classed as Near Threatened (Foster, 2010a). *A. labiatus* is listed as recorded solely in 1980 (Eyre, 2003b) and has been recorded from just eight hectads in Scotland since 1980 (Foster, 2001).

Criteria for defining what constitutes an outstanding assemblage of water beetles are not available, so it is difficult to determine the relative importance of this site. The water beetle assemblage may be a qualifying feature if Rossie Moor holds a strong population of *A. labiatus*. Given that the species was only recorded in 1980, evidence for this is lacking. Whilst the beetle assemblage may, therefore, not be a qualifying feature, a precautionary approach would be to regard it as such until an outstanding assemblage can be defined.

One Rare fly, *T. freyi*, is listed in the ISR. This RDB3 species is listed for 11 sites by Falk (1991b), of which five are in Scotland and Rossie Moor is the only site in the Dundee and Angus Area of Search. The ISR also lists six flies regarded then as Nationally Notable. All these Rare and Scarce species were recorded in 1981. *T. freyi* was recorded again on a SCM visit in 2003 (Godfrey, 2004). Also recorded during that visit was the cranefly *Dicranomyia aperta*. This species was classed as RDB1 by Falk (1991b) with records from just five sites, of which only two since 1940. A SCM visit in 2010 assessed the fly assemblage indirectly through habitat features, especially for *T. freyi*, and found that there was excellent potential for occurrence of this species (Wilkinson, 2010).

The presence of *T. freyi* and *D. aperata*, together with four Scarce species, probably justifies the fly assemblage being regarded as a qualifying feature. The recording of both Rare species during the 2003 SCM visit suggests that direct monitoring is appropriate.

As the two Rare flies are associated with wetlands or boggy ground, there may be a case for regarding the wetland invertebrate assemblage (including water beetles) as the qualifying feature. However, surveys methods are likely to be different for these taxa, so they should continue to be regarded as separate features for monitoring.

3.137.4 Recommendations

The beetle assemblage refers specifically to water beetles. It is difficult to determine if this is a qualifying feature but as an interim measure, it should be regarded as such. Direct monitoring is appropriate.

The fly assemblage is a qualifying feature. Direct monitoring may be appropriate but this should be reviewed if the Rare species prove difficult to find during future SCM rounds.

3.138 Rum

3.138.1 SSSI citation (reviewed 29 September 2009)

"The insect and other invertebrate fauna is rich for a remote island and includes many rare species and Hebridean forms which collectively comprise a nationally important assemblage."

3.138.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.138.3 Discussion

This large site has been extensively surveyed for invertebrates, with over 2,400 species recorded. These include 11 RDB3 or RDBK species comprising four beetles, one fly, one sawfly, four moths and one dragonfly. Furthermore, the list contains 12 species classed as Nationally Notable A and 50 as Nationally Notable B. The rare species have diverse habitat and resource requirements. For example, the larvae of the fly *Hypoderma diana*, an RDB3 species (Falk, 1991b), live in red and roe deer (van Emden, 1954) while the rove beetle *Omalium rugulipenne*, an RDBK species, is found under seaweed (Hyman & Parsons, 1994).

Four moths were regarded as Rare: the slender-striped rufous (*Coenocalpe lapidata*), belted beauty (*Lycia zonaria*), grey (*Hadena caesia mananii*) and slender Scotch burnet (*Zygaena loti scotica*). The former two species are now regarded as Nationally Notable A whilst the latter two species retain their RDB status (Waring & Townsend, 2003). All are candidates for monitoring directly. However, it should be noted that the slender Scotch burnet may be on the list in error (Kirkland *et al.*, 2012).

The Rare beetle species are *Leiodes picea*, *Ptinella limbata*, *Arena tabida* and *Omalium rugulipenne* all with RDBK status (Hyman & Parsons, 1994). However their diversity of habits (two of the Rare species occupy woodland and two coastal habitats) and the fact that most records in the ISR are either undated or stem from prior to 1970 makes the selection of targets among the beetles for direct monitoring difficult. Other 35 Scarce species are on the site list.

The contractor for the 2010 SCM survey concluded that fly habitat features were in a favourable condition (Wilkinson, 2010). The contractor reported that 47% of species of conservation concern are associated with remnant woodland areas.

During 2015 SCM site visits, 144 invertebrate species were recorded, including 65 spiders and 55 beetles. There were representatives of Hemiptera, Hymenoptera, Orthoptera, Trichoptera, Collembola, Myriapoda, Opiliones, Pseudoscorpiones and Archaeognatha (Cathrine *et al*., 2017b).

3.138.4 Recommendations

Given the extensive list of Rare and Scarce species, the invertebrate assemblage is clearly a qualifying feature. However, direct monitoring of the full range of species is impractical. Hence it would be useful to identify subsets to monitor, which may be qualifying features in their own right. Indirect monitoring should be carried out of key habitat features for Rare and Scarce species. Direct monitoring for Lepidoptera should be the most straightforward but even this has proved to be challenging.

Rum is regularly visited by naturalists; the data generated should be collated in order to maintain and update the species list and to help identify candidates for direct monitoring.

3.139 Shieldaig Woods

3.139.1 SSSI citation (reviewed 30 September 2008)

"Within the pine wood there are nationally important assemblages of flies and beetles. These include the Red Data Book hoverfly *Callicera rufa* and three species of nationally scarce beetle, all of which are native pinewood specialists."

3.139.2 Notified invertebrate feature(s)

Biological: Invertebrates: Flies.

Invertebrates: Beetles.

3.139.3 Discussion

The ISR lists just a single species with RDB status, the hoverfly *C. rufa*. This species has since been downgraded to Nationally Scarce, with records from 36 post-1980 hectads (Ball & Morris, 2014). The species was searched for unsuccessfully during a SCM visit in poor weather in 2003 (Godfrey, 2004). None of the 27 other fly species recorded were classed as Rare or Scarce. A SCM visit in 2010 focussed primarily on indirect monitoring of *C. rufa,* and suitable habitat was found to persist on site (Wilkinson, 2010). *C. rufa* is not a qualifying feature as a single species and, given that no other Rare or Scarce species are listed, the fly assemblage cannot be considered a qualifying feature.

The ISR shows that the beetle assemblage includes one Nationally Notable A species, *Leistus montanus*, and two Nationally Notable B species, *Xylostiba monilicornis* and *Rhagium inquisitor*, all recorded in 1976. *L. montanus* occurs in montane locations in northern Scotland, North Wales and the Lake District (Luff, 1998). Although the citation reported that the three Nationally Scarce beetles are native pinewood species, *L. montanus* is reported to occur in dry habitats, such as scree slopes and shingle banks (Hyman & Parsons, 1992; Luff, 1998). *X. monilicornis* occupies woodland, including broadleaved and conifer woods (Hyman & Parsons, 1994), whilst *R. inquisitor* is associated primarily with dead Scots pine. On a SCM visit for beetles in 2010, two further saproxylic beetle species then regarded as Nationally Notable B were recorded, *Cis festivus* and *Zilora ferruginea*, as well as *Hydrocyphon deflexicollis,* which has aquatic larvae and is regarded as Near Threatened (Foster, 2010a; Telfer, 2011). Shieldaig Woods SSSI is the only site for *Z. ferruginea* outside Speyside and Deeside and the species has recently been reassigned as Vulnerable. As Shieldaig Woods is the only known site for the species in the Area of Search, it could be a qualifying feature as a single species. Larvae of the species occupy the bracket fungus *Hirschioporus abietinus* on dead pine (Alexander, 2002). Two adults were found on the 2010 survey though the contractor reported that adults are rarely encountered (Telfer, 2011). Thus direct monitoring may be challenging.

