



REGIONAL ACTION PLAN FOR THE BUTTERFLIES AND MOTHS OF SOUTH WEST SCOTLAND

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This Regional Action Plan is one of a series being drawn up by Butterfly Conservation's branches throughout the UK. These plans were initiated under Butterfly Conservation's "Action for Butterflies" project, supported by the World Wide Fund for Nature, Scottish Natural Heritage, English Nature, and the Countryside Council for Wales. The preparation of this Plan was part-funded by SNH.

Dedication

This plan is dedicated to Bill Brackenridge who devoted much time and effort to the conservation of butterflies and other wildlife of the Region.

Acknowledgements

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Executive Summary

This Regional Action Plan (RAP) summarises existing knowledge on the distribution, status and ecology of high and medium priority butterflies and moths in the South West Scotland, and outlines actions and targets for their conservation.

The prime purpose of this Plan is to guide the activities of Butterfly Conservation's regional Branch for South West Scotland. However, we hope that it will also be of use to others, particularly those preparing Local Biodiversity Action Plans (LBAPs), and to those involved in land management.

The high priority butterflies and macro-moths¹ for South West Scotland are:

BUTTERFLIES	
Chequered Skipper	<i>Carterocephalus palaemon</i>
Dingy Skipper	<i>Erynnis tages</i>
Large Heath	<i>Coenonympha tullia</i>
Marsh Fritillary	<i>Euphydryas [Eurodryas] aurinia</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Northern Brown Argus	<i>Aricia artaxerxes</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>
Small Blue	<i>Cupido minimus</i>
MOTHS	
Argent and Sable	<i>Rheumaptera hastata nigrescens</i>
Barred Tooth-stripe	<i>Trichopteryx polycommata</i>
Cousin German	<i>Paradiarsia sobrina</i>
Lunar Yellow Underwing	<i>Noctua orbona</i>
Narrow-bordered Bee Hawk	<i>Hemaris tityus</i>
Northern Dart	<i>Xestia alpicola alpina</i>
Slender Scotch Burnet	<i>Zygaena loti scotica</i>
Square-spotted Clay	<i>Xestia rhomboidea</i>
Sword Grass	<i>Xylena exsoleta</i>

¹ “Micro-moths” have been omitted (see Section 3.3)

The main priorities for action are :

Research, Survey & Monitoring

- To identify all core colonies of priority species.
- To undertake research where necessary to determine habitat requirements.
- To ensure monitoring continues on established sites, and set up additional monitoring where necessary.
- To collate monitoring data and provide feedback to recorders, in co-operation with UK schemes and Local Biological Record Centres.

Site safeguard & Management

- To encourage or undertake site management where necessary.

Advisory

- To liaise with landowners and statutory and voluntary organisations to promote the effective conservation of Lepidoptera in the Region.
- To disseminate information on the distribution and habitat requirements of key species to those who can further their conservation.

Publicity

- To promote the need for conserving Lepidoptera as part of the wider biodiversity message.
- To publicise the activities of Butterfly Conservation, and to recruit additional members to Butterfly Conservation's South West Scotland Branch.

1 Introduction

This Regional Action Plan is one of a series being drawn up by Butterfly Conservation's branches throughout the UK. These plans were initiated under Butterfly Conservation's "Action for Butterflies" project, supported by the World Wide Fund for Nature, SNH, English Nature, and the Countryside Council for Wales, and follow a standard format (Bourn *et al.* 1996).

Functions of the Regional Action Plan

The Plan has several intended functions:

- It summarises current knowledge on the distribution, conservation status and ecology of key butterfly and moth species within the Region, and points the way to action for their conservation.
- It provides guidance for Butterfly Conservation's own regional Branch in planning its activities and setting priorities for the future.
- The Plan also aims to inform other organisations about issues of butterfly and moth conservation in the area, and how these can be addressed practically in a co-operative framework. Targets have been set with a particular regard to partnership approaches in the work.