3.139.4 Recommendations

On available evidence, the fly assemblage is not now a qualifying feature.

The beetle assemblage, especially saproxylic beetles, is a qualifying feature. Indirect monitoring of habitat quality is likely to be the most appropriate approach for SCM purposes, though periodic direct surveys are desirable to establish if the site continues to hold an assemblage consistent with a qualifying feature.

3.140 Shingle Islands

3.140.1 SSSI citation (reviewed 1 March 2013)

"The insect fauna includes some rare and local flies associated with damp deciduous woodland and riverine shingle, including the crane flies *Tipula laetabilis*, and *Rhabdomastix laeta* and the stiletto fly *Spiriverpa lunulata*."

3.140.2 Notified invertebrate feature(s)

Biological: Invertebrates: Fly assemblage.

3.140.3 Discussion

Three Rare fly species are listed in the ISR. The RDB2 cranefly *T. laetabilis,* which was to Britain in 1975, was recorded at Shingle Islands in 1978 and mapped from four hectads by Stubbs (1992). The RDB3 cranefly *R. hilaris,* which is found mainly at river banks in the Central Highland (Falk, 1991b), was recorded at Shingle Islands SSSI in 1998. The RDB3 stiletto fly *S. lunulata* is found mainly on riverside shingle at the Central Highlands (Falk, 1991b), and it recorded at Shingle Islands SSSI in 1995.

None of these Rare species were recorded during a SCM visit in 2003 (Godfrey, 2004) whilst a visit in 2010 focussed on indirect monitoring of habitat features used by the Rare species (Wilkinson, 2010). All three Rare species are associated with exposed riverine sediments, together with a Nationally Notable B cranefly listed in the ISR, *Nephrotoma dorsalis* (Falk, 1991b). Another cranefly recorded from the site, the Scarce *Diogma glabrata*, is associated with damp woodland (Falk, 1991b). Some or all Rare species may be qualifying features as single species, but given their commonality of habitat requirements, it is most convenient to regard the fly assemblage of exposed riverine sediments as the qualifying feature. The SCM visit in 2003 demonstrated that these may not be easy to find.

3.140.4 Recommendations

The fly assemblage, especially those species associated with exposed riverine sediments, is a qualifying feature. This assemblage may be best monitored by indirect assessment of habitat resources.

3.141 Spey Bay

3.141.1 SSSI citation (reviewed 11 January 2012)

"The wide range of habitats supports diverse invertebrate communities including two rare butterflies, the small blue *Cupido minimus* and the dingy skipper *Erynnis tages*."

3.141.2 Notified invertebrate feature(s)

Biological: Butterflies: Small blue (*Cupido minimus*).
Dingy skipper (*Erynnis tages*).

3.141.3 Discussion

No ISR was available to assist with preparation of this review.

The small blue butterfly is a UK Priority Species found mainly in southern England but also in scattered areas elsewhere, including eastern Scotland (Fox *et al*., 2006a). The dingy skipper is, in the UK, found mainly in England and Wales where it is widely but patchily distributed. In Scotland, it is found mainly on the southern Moray Firth coast with a few sites in the Great Glen and in Dumfries & Galloway (Fox *et al*., 2006a).

As declining species, both butterflies can be qualifying features at two sites with the strongest colonies in each Area of Search (Bainbridge *et al*., 2013). Data do not exist to compare the population strengths between sites, but both species are well established at this site and have been monitored since 1997 through butterfly transects (Prescott, 2015). Thus a precautionary approach would be to regard each as being qualifying features.

3.141.4 Recommendations

The small blue and dingy skipper are qualifying features for which continued direct monitoring is appropriate.

3.142 St Cyrus and Kinnaber Links

3.142.1 SSSI citation (reviewed 29 May 2009)

"The floristic diversity is paralleled by a rich and remarkable invertebrate fauna. The site possesses the most diverse moth and butterfly fauna of any site in Eastern Scotland. The moth fauna is especially rich with many scarce Scottish species such as the shore wainscot *Mythimna litoralis*, *Adaina microdactyla*, *Metzneria lappella*, *Cochylidia rupicola*, and, at its only known Scottish locality, *Elachista subocellea*.

The site is also one of the a few localities in Aberdeenshire for the small blue butterfly *Cupido minimus*."

3.142.2 Notified invertebrate feature(s)

Biological: Invertebrates: Moths.
Butterflies: Small blue (*Cupido minimus*).

3.142.3 Discussion

No SCM documents were available to assist with this review. The ISR lists 14 Scarce moths but not *Elachista subocellea,* which is classed as Nationally Scarce B (Davis, 2012). The site has been subject to sustained study of its moth fauna in recent years so this list will likely grow. Most of the Scarce species recorded are coastal specialists. The white colon (*Sideridis albicolon*), shore wainscot (*M. litoralis*), square-spot dart (*Euxoa obelisca grisea*), coast dart (*Euxoa cursorial*), sand dart (*Agrotis ripae*), Portland moth (*Actebia praecox*) and lime grass (*Photedes elymi*) have been recorded in just a handful of Scottish hectads (Hill *et*

al., 2010). The bordered grey (*Selidosema brunnearia*) is especially notable at this site, as an isolated colony and possibly the only one on the east coast of Britain. Unlike elsewhere in Britain, larvae of the St Cyrus colony have recently been confirmed to feed in their final instar on rest harrow (*Ononsis repens*) (Brooks & Leverton, 2015). Each of the Scarce micro-moths listed in the ISR, *Rhigognostis senilella*, *Eudonia lineola*, *Crambus pratella*, *Eulamprotes wilkella* and *Caryocolum vicinella*, are also coastal specialists (Emmet & Langmaid, 2002a; Sterling & Parsons, 2012). The moth assemblage is clearly a specialised fauna associated with a range of coastal habitats, including saltmarsh, sand dune and cliffs.

St Cyrus lies in the Kincardine and Deeside Area of Search, where the small blue butterfly may be extinct (Fox *et al*., 2006a; Young, 2015). However, a single small blue was photographed on the SSSI in 2012 (Paul Brookes, pers. comm.). Colonies remain along the coast to the south of St Cyrus, in the Dundee and Angus Area of Search, and it is possible that the 2012 sighting was of a wandering individual. Although further records have not come to light, recolonisation may be possible. However in the absence of recent evidence of an established population, the small blue butterfly must be assumed to absent from the site.

3.142.4 Recommendations

Given the range of Scarce species, the moth assemblage is a qualifying feature and should be monitored directly.

The small blue is no longer a qualifying feature as it appears to have been lost from St Cyrus as a breeding species.

3.143 Strath

3.143.1 SSSI citation (reviewed 15 July 2010)

"An exceptional variety of mollusc species has been recorded from the site and includes the notable snails *Vertigo lilljeborgi* and *Acicula fusca*. Three of the species recorded occur here are at their most northerly known locations in Europe."

3.143.2 Notified invertebrate feature(s)

Biological: Invertebrates: Molluscs.

3.143.3 Discussion

The ISR reported that 41 species of snail had been recorded from Strath SSSI. Most are common or local species, except for one Nationally Notable B species, *A. fusca*, and a species formerly regarded as RDB3, *V. lilljeborgi*. The latter inhabits saturated decaying vegetation in sedge (*Carex*) and rush (*Juncus*) swamps in northern and western Britain (Kerney, 1999). Its status has recently been reassessed as Nationally Scarce (Seddon *et al*., 2014).

An SCM visit in 2013 increased the list of mollusc species recorded to 49 and, whilst *V. lilljeborgi* was recorded, no further Rare or Scarce species were found (Alexander, 2014d).

In the absence of Rare species, and with just two Scarce species, the snail assemblage may not now be a qualifying feature. However, the site may have the best known assemblage in the AOS, and the SCM contractor in 2013 reported that it had an exceptional variety of mollusc species. In the absence of guidance on defining the species number required for a mollusc assemblage, a precautionary approach would be to regard the assemblage as qualifying. Methods for surveying terrestrial molluscs are described by Alexander (2014d).

3.143.4 Recommendations

The number of mollusc species recorded indicates that this is a rich site and the assemblage should be regarded as a qualifying feature. Direct monitoring should be continued.

3.144 Strathmore Peatlands

3.144.1 SSSI citation (reviewed 30 September 2009)

"Water beetle *Oreodytes alpinus*

The water beetle *Oreodytes alpinus* has been recorded from the exposed edges of Loch More and Loch Gaineimh. This beetle is nationally rare, with the entire British population being found only in a small number of lochs in Caithness and Sutherland."

3.144.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle (*Oreodytes alpinus*).

3.144.3 Discussion

The water beetle *O. alpinus* was discovered in Scotland in 1985. It was listed as RDB3 by Hyman & Parsons (1992) but reassessed as Vulnerable by Foster (2010b). It occurs in unstable turbulent sand and is confined to base-rich lochs in the far north-east of mainland Scotland (Foster, 2001). It has been found in 11 lochs across eight hectads (Foster, 2010a). *O. alpinus* was recorded from four of nine sampling points during SCM in 2003, at Loch Gaineimh and Loch More (Eyre, 2003b). It was recorded again at both lochs during a SCM visit in 2010 (Foster, 2010b).

Combining species lists compiled in 2003 and 2010, there are 32 water beetle species at the site. These include seven species formerly classed as Nationally Notable, but only two have been recorded since 1986. Monitoring *O. alpinus* will inevitably result in incidental monitoring of other water beetles, although there is insufficient evidence that the water beetle assemblage is exceptional.

3.144.4 Recommendations

Given its national status, and the threats that are posed from changing land use in peatland (Foster, 2010a), the water beetle *O. alpinus* is a qualifying feature and direct monitoring should continue.

3.145 Struan Wood

3.145.1 SSSI citation (reviewed 14 September 2007)

"Struan Wood is in Glen Garry within highland Perthshire, 7 km west of Blair Atholl village. The site is important both for being an ancient birch wood and for the insects it supports, especially the rare beetles associated with dead wood and a very rare species of moth.

The wood is a small remnant of once extensive highland birch woodland within Perth and Kinross, and one of the best examples within the district. The long history of woodland cover has meant that invertebrates with very specific habitat requirements have persisted. The site is a good example of the outstanding insect fauna found in Tummel-Garry valley system. Of particular importance are the six rare beetle species that have been recorded, including

the endangered *Abdera affinis*. The very rare moth *Ancylis tineana*, which requires low birch regeneration to survive, is also found here."

3.145.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Moth (*Ancylis tineana*).

3.145.3 Discussion

The ISR lists five beetle species regarded at the time as Rare, and a further five as Nationally Notable B. The rarest is the RDB1 *A. affinis*, which is listed as being recorded in 1982. This was the only British record since 1909 (Hyman & Parsons, 1992). This beetle is associated with fungi on trees (Hyman & Parsons, 1992), and it is certainly a qualifying feature as a single species. The other Rare species (Hyman & Parsons, 1992, 1994), all recorded in 1982, are *Bolitophagus reticulatus* (RDB3), *Rhopalodontus perforatus* (RDB3) and *Atheta boletophila* (RDBK), though *B. reticulatus* has recently been reassessed as Nationally Scarce (Alexander *et al*., 2014). All are saproxylic and associated with woodland, especially birch or pine (Alexander, 2002). *Epuraea silacea* (RDB3) was also listed in the ISR, but this has since been found to be a synonym of the common species, *E. deleta* (Alexander, 2014e).

A SCM visit focussing on beetles in 2003 did not produce further records of *A. affinis*, though *B. reticulatus* was recorded (Eyre, 2004). A SCM visit in 2013 again produced a record of *B. reticulatus* and *R. perforatus* was also found (Alexander, 2014e). This visit also produced a record of *Agathidium confusum*, new to the site. This is a RDBI species, probably associated with woodland (Hyman & Parsons, 1994) and is regarded as saproxylic (Alexander, 2002).

The assemblage of saproxylic beetles contains a number of Rare and Scarce species and is clearly a qualifying feature. Given its UK rarity level, continued attempts should be made to directly monitor *A. affinis*. This should be combined with monitoring of the remainder of the saproxylic beetle assemblage although, as most species may be difficult to find, this should be supplemented by indirect monitoring of dead wood resources.

The only Rare or Scarce moth listed in the ISR is *A. tineana*. It was classed as RDB1 but is now regarded as pRDB2 (Davis, 2012). The species feeds on a variety of trees and shrubs, especially in areas of young birch. It was found at Struan in 1974 (Bradley *et al*., 1979) and was present in 1994. It was not found during SCM visits in 2003 and 2004 and the extent of suitable habitat was reported to be low (Prescott *et al.*, 2006). However, 92 larval spinnings were found on a visit in 2012, showing that the species is at least locally common (Prescott, 2015). There are reportedly three locations in the West Perth Area of Search with recent records of *A. tineana*. Comparative data are not available to determine the relative importance of each site, but the results of the 2012 SCM visit indicate that there is potentially a strong colony at Struan Wood SSSI and, as such, the moth is probably a qualifying feature.

3.145.4 Recommendations

The beetle assemblage, in particular saproxylic beetles on birch or pine, is a qualifying feature. *A. affinis* should be monitored directly. The remainder of the assemblage can be monitored alongside this or through indirect monitoring of dead wood resources.

The moth *A. tineana* is a probably qualifying feature and should be monitored directly.

3.146 Sunart

3.146.1 SSSI citation (reviewed 15 July 2010)

"The SSSI also contains a diversity of invertebrates, components of which are nationally important. In particular, there is a notable dragonfly and damselfly assemblage which includes the nationally rare northern emerald dragonfly *Somatochlora arctica*. The woodlands are inhabited by strong populations of the nationally scarce chequered skipper butterfly *Carterocephalus palaemon* and the juxtaposition of grassland, heathland and scrub habitats on warm south-facing slopes supports nationally important populations of four species of moth, the ringed carpet moth *Cleora cinctaria bowesi*, Pretty Pinion *Perizoma blandiata* and the Atlantic groundling *Scrobipalpa clintoni* are nationally scarce. The New Forest burnet moth *Zygaena viciae argyllensis* is a red data book species at its only known location in Great Britain."