Coverage

The Region dealt with in the plan is the area covered by Butterfly Conservation's Glasgow Branch, see Map 1. This corresponds to the combined Local Authority areas of Argyll & Bute, Stirling, West Dunbartonshire, East Dunbartonshire, Inverclyde, Renfrewshire, East Renfrewshire, City of Glasgow, North Lanarkshire, North Ayrshire, East Ayrshire, South Lanarkshire, South Ayrshire, and Dumfries and Galloway.



Features of South West Scotland

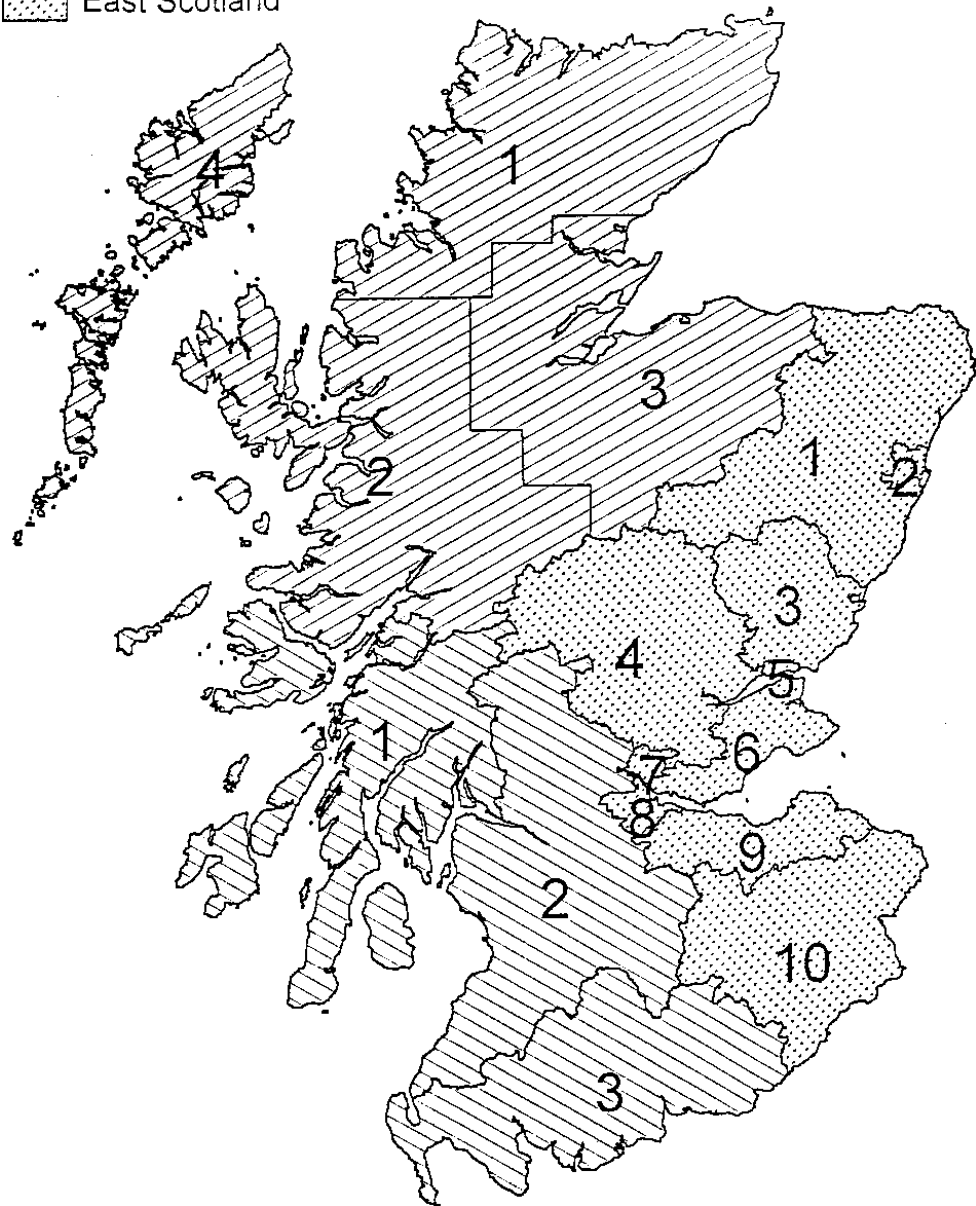
The Region covers about 2.3 million hectares, approximately 30% of the land area of Scotland. It has a population of just over 2.5 million (about 50% of the Scottish population), most of which is concentrated in the conurbation of Glasgow.