3.146.2 Notified invertebrate feature(s)

Biological:	Dragonflies:	Dragonfly assemblage.
	Butterflies:	Chequered Skipper (*Carterocephalus palaemon*).
	Invertebrates:	Moths.

3.146.3 Discussion

No ISR was available to inform this review.

The dragonfly assemblage is the only feature for which SCM documents were available. Eight species were recorded during a SCM visit in 2010 though these did not include the species that require bog pool habitats, azure hawker (*Aeshna caerulea*) and northern emerald (Willet & Corcoran, 2011). SCM visits in 2013 produced records of 13 species, including northern emerald, keeled skimmer (*Orthetrum coerulescens*), beautiful demoiselle (*Calopteryx virgo*) and southern hawker (*Aeshna cyanea*) (Batty, 2014c). This is a large site, spanning some 20 miles of coast, although sampling in 2013 concentrated on a smaller area at the northern end of the site. With 13 species recorded, the site easily exceeds the nine species threshold for a qualifying feature (Bainbridge *et al*., 2013).

Little information was available to assess the relative importance of the site for the chequered skipper. The Site Management Statement reported that the feature was Favourable-maintained in 2006. Sunart SSSI lies within the South Lochaber AOS, which holds a substantial proportion of the species' range (Fox *et al*., 2006a).

The highlight of the moth assemblage is the New Forest burnet, a RDB1 species for which Sunart SSSI is the only known extant UK site. It was discovered here in 1963 and the population declined to a low point in 1990 before subsequently recovering in response to introduction of grazing management (Young & Barbour, 2004). The moth is a very strong qualifying feature as a single species and direct monitoring should continue.

The citation lists three other moth species. The ringed carpet is classed as Nationally Notable A, pretty pinion is Nationally Notable B (Manley, 2008) - though Local may be a more appropriate status (Waring & Townsend, 2003) - and *S. clintoni* is Nationally Scarce A (Davis, 2012). It is doubtful that these species alone provide evidence for a sufficiently rich moth assemblage.

3.146.4 Recommendations

The dragonfly assemblage is a qualifying feature. The feature should be monitored directly.

In the absence of quantitative data to compare the relative importance of Sunart with other sites in the Area of Search, as a precautionary approach the chequered skipper should be regarded as a qualifying feature and monitored directly.

The moth assemblage may not be a qualifying feature, but the New Forest burnet certainly is, and should be monitored directly.

3.147 Talisker

3.147.1 SSSI citation (reviewed 14 October 2010)

"A rare day-flying moth, the Talisker burnet moth *Zygaena lonicerae jocelynae*, which is known from only three areas on Skye, survives in scattered populations on the maritime grassland on the steep coastal cliffs."

3.147.2 Notified invertebrate feature(s)

Biological: Invertebrates: Burnet moth (*Zygaena lonicerae jocelynae*).

3.147.3 Discussion

The Talisker burnet is a subspecies of narrow-bordered five-spot burnet. It is restricted to the south-western coastal part of central Skye (Heath, 1985), where it occurs on non-grazed rocky undercliffs (Prescott *et al.*, 2004). Although Heath (1985) showed three mapped hectads, just a single hectad was shown by Hill *et al*. (2010), this representing one or more records from 2000 or later.

The ISR also lists the RDB3 grey moth (*Hadena caesia mananii*) as recorded in 1977 at the same hectad in the Skye and Lochalsh Area of Search as for Talisker burnet (Hill *et al*., 2010). This species could, therefore, also be a qualifying feature, or combined with the Talisker burnet as elements of a moth assemblage. Currently, though, the species is not a notified feature.

3.147.4 Recommendations

As an endemic sub-species with a highly restricted range, the Talisker burnet is a qualifying feature and should be monitored directly. As a conspicuous day-flying species, monitoring should be straightforward.

The grey may also be a qualifying feature but is not a notified feature.

3.148 Taynish Wood

3.148.1 SSSI citation (reviewed 24 March 2011)

"The whole SSSI hosts a diverse range of invertebrates. The nationally-important moth assemblage includes over 450 species. Four of these are considered to be particularly rare in Scotland, such as *Clepsis rurinana*, a micro-moth.

The Taynish woodlands and clearings, with their wealth of micro-habitats, including an abundance of dead wood, provide ideal conditions for a nationally-important beetle assemblage. This includes nationally-scarce species, such as the weevil *Ceutorhynchus parvulus*.

The nationally-important fly assemblage includes 61 species of true flies, several of which are listed as being of conservation status; for example, a snail-killing fly *Tetanocera freyi*.

The nationally-important moth assemblage includes over 450 species. Four of these are considered to be particularly rare in Scotland, such as *Clepsis rurinana*, a micro-moth.

The herb-rich fen meadows are good habitat for the internationally-important marsh fritillary butterfly *Euphydryas aurinia*, in association with its larval food plant, devil's-bit scabious *Succisa pratensis*. Taynish is a core area for the local meta-population. The purple moor grass *Molinia caerulea* meadows of the coastal grassland fens also benefit other butterflies species.

In recent years, 13 species of dragonfly and damselfly have been found at Taynish Woods, making it a nationally-important assemblage. The assemblage includes the southern hawker dragonfly *Aeshna cyanea* and it is one of the few Scottish sites with the hairy dragonfly *Brachytron pratense*."

3.148.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
		Fly assemblage.
		Moth assemblage.
	Butterflies:	Marsh fritillary (*Euphydryas aurinia*).
	Dragonflies:	Dragonfly assemblage.

3.148.3 Discussion

The citation refers to the beetle assemblage as a notified feature, although one species is named, the RDB3 *C. parvulus*. This species occupies grassland or disturbed ground on or near the coast (Hyman & Parsons, 1992). There is no date for the record, and the region is not listed for the species (Hyman & Parsons, 1992). SCM fieldwork was carried out in 2015 and focussed on three further species in addition to *C. parvulus*: *Dendroxena quadrimaculata*, *Leptusa norvegica* and *Meloe violaceus* (Cathrine *et al*., 2017a). All are Nationally Notable B species with 1987 records for *D. quadrimaculata* and *M. violaceus* whilst the recording date of *L. norvegica* is unknown. *D. quadrimaculata* and *M. violaceus* were not recorded during the 2015 fieldwork (Cathrine *et al*., 2017a). With scant details for *C. parvulus* and just four Nationally Scarce beetle species recorded, the assemblage may fall short of the criteria required for defining a qualifying feature.

One species of fly is referred to directly in the citation, the snail-killing fly *T. freyi*. This RDB3 species inhabits wetlands, possibly requiring some base enrichment (Falk, 1991b) and was recorded at Taynish Woods in 1976. A further RDB3 fly has been recorded, the cranefly *Orimarga virgo*. This species occurs at seepages, sometimes in association with small streams (Falk, 1991b). It was also recorded at the site in 1976. Two further RDB3 cranefly species are listed by Wilkinson (2011): *Molophilus lackschewitzianus*, a species usually found in heavily shaded clay woods with incised streams (Falk, 1991b), and *Triogma trisulcata,* which occurs in seepages in bogs and upland streams (Falk, 1991b). No details of these records were included. The ISR lists five fly species classed as Notable B: a dung fly (*Parallelomma vittatum*), two hoverflies (*Platycheirus perpallidus* and *Platycheirus podagratus*) and two craneflies (*Helius pallirostris* and *Gonomyia conoviensis*). SCM fieldwork in 2003 did not produce records of the Rare species but did add two additional flies to the list of Nationally Scarce species, *Opomyza lineatopunctata* and *Thricops innocuus* (Godfrey, 2004). The site was visited again for SCM purposes in 2011 but monitored indirectly (Wilkinson, 2011). The assemblage of Rare and Scarce fly species appears to be

sufficient to be a qualifying feature. The assemblage seems to be associated with wetland features of the woodland, and extensive areas of mire and fen that fringe and intersect the woodland (Wilkinson, 2011).

The citation refers to over 450 species of moths, including *C. rurinana*. This species was formerly considered as pRDB3 but this was revised to pRDB1 by Davis (2012). It was searched for in August 2003 but not found (Prescott *et al.,* 2004), but then one male was recorded on the night of 15 July 2014, probably the first British record since the original 1983 record at Taynish Woods (Prescott, 2015). *C. rurinana* is clearly an important feature of the site and is a qualifying feature in its own right. However, as the ISR lists also one Nationally Notable A and ten Nationally Notable B species, and since one further species from each category was added in 2014 (Prescott, 2015), the moth assemblage as a whole should be considered as a qualifying feature.

Taynish Woods lies within the Lorne Area of Search, one of four in Scotland that is especially important for marsh fritillary. The Site Management Statement reported that Taynish Woods SSSI is a marsh fritillary meta-population stronghold, and the feature was assessed as Favourable in 2006. The butterfly is also an SAC feature. Although the importance of populations in the Area of Search has not been ranked, given the well-established nature of the species at Taynish Woods, it is probably a qualifying feature.

The dragonfly assemblage was found to comprise 12 species in 2002 (Batty, 2002) and then 13 species, all breeding, in 2013 (Batty, 2013a). These included two Nationally Scarce species, the hairy dragonfly and the keeled skimmer (*Orthetrum coerulescens*).

3.148.4 Recommendations

The beetle assemblage may not be a qualifying feature.

The fly assemblage is a qualifying feature. The assemblage is especially associated with wet features, which should primarily be monitored indirectly.

The moth *C. rurinana* is a qualifying feature, though should be regarded as the key species within a moth assemblage. Whilst monitoring should prioritise *C. rurinana*, other Scarce species in the assemblage should be monitored where practical.

The marsh fritillary is probably a qualifying feature and should be monitored directly.

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.149 Tayport – Tentsmuir Coast

3.149.1 SSSI citation (reviewed 13 October 2010)

"There are 30 rare or notable species of beetle found at Tayport–Tentsmuir Coast including *Leiodes ciliaris* and *Orthocerus clavicornis* as well as locally important species such as *Aegialia arenaria* and *Anomala dubia*, all of which contribute to an outstanding assemblage of invertebrates associated with sand dune systems including heath, scrub and pine. The sand dune invertebrate fauna is particularly rich and diverse, including 46 nationally rare or scarce species. Four of these are Red Data Book species, including the cousin German moth *Protolampra sobrina"*.

3.149.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.149.3 Discussion

The ISR lists four RDBK beetle species: *Omalium rugulipenne*, *Cypha imitator*, *Arena tabida* and *Trichohydnobius suturalis*. Three are coastal specialists; *O. rugulipenne* is found under seaweed on sandy coasts, *A. tabida* is found in a variety of coastal habitats and *T. suturalis* occurs in sandy coastal places (Hyman & Parsons, 1994). The fourth species, *C. imitator*, may be associated with rotten wood and bark. The ISR lists a further 29 Scarce beetle species for the site.

Beetles were surveyed for SCM purposes during a number of site visits in 2004 and 2005 (Blake, 2005). Two of the Scarce species were recorded, *L. ciliaris* and *O. clavicornis*, together with 11 species of local importance, most of which are associated with sandy coastal habitats.

Although records of the three Rare species date from the 1960s (listed as 1960-1982 for *A. tabida*), the site clearly supports a range of specialised coastal beetle species.

The citation also mentions a moth, the cousin German. This UK Priority Species was formerly regarded as RDB3 (Shirt, 1987) but recent surveys have revealed its presence at a number of new sites and it is now regarded as Nationally Notable A (Waring & Townsend, 2003). It is listed in the ISR as being recorded in 1970, although it is doubtful that it survives at the site, if indeed it was ever reliably recorded. This moth is dependent on bilberry (*Vaccinium myrtillus*) growing under birches, and it is more frequently associated with upland birch woodland in Scottish glens (Waring & Townsend, 2003). The required combination of food plants was not found during Lepidoptera surveys in 2001 and 2002 (Littlewood, 2002). The lunar yellow underwing (*Noctua orbona*) is a stronger candidate for a qualifying feature. It is listed in the ISR as occurring in 1976 and was recorded again in 2002 and in 2007 (Duncan Davidson, pers. comm.). Although recorded in 21 Scottish hectads before 2000, the Tentsmuir records represent one of only two post-2000 hectads in Scotland. The species has declined in its range across the UK and is now mainly found in East Anglia (Hill *et al*., 2010), where larvae feed on fine-leaved grasses on well-drained light soils (Haggett, 2005), a similar habitat to those on parts of the Tayport – Tentsmuir Coast SSSI. Other Nationally Notable B moths recorded at Tentsmuir are *Crambus pratella*, coast dart (*Euxoa cursoria*) and Portland moth (*Actebia praecox*), which are associated with coastal or sandy habitats. The site also harbours the grayling butterfly (*Hipparchia semele*) (Littlewood, 2002), another species associated with coastal sandy habitats. These species together may meet JNCC qualifying feature criteria for butterfly and moth assemblages, although they are not notified features.

3.149.4 Recommendations

The beetle assemblage, especially of species associated with coastal habitats, is a qualifying feature. Many of the species may be difficult to locate during short visits. Indirect monitoring of coastal habitat resources may therefore, be more appropriate for SCM purposes.

The butterfly and moth assemblages may also be qualifying features though they are not notified features.

3.150 Tayvallich Juniper and Fen

3.150.1 SSSI citation (reviewed 2 July 2010)

"The valley mires and lochans are also important for their damselfly and dragonfly populations. Eleven species are known to breed within the SSSI including the unusual keeled skimmer *Orthetrum coerulescens*."

3.150.2 Notified invertebrate feature(s)

Biological: Dragonflies : Dragonfly assemblage.

3.150.3 Discussion

Thirteen and 12 breeding dragonfly species were recorded during SCM in 2002 (Batty, 2002) and 2013 (Batty, 2013a), respectively. These figures exceeded the minimum required for mainland Scotland (Bainbridge *et al*., 2013).

Tayvallich Juniper and Fen SSSI is part of the Tayvallich Juniper and Coast Special Area of Conservation (SAC), which is designated, among other features, for marsh fritillary (*Euphydryas aurinia*). It is not clear how important the Tayvallich Juniper and Fen SSSI is for this species, but it could be a qualifying feature. However, as it is a regarded as a feature of the SAC, direct monitoring specifically for the SSSI seems unnecessary.