Although much of the central part has been modified by urban development and industry, there remains a great diversity of natural habitats from montane to oceanic island, and the Region is correspondingly very rich in terms of biodiversity.

During the past century, large tracts of land in Argyll and Dumfries and Galloway have been afforested with conifers, with the consequent loss of much blanket bog, heather moorland and rough grassland (Mackey *et al.*, 1999).

Butterfly Conservation Regions

-  Highlands and Western Isles
-  South and West Scotland
-  East Scotland



Map 1. The South West Scotland Region, showing sub-regions used for the purposes of this plan.

- 1 *North* : Argyll, Bute & Arran;
- 2 *Central*: Ayrshire to Stirling;
- 3 *South*: Dumfries and Galloway.

The Region comprises the following Watsonian vice-counties: 72 Dumfrieshire, 73 Kirkcudbrightshire, 74 Wigtonshire, 75 Ayrshire, 76 Renfrewshire, 77 Lanarkshire, 86 Stirlingshire, 98 Argyll Main, 99 Dumbartonshire, 100 Clyde Isles, 101 Kintyre, 102 South Ebudes, and 103 Mid Ebudes.

The remoteness of the many peninsulas and islands, some of which are uninhabited, offer a particular challenge to conservationists in both the collection of data and the implementation of management and other policies.

Butterfly Conservation in South West Scotland

The Glasgow Branch is the longest-established and largest of Butterfly Conservation's three Scottish Branches. The region's centralised population affords the Branch the opportunity for rapid expansion of its membership and raising the profile of butterfly and moth conservation. However, considering the Region's population size, current membership is still low. For this reason the targets outlined in this Plan are modest compared to those attempted by larger Branches in other parts of the UK.

Delivery of Butterfly Conservation's objectives can only be achieved through co-operation and partnership with:

- private landowners and their respective organisations, the National Farmer's Union of Scotland (NFUS) and the Scottish Landowners' Federation (SLF);
- organisations with land management responsibilities, such as Forest Enterprise (FE), Scottish Executive Rural Affairs Department (SERAD), the Royal Society for the Protection of Birds (RSPB), Scottish Wildlife Trust (SWT), National Trust for Scotland (NTS), and the Woodland Trust (WdT);
- and those with a remit for providing advice on nature conservation, such as the Scottish Agricultural College (SAC) and the Farming and Wildlife Advisory Groups (FWAG).

The Region attracts naturalists from all over Britain, and their continued help will be also needed to ensure adequate field survey in the foreseeable future.

2 Sources of Information

The information used in the compilation of this Plan has come from Butterfly Conservation's Glasgow Branch, Local Record Centres, the *Scottish Diurnal Lepidoptera Project* (SDLP)¹, a recent review of the occurrence of UK Biodiversity Action Plan (BAP) invertebrates in Scotland (Sivell & Phillips, 1999), a review of land cover change (Mackey, E.C. *et al.*, 1999), and also from UK-wide recording schemes. Reference has also been fully made to the Action Plans published for priority species as part of the UK BAP (Department of Environment, Transport and the Regions - DETR, 1995, 1999a & 1999b) and those prepared by Butterfly Conservation as part of its *Action for Butterflies* project from 1995-2000 (see Appendix VI).

For butterflies, *The Atlas of Butterflies in Britain and Ireland* (Heath, Pollard, and Thomas 1984) has been used as a baseline against which trends have been examined. 'Recent' data are based on the latest provisional maps from the '*Butterflies for the New Millennium*' project, organised by Butterfly Conservation and the Centre for Ecology and Hydrology (CEH, formerly the Institute of Terrestrial Ecology, ITE), which comprise records for the period 1995-99 (Fox and Asher, 2000).

For information on ITE's Butterfly Monitoring Scheme (BMS), reference has been made to the annual BMS reports, and an update on both the BMS and independently-monitored transects in Scotland 1999 (Greatorex-Davies, pers. comm.).

For moths, the position is currently less satisfactory. Almost all species treated in this Plan have had records submitted to the UK Scarce Moth Network co-ordinated by Butterfly Conservation and supported by the JNCC. The data are not yet available in published form. The distribution data (Section 5) has therefore been drawn largely from the interim maps (Waring, 1992), but for key species this has been updated with reference to the species action plans compiled by the government (DETR, 1995, 1999a & 1999b).

Historically, moths are divided into "macro-moths" (large moths), or "micro-moths" (small moths). Although the status of the "micro-moths" in Scotland has been summarised by Bland and Young (1996), our current knowledge on ecology, distribution, threats and habitat management is generally poor (see Section 3.3).

¹ The SDLP was a two year ITE-led, SNH-funded project (Pearce *et al.*, 1999), which collated distribution data for 15 scarce species of butterflies and day-flying moths, and established baselines for monitoring their populations and habitats at selected sites.

3 Assigning Regional Priorities

3.1 Butterflies

Regional priorities are determined using criteria proposed in Butterfly Conservation's Guidelines for producing Regional Action Plans (Bourn et al., 1996). These criteria are used to amend the UK rating given in the UK BAP (Kinnear, P., 2000; Appendix I).

The criteria are; *rarity*, *rate of decline*, and *proportion of the UK resource held within the Region*, and are used to assign species to **High**, **Medium** or **Low** categories. Low priority species have not been included in this Plan. (For a full discussion on how regional priorities were derived, see Appendix IV).

UK BAP Rating

Four species recorded in the Region are termed “UK Priority Species”:

Chequered Skipper	<i>Carterocephalus palaemon</i>
Marsh Fritillary	<i>Euphydryas aurinia</i>
Northern Brown Argus	<i>Aricia artaxerxes</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>

These species are assigned to the **High Priority** category in the Plan.

A further four “UK Species of Conservation Concern” have been recorded:

Large Heath	<i>Coenonympha tullia</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Small Blue	<i>Cupido minimus</i>
Small Pearl-bordered Fritillary	<i>Boloria selene</i>

These species are *initially* assigned to the **Medium Priority** category in the Plan.

Note: The Small Blue has not been reliably recorded in the Region since around 1980, and may be extinct.

Regional Priority

A species qualifies for a higher regional priority than its UK rating if it fulfils one or more of the following criteria:

Rate of Decline

Species which have declined by >32% over 25 years in the number of 10 km squares occupied in the Region.

The following species have had their rating enhanced due to their recent rate of decline:

Dingy Skipper	<i>Erynnis tages</i>
Grayling	<i>Hipparchia semele</i>

Rarity

Species which occur in less than 0.6% of tetrads (a tetrad is a 2 x 2 km square) in the Region, or less than 30 colonies.

The following species have had their rating enhanced due to their rarity:

Dingy Skipper	<i>Erynnis tages</i>
Small Blue	<i>Cupido minimus</i>

Proportion of the UK Resource

Species for which the Region holds 20% or more of the total UK population.