3.150.4 Recommendations

The dragonfly assemblage is a qualifying feature and should be monitored directly.

3.151 Torridon Forest

3.151.1 SSSI citation (reviewed 28 April 2010)

"Nationally rare invertebrate species are associated with habitats on the site including the leaf beetle *Phyllodecta polaris*, the sawfly *Pachynematus moerens* and the spider *Erigone psychrophila*."

3.151.2 Notified invertebrate feature(s)

Biological: Invertebrates: Sawflies, wasps and ants.

Spiders.

Beetles.

3.151.3 Discussion

The ISR lists just four invertebrate species, three of which are those mentioned in the citation. The sawfly *P. moerens* occurs in montane areas and is possibly associated with *Carex*. A 1978 record is cited for Torridon Forest, and a one-day SCM visit in 2003 resulted in no sawflies of any species recorded (Godfrey, 2004). However, Geoff Wilkinson and Chris Cathrine (pers. comm.) have pointed out that the RDB3 classification for *P. moerens* is based on a taxonomic misunderstanding. The original citation for this site referred to "*P. torridonensis* RDB3". Subsequent taxonomic studies however have revealed that *P. torridonensis* is a synonym of *P. moerens* (Liston *et al*., 2010, 2014). As *P. torridonensis* is no longer a recognised species, it is not justifiable to transfer its rarity designation to the common and widespread *P. moerens*. Therefore this sawfly no longer qualifies as a feature. No other sawfly records were available for this review.

The spider listed in the citation, *E. psychrophila*, is reported in the ISR to be a Nationally Scarce species and as such is not a qualifying feature. The ISR also lists the RDB3 *Micaria alpina*, which has been recorded in just three GB hectads. As such it would likely be a qualifying feature as a single species. However, it is now known that this species does not occur on the SSSI and was included as a result of a transcription error in a record referring to a different site (Kirkland *et al*., 2012). Nonetheless, as the habitat at Torridon Forest looks

suitable for the species, it was searched for during SCM visits in 2011 but not found (Kirkland *et. al.,* 2012). *E. psychrophila* and *Lepthyphantes whymperi* (Nationally Notable B) were recorded among a range of spiders that are typical of montane habitats.

The leaf beetle listed in the citation, *P. polaris*, was classed as RDB3 (Hyman & Parsons, 1992) with Hubble (2014) retaining it as a Nationally Rare species with Near Threatened status. It is a montane beetle, associated with dwarf willow (*Salix herbacea*) on dolomite limestone outcrops in north and west Scotland (Hubble, 2014). It unsuccessfully searched for during a SCM visit in 2003. No other Rare species were found either. A Nationally Notable B water beetle species, *Enochrus affinis*, was the only Scarce beetle found (Eyre, 2004). However *P. polaris* was recorded during a SCM visit in 2010, despite this visit being carried out in poor weather. A Nationally Notable B ground beetle, *Patrobus septentrionis*, was also recorded. It is not possible to determine if Torridon Forest is the most important site for *P. polaris* in the Area of Search but, given its national rarity status, it probably remains a qualifying feature as a single species whilst the 2010 SCM visit demonstrated that direct monitoring is appropriate.

3.151.4 Recommendations

Sawflies should not be regarded as a qualifying feature.

With no site records of Rare species, and records of just three Scarce species available to this review, it appears that the spider assemblage is not a qualifying feature.

It is doubtful that the beetle assemblage as a whole should be considered as a qualifying feature, as records of just two Scarce species do not provide sufficient evidence of a rich assemblage. However, *P. polaris* probably is a qualifying feature and can be monitored directly.

3.152 Turnberry Dunes

3.152.1 SSSI citation (reviewed 23 February 2010)

"Turnberry Dunes, lying 0.3 km west of Turnberry, is of national importance for its rich beetle assemblage (Coleoptera) which includes a number of Nationally Scarce species such as the weevils *Aizobius sedi* and *Trichosirocalus dawsoni* and the staphylinids *Cafius fucicola* and *Heterothops binotatus*. Two red data book species have also been recorded, the featherwing beetle *Actinopteryx fucicola* and the weevil *Ceutorhynchus cakilis*. A number of species have also been recorded for which the site is the most northerly known station in Britain."

3.152.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.152.3 Discussion

The citation refers to two RDB beetle species, *A. fucicola* and *C. cakilis*. These were both discovered at the site during SCM in 2002 and 2003 (Blake, 2004a). *A. fucicola* is an RDBK species that occurs under seaweed and other beach debris (Hyman & Parsons, 1994) whilst *C. cakilis*, also classed as RDBK, is a littoral species that breeds on sea rocket (*Cakile maritima*) and sea kale (*Crambe maritima*) (Hyman & Parsons, 1994).

The citation names four Nationally Scarce beetles. Four are also named in the ISR. One of these, *T. dawsoni*, was recorded during the 2002/03 SCM visits.

The Scarce species records are all dated in the ISR as being pre-1975. However, with the discovery of two Rare species restricted to shorelines, the beetle assemblage is still clearly important and specialised. Direct monitoring is desirable, given the antiquity of some of the records. This may be challenging since a single specimens of each Rare species has been recorded (Blake, 2004a).

3.152.4 Recommendations

The beetle assemblage is a qualifying feature. Direct monitoring should be supplemented by indirect monitoring of habitat.

3.153 Tweedwood - Gateheugh

3.153.1 SSSI citation (reviewed 27 January 2011)

"The woodlands have a high entomological interest due to their aspect, variety of soil and plant associations, high proportion of over-mature/dead timber, and range of habitats. Beetles are of particular importance with 2 national rarities and 24 species of restricted Scottish distribution, of which 7 depend on the constant availability of dead/dying timber, including *Microscydmus nanus* and *Ptinus subpilosus*. The presence of flightless beetle species further indicates the site's antiquity; several are at their only known Borders station, while others are extremely restricted in Scotland."

3.153.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetle assemblage.

3.153.3 Discussion

Although the citation refers to two Rare beetle species and 24 species of restricted distribution in Scotland, these are not listed in the ISR. However, some details of site records were given in the report describing a SCM visit in 2011 (Alexander, 2011), which focussed on saproxylic species. It was reported that most previous beetle records were generated in 1970, and six of the saproxylic species recorded were classed as Nationally Notable (Hyman & Parsons, 1992; 1994). These include one of the two saproxylic species mentioned in the citation, *P. subpilosus*.

The one-day SCM visit in 2011 generated records of 18 saproxylic beetles. None of the previously reported Scarce species was found, although three beetles considered to be of note in a local context were identified. The contractor reported that there was no reason to believe that the Scarce species previously reported have been lost from the site. He also reported that Tweedwood-Gateheugh is one of the richest woodland sites for such fauna in southern Scotland (Alexander, 2011). A total of 30 beetles species were recorded during SCM in 2015, of which eight are saproxylic; several are local in Scotland, at or near the northerly limit of their UK distribution. Neither species listed on the citation were found, although another Nationally Scarce beetle, *Cis jacquemartii*, was recorded (Cathrine *et al.*, 2017a).

Given a lack of information on Rare beetles, it is difficult to assess whether the assemblage should be regarded as a qualifying feature. The failure to locate Rare or Scarce species during 2011 and 2015 SCM visits shows that this may be a difficult fauna to survey.

3.153.4 Recommendations

Evidence available for this review was insufficient to establish whether the beetle assemblage is a qualifying feature.

3.154 Waulkmill

3.154.1 SSSI citation (reviewed 25 March 2011)

"The maritime cliff is one of the best general habitats for moths and butterflies in Orkney and is the only known location in Orkney for the golden-rod case-bearer moth (*Coleophora obscenella*)."

3.154.2 Notified invertebrate feature(s)

Biological: Invertebrates: Golden-rod case-bearer moth (*Coleophora obscenella*).

3.154.3 Discussion

Coleophora obscenella, now known as *Coleophora virgaureae* (Agassiz *et al*., 2013), is classified as Nationally Scarce B (Davis, 2012). The larva feeds on goldenrod (*Solidago virgaurea*) and, occasionally, sea aster (*Aster tripolium*) (Emmet, 1996). At Waulkmill, the species was first recorded in 1970. It was recorded again, during a SCM survey in 2014, when three larval cases were found (Prescott, 2015). The citation reported that Waulkmill is the only known site for this moth on Orkney, though it is not a rare species nationally. It was recorded in 54 British vice counties, including 15 in Scotland, prior to 1996 (Emmet, 1996). By 2015, the number of vice counties in Scotland with records of had risen to at least 24 (http://www.eastscotland-butterflies.org.uk/sm_Coleophoridae.html - accessed 26/11/2015).

3.154.4 Recommendations

C. obscenella is a Scarce though widely recorded species in Britain and does not meet qualifying feature criteria.

3.155 Western Gailes

3.155.1 SSSI citation (reviewed 23 February 2011)

"Western Gailes, located 1 km south of Irvine, comprises a section of foreshore backed by a line of high fixed dunes which exhibits a range of characteristic sand dune plant species together with the Nationally Scarce Isle of Man cabbage *Coincya monensis monensis*. The site also supports a diverse invertebrate assemblage, with beetles (Coleoptera) and flies (Diptera) being of particular importance. Nationally scarce species from each group are present at the site, including the following: the bee fly *Phthiria pulicaria*; the hoverfly *Eumerus sabulonum*; the clown beetle *Hypocaccus rugiceps*; the seed weevil beetle *Diplapion stolidum*; the ground beetle *Amara praetermissa* and the hairy-horned beetle *Orthocerus clavicornis*. A number of species present here are close to the northern limits of their range."

3.155.2 Notified invertebrate feature(s)

Biological: Invertebrates: Invertebrate assemblage.

3.155.3 Discussion

The citation refers to two Scarce species of fly and four Scarce species of beetle. No Rare species is mentioned although the ISR refers to *Anthicus scoticus*, an RDB3 beetle associated with muddy, sandy or silted places (Hyman & Parsons, 1994) and recorded in 1983.

SCM visits focussing on beetles were carried out in 2002 and 2003 (Blake, 2004b). A total of 108 species were recorded, including two of seven previously reported Scarce species, *Phylan gibbus* and *H. rugiceps*, and three additional Nationally Scarce species, *D. stolidum*, *A. praetermissa* and *O. clavicornis*. The only other SCM document available was from indirect monitoring of habitat features for flies (Wilkinson, 2010).

3.155.4 Recommendations

The status of the invertebrate assemblage as a qualifying feature is doubtful. However, the lack of recent SCM data hinders assessments for this site, so further surveys should be carried out to aid consideration of the status of the invertebrate assemblage with respect to qualifying feature status.

3.156 Whiting Ness - Ethie Haven

3.156.1 SSSI citation (reviewed 27 November 2009)

"The coastal grassland along the cliff top also supports kidney vetch *Anthyllis vulneraria*, the food plant of the caterpillars of the Scottish rarity, the small blue butterfly *Cupido minimus*."

3.156.2 Notified invertebrate feature(s)

Biological: Butterflies: Small blue butterfly (*Cupido minimus*).

3.156.3 Discussion

The small blue butterfly is a UK Priority Species found mainly in southern England but also in scattered areas elsewhere, including eastern Scotland (Fox *et al*., 2006a). There are a number of recently recorded sites for the species in the Dundee and Angus Area of Search (Fox *et al*., 2006a), but there are no data to compare the relative strength of these colonies. However, the small blue was recorded at a number of locations in the southern section of the Whiting Ness – Ethie Haven SSSI in 2013 and 2014 (Prescott, 2015), so a precautionary approach would be to regard it as a qualifying feature. The species should be directly monitored through counts of adults and eggs. Eggs are easily located on kidney vetch (*Anthyllis vulneraria*), and such survey work is less weather-dependent than searches for adults.

The ISR lists a single Rare species, the beetle *Atomaria procerula*. This RDBI species is a woodland beetle, which occurs in rotten wood (Hyman & Parsons, 1994). Whiting Ness - Ethie Haven is unlikely to be important to this species, which has apparently been recorded solely in 1976.

3.156.4 Recommendations

The small blue is a qualifying feature and should be monitored directly.

3.157 Whitlaw Bank to Hardies Hill

3.157.1 SSSI citation (reviewed 24 June 2010)

"The grasslands support a colony of the rare small blue butterfly *Cupido minimus* which relies on kidney vetch *Anthyllis vulneraria* as the food plant for its larvae. The rare soldierfly *Oxycera dives* is found in and around the partially shaded mossy seepages, wet rock faces and flushed grassland present on the site."

3.157.2 Notified invertebrate feature(s)

Biological: Butterflies: Small blue (*Cupido minimus*).

Invertebrates: Soldierfly (*Oxycera dives*).

3.157.3 Discussion

The Site Management Statement for Whitlaw Bank to Hardies Hill SSSI reported that the small blue has not been seen since 1977. Unless management is carried out, possibly through reintroduction combined with identifying and reversing the causes of its loss, the small blue cannot be considered a qualifying feature. Even if the species is reinstated, a strong colony would be required to meet qualifying feature guidelines.

The RDB3 soldierfly *O. dives* was found at this site in 1988 and has been discovered in recent years in a wide range of sites (Stubbs & Drake, 2014). It is associated with seepages at woodland edge, and it was a target for SCM in 2002, when a single female specimen was found (Drake, 2004). That visit also produced records of five other Scarce flies, comprising one soldierfly and four craneflies, all of which are associated with damp areas or seepages. It may, therefore, be better to consider the fly assemblage as a whole, specifically flies associated with damp areas or flushes. Such areas were the focus of indirect monitoring of habitat features for Rare and Scarce flies carried out in 2010 (Wilkinson, 2010).

3.157.4 Recommendations

The small blue butterfly is extinct at the site and is no longer a qualifying feature.

The fly assemblage of wet areas and seepages, including the notified feature, *O. dives*, should be considered as a qualifying feature. Monitoring should be carried out by a combination of indirect and direct methods.

3.158 Whitlaw Mosses

3.158.1 SSSI citation (reviewed 11 August 2010)

"The diverse invertebrate fauna includes over 250 species of fly, 160 species of beetles and 84 species of butterflies and moths. The notified invertebrate species are: the beetle assemblage which comprises a suite of species typical of mosses, flowing waters and pools; nine Red Data Book species including three sawflies *Nematus monticola* and *Phyllocolpa* spp., five flies (Diptera) *Tetanocera freyi*, *Oxycera dives*, *Scathophaga tinctinervis*, *Parhelophilus consimilis* (a hoverfly), *Dicranomyia magnicauda* (a cranefly), and the micro-moth northern grey twist *Aphelia unitana*."