The following species have had their rating enhanced due to the proportion of the UK resource within the Region:

Scotch Argus	<i>Erebia aethiops</i>
Mountain Ringlet	<i>Erebia ephron</i>
Large Heath	<i>Coenonympha tullia</i>

Summary

Thus the following species have had their priority rating enhanced for South West Region:

Species	UK Rating	Regional Rating
Dingy Skipper	Low	High
Large Heath	Medium	High
Mountain Ringlet	Medium	High
Small Blue	Medium	High
Grayling	Low	Medium
Scotch Argus	Low	Medium

Under-recorded Species

Several species qualified on apparent rate of decline, but there is a consensus among recorders that these apparent declines are probably due more to under-recording than due to habitat loss. However, efforts should be made to improve the recording of these species, so that any real changes in distribution become clearer. These species are:

Green Hairstreak	<i>Callophrys rubi</i>
Purple Hairstreak	<i>Neozephyrus (= Quercusia) quercus</i>
Dark Green Fritillary	<i>Argynnis aglaja</i>
Speckled Wood	<i>Pararge aegeria</i>
Wall Brown	<i>Lasiommata megera</i>

Species at the edge of their range

Some species are rare in the Region, but this is because they are at the edge of their UK range here, and are much more common south of the Border. From a UK perspective these species do not need resources directed to them. These species are:

Large Skipper

Ochlodes venata

Holly Blue

Celastrina argiolus

Comma

Polygonia c-album

(Occasional records are received for the Holly Blue, but it is probably not be resident. It is common in south Cumbria, and there are small colonies in the Carlisle area).

A full list of the butterflies recorded in the Region is given in Appendix V. A full list of the butterflies recorded in the Region (by local authority area) can be found in Sivell and Phillips (1999).

3.2 Key Butterflies for South West Scotland

The table below shows high and medium priority butterflies in the Region. Note that these ratings are for guidance, and may change in the light of further recording.

High Priority		Justification
Chequered Skipper	<i>Carterocephalus palaemon</i>	UK Priority Species
Dingy Skipper	<i>Erynnis tages</i>	Rapid recent decline Rare
Large Heath	<i>Coenonympha tullia</i>	UK Species of Conservation Concern Large proportion of UK population
Marsh Fritillary	<i>Euphydryas aurinia</i>	UK Priority Species
Mountain Ringlet	<i>Erebia epiphron</i>	UK Species of Conservation Concern Large proportion of UK population
Northern Brown Argus	<i>Aricia artaxerxes</i>	UK Priority Species
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>	UK Priority Species
Small Blue	<i>Cupido minimus</i>	UK Species of Conservation Concern Rare (possibly extinct)
Medium Priority		
Grayling	<i>Hipparchia semele</i>	Rapid recent decline
Scotch Argus	<i>Erebia aethiops</i>	Large proportion of UK population
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	UK Species of Conservation Concern

3.3 Moths

The determination of regional priorities for moths has drawn on the following sources of information:

- UK BAP (DETR, 1995, 1999a & 1999b);
- British Red Data Book for Insects (Shirt, 1987); and
- Bland and Young (1996).

The Red Data Book used the following categories based primarily on rarity, i.e. RDB1 (Endangered), RDB2 (Vulnerable) and RDB3 (Rare). Most of the RDB-category moths in Scotland are on the UK BAP lists.

The paper by Bland and Young assessed moths in terms of rarity, threat, and knowledge of their ecology, and includes a number of species of “micro-moth” in the high threat categories. However, in general, little is known of their biology or habitat requirements of micro-moths, and in some cases their distribution is very poorly known. The prime actions for these species, which often require specialist identification, is further survey and research work, and protection of sites where rare species are known to occur. Thus for now we have omitted micro-moths from the priority lists (see Appendix III).

Ideally, regional priorities would be determined using the criteria in the Regional Action Plan guidelines, as has been done for the butterflies, but the data are generally not good enough to examine regional rates of decline, rarity or proportion of the UK resource. We would hope that the list and priorities could be revised in the light of additional recording over the next few years.

3.4 Key Moths of South West Scotland

The list below shows the regional ratings given to moths in the Region. Note that these ratings are for guidance, and may change in the light of further recording.

High Priority		Justification
Argent and Sable	<i>Rheumaptera hastata nigrescens</i>	UK Priority Species
Barred Tooth-stripe	<i>Trichopteryx polycommata</i>	UK Priority Species
Cousin German	<i>Paradiarsia sobrina</i>	UK Priority Species
Lunar Yellow Underwing	<i>Noctua orbona</i>	UK Priority Species
Narrow-bordered Bee Hawk	<i>Hemaris tityus</i>	UK Priority Species
Northern Dart	<i>Xestia alpicola alpina</i>	UK Priority Species
Slender Scotch Burnet	<i>Zygaena loti scotica</i>	UK Priority Species
Square-spotted Clay	<i>Xestia rhomboidea</i>	UK Priority Species
Sword Grass	<i>Xylena exsoleta</i>	UK Priority Species
Medium Priority		
Belted Beauty	<i>Lycia zonaria</i>	UK Species of Conservation Concern
Broad-bordered White Underwing	<i>Anarta melanopa</i>	UK Species of Conservation Concern
Broom Tip	<i>Chesias rufata</i>	UK Species of Conservation Concern
Forester	<i>Adscita statures</i>	UK Species of Conservation Concern
Grey	<i>Hadena caesia mananii</i>	UK Species of Conservation Concern
Grey Scalloped Bar	<i>Dyscia fagaria</i>	UK Species of Conservation Concern
Northern Arches	<i>Apamea zeta assimilis</i>	UK Species of Conservation Concern
Rannoch Brindled Beauty	<i>Lycia lapponaria</i>	Rare (RDB3)
Slender-striped Rufous	<i>Coenocalpe lapidata</i>	UK Species of Conservation Concern
Transparent Burnet	<i>Zygaena purpuralis</i>	Known to be declining
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	UK Species of Conservation Concern

N.B. The critically endangered New Forest Burnet (*Zygaena viciae*) occurs in western Scotland, but has a separate action plan and thus it is not considered further here.

4 Species Accounts: Butterflies

4.1 Rationale

The species accounts are presented as follows:

Ecology

Brief information is provided on ecology, behaviour and habitat requirements. More detail will be found in the Action Plans published by DETR (also available on the Joint Nature Conservation Committee - JNCC - web site at <http://www.jncc.gov.uk/ukbg>), and by Butterfly Conservation (Appendix VI). Plant names are given according to Stace (1997).

Status

Whether listed in the UK BAP or Red Data Book, and any legal protection.

Distribution

Distribution is summarised under three sub-regions:

North: Argyll, Bute and Arran.

Central: Stirling, West Dunbartonshire, East Dunbartonshire, Inverclyde, Renfrewshire, East Renfrewshire, City of Glasgow, North Lanarkshire, North Ayrshire (excluding Arran), East Ayrshire, South Lanarkshire and South Ayrshire.

South: Dumfries and Galloway.

Threats

These include current and potential threats to colonies. Note that, in addition to those threats given, neglect or abandonment can be just as damaging as unsuitable management.

Site Safeguard & Management

Reserves or other areas where species have been are targeted for appropriate management. This section is likely to be deficient as the knowledge on what is being done for various species is currently fragmented, something we are hoping to rectify.

Advisory

Any ongoing species-specific advisory work or recent literature on local distribution, habitat management etc. Advisory work broadens out to policy work on issues such as agri-environment and forestry, and is primarily undertaken by Butterfly Conservation staff.

Research & Survey

Any recent research or survey work.

Monitoring

Any known current monitoring of colonies or habitat.

Action

Butterfly Conservation's targets

We have tried to define targets that are ambitious but realistic in view of the increasing amount of resources we hope will be available for biodiversity work.

A key action is often to identify “core” colonies, i.e. large colonies that may support a number of surrounding smaller colonies, and are thus crucial for the long-term persistence of a species in an area.

Potential Partners

We have attempted to identify appropriate organisations who may be able to assist us with certain actions. We do however recognise that most organisations have limited resources, and will not necessarily be able to commit themselves to many of these. We also recognise that landowners and managers are essential partners to almost all that we want to achieve. That an organisation is not listed may be an oversight, and the list of partners suggested is not meant to be exclusive. Some agencies felt only able to commit themselves to actions identified in the UK plans at this stage.

Local Volunteers

In almost all cases, there will be a crucial role for local volunteers, whether affiliated to Butterfly Conservation or to other groups, or acting as individuals, or working through their Local Biodiversity Action Plans.

4.2 High Priority Species

Chequered Skipper (*Carterocephalus palaemon*)

Ecology

Primarily a species of woodland edge or open woodlands which are usually subject to light grazing. The adults nectar in drier areas on bugle (*Ajuga reptans*) and bluebell (*Hyacinthoides non-scripta*), whilst the larvae require wetter areas supporting their food plant, purple moor-grass (*Molinia caerulea*). For detailed information on ecology and management, see Ravenscroft & Warren (1996a).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1995). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

The first Scottish records were from near Fort William (Mackworth-Praed, 1942), and it was subsequently found in West Inverness-shire as far south as Loch Etive (Collier 1986). Surveys were carried out for SWT in the 1970's (Moffat, 1975; Houston, 1976), and for SNH in 1993 (Ravenscroft, 1994). The Chequered Skipper has been recorded from some 50 sites in Scotland, mostly in the Highland region. These cover 30 10 km squares, although it thought that its continued survival may depend on just 10-12 core colonies. The butterfly became extinct in England in around 1975.

North Recorded in three 10 km squares near Loch Creran and Loch Etive, north Argyll, which contain 13 current and former sites.

*Central
& South* Never recorded.

Threats

Under-grazing or removal of grazing, allowing the scrubbing over of open woodland sites.
Over-grazing.
Lack of woodland management, leading to loss of open glades and rides.

Site Safeguard & Management

Positive management of forestry plantations and powerline wayleaves is required to maintain several colonies. The Chequered Skipper occurs on Glasdrum National Nature Reserve (NNR).

Advisory

Butterfly Conservation has compiled a list of owners of all sites and there is on-going consultation with the Forestry Commission (FC) and SNH. A booklet with detailed information on ecology and management has been produced by Butterfly Conservation (Ravenscroft, 1996a), with funding from SNH and Scottish Hydro.

Research & Survey

Butterfly Conservation has produced a comprehensive site inventory, identifying ten core areas, only one of which occurs in this Region. Detailed surveys have been carried out in recent years (Ravenscroft 1994, 1995, 1996b). Core sites were re-surveyed in 1999 by SNH.

Monitoring

Formerly monitored at Glasdrum NNR, this species is no longer monitored in the Region.

Action	BC's Targets	Potential Partners
Protect core sites from damage or inappropriate management	2001	SNH, FC, LA, SERAD, owners
Ensure land management advisers have adequate guidance	2001	FC, SNH
Provide owners of all core sites with management guidelines	2001	SAC, SNH, SWT
Survey all historical, extant and potential sites	2005	LBAP, SNH
Re-establish monitoring at Glasdrum NNR	2001	LBAP, SNH

Dingy Skipper (*Erynnis tages*)

Ecology

A species of lightly-grazed, usually moderately base-rich and well-drained grasslands, often occurring in small, discrete colonies, where the larval food plant is common bird's-foot-trefoil (*Lotus corniculatus*). It is also sometimes found on damper grasslands, where the food plant is greater bird's-foot-trefoil (*L. uliginosus*). For detailed information on ecology and management, see Bourn, *et al.* (2000).

Status

Not listed in the UK BAP