3.158.2 Notified invertebrate feature(s)

Biological:	Invertebrates:	Beetle assemblage.
	Invertebrates:	Fly assemblage.
	Invertebrates:	Moth (*Aphelia unitana*).
	Invertebrates:	Sawflies, wasps and ants.

3.158.3 Discussion

The citation makes clear that the beetle assemblage refers specifically to water beetles, though no species are named. The ISR lists four species, each classed then as RDB3, namely *Hydrochus brevis*, *Laccornis oblongus*, *Hydroporus glabriusculus* and *Acilius canaliculatus*, with records dated between 1974 and 1991. In the most recent review (Foster, 2010a) *H. brevis* and *L. oblongus* are classed as Near Threatened, *H. glabriusculus* as Vulnerable and *A. canaliculatus* as Nationally Scarce.

On Beanrig Moss, Blackpoll Moss, Lindean Moss and Murder Moss, 24, 8, 23 and 13 water beetle species were recorded respectively from SCM in 2002 (Eyre, 2003c). *H. glabriusculus* was found at Beanrig Moss, Blackpoll Moss and Lindean Moss. *A. canaliculatus* was recorded at Lindean Moss as well as another Nationally Scarce species, *Cyphon kongsbergensis*. A SCM visit in 2010 produced records of 37 species, including *H. glabriusculus* and the Near Threatened *H. longicornis*. *A. canaliculatus* was also again recorded at Lindean Moss. The cumulative list for the four wetlands after that visit stood at 88 species (Foster, 2010b).

The extensive species list, coupled with the presence of three Rare species, indicates that this is an important assemblage. Some of the Rare species may be single species qualifying features, especially, *H. glabriusculus*, which in Scotland is confined to the Border Mires (Foster, 2001). However, as monitoring can be effectively combined, it is most useful to regard the water beetle assemblage as a whole.

Of the fly species listed in the citation, *T. freyi* and *O. dives* are classed as RDB3 while *S. tinctinervis*, *P. consimilis* and *D. magnicauda* are classed as RDB2 (Falk, 1991b). *D. magnicauda* was recorded in 1976 and, the latest records for the other species are from the 1980s (Wilkinson, 2010). SCM for flies was carried out in 2002 (Drake, 2004). *P. consimilis* and *T. freyi* were among the species recorded along with 13 species classed as Nationally Notable. Further SCM in 2010 focussed on indirect monitoring of habitat resources for the Rare species (Wilkinson, 2010). The list of Rare species recorded is of sufficient quality to qualify the fly assemblage. All Rare species are associated to some extent with wetlands.

The micro-moth *A. unitana* was regarded as Nationally Scarce A in the latest review (Davis, 2012) and has been recorded from eight Scottish vice counties (http://www.eastscotland-butterflies.org.uk/sm_Tortricidae.html#49.032 – accessed 09/03/2016). Its taxonomic status is unclear; Bland (2014) regarded *A. unitana* as a form of the common species *Aphelia paleana*, though the most recent British Isles checklist retains *A. unitana* as a species (Agassiz *et al*., 2013). A single specimen was recorded during a SCM visit in 2014 (Prescott *et al.*, 2006).

The three Rare sawflies listed in the ISR are *Phyllocolpa acutiserra*, *N. monticola* and *Phyllocolpa excavata*, which were regarded at the time of the ISR as pRBD1, pRDB1 and pRDB3, respectively. *P. excavata* has since been found to refer to *Phyllocolpa carinifrons* (Cathrine *et al.,* 2015). None of these species was found during SCM in 2002, although *P. carinifrons* was present during SCM visits in 2013 and 2014. The ecological requirements of these species are little known, although all are thought to have some larval association with willows (Cathrine *et al.,* 2015).

3.158.4 Recommendations

The beetle assemblage, specifically the water beetle assemblage, is a qualifying feature. Direct monitoring should be continued.

The fly assemblage, in particular species associated with wetlands, is a qualifying feature. The feature should primarily be monitored by indirect means.

Given that the micro-moth *A. unitana* is now regarded as Nationally Scarce, it does not meet qualifying feature criteria.

The rarity status of the three sawfly species is sufficient to regard the assemblage as a qualifying feature. However, finding the species has proved to be challenging, whilst indirect monitoring is restricted to confirming the presence of food plants.

3.159 Woodhall Loch

3.159.1 SSSI citation (reviewed 18 February 2015)

"The community of aquatic water beetles is one of the best representations of loch and fen species in the area which include both southern species such as *Noterus clavicornis* and *Enochrus testaceus* and northern species some of which are rare and declining such as *Hygrotus quinquelineatus* and *Helophorus strigifrons*. A further species *Ilybius subaeneus* is known from only a small number of Scottish sites. Additional invertebrate interest includes a rove beetle *Stenus nitens* known elsewhere only from East Anglia, a small number of locations across central and northern England and Ireland and the caddisfly *Anabolia brevipennis*."

3.159.2 Notified invertebrate feature(s)

Biological: Invertebrates: Beetles.

Invertebrates: Caddisfly (*Anabolia brevipennis*).

3.159.3 Discussion

The citation refers to five water beetle species by name, *N. clavicornis*, *E. testaceus*, *H. quinquelineatus*, *H. strigifrons* and *I. subaeneus*. The last three are classed as Nationally Scarce, while the first two species do not meet the criteria required for this status (Foster, 2010a).

SCM in 2002 produced a list of 31 water beetle species, taking the total for the site to 70 species (Eyre, 2003c). A SCM visit in 2010 produced records of 25 species, taking the overall site total to 73 species (Foster, 2010b). Among species recorded in 2010 were five classed at the time as Nationally Scarce.

Although the site species list is quite long, with 13 species formerly considered to be Nationally Scarce, it does not include any Rare species. However, Woodhall Loch had the 8th place in a ranking of 28 sites for water beetles in the group of mesotrophic or eutrophic fen sites with large areas of open or permanent water (Foster & Eyre, 1992). Therefore a precautionary approach would be to continue to consider the water beetle assemblage as a qualifying feature.

The citation refers to an additional beetle species, *S. nitens*, as not occurring elsewhere in Scotland. The species is, however, listed in the ISRs for several other sites such as Whitlaw Mosses, Alvie, Loch Vaa and Muir of Dinnet (although errors are known to occur in the ISR database). As a local species it would not normally be a candidate for a qualifying feature.

The caddisfly *A. brevipennis* is a notified feature as a single species. It favours pools with a slight water flow in dense reed-fen or carr woodland. It was formerly classed as RDB3 though this was revised to Notable (Wallace, 1991). Wallace (2010) concurred that Woodhall Loch is the only confirmed Scottish site. The species was first recorded in 1985 and a single larva was found during SCM in 2013 (Knight, 2014), confirming the species' presence.

3.159.4 Recommendations

The beetle assemblage, specifically water beetles, should be considered a qualifying feature and monitored directly.

As a Scarce species, the caddisfly *A. brevipennis* is not a qualifying feature candidate.

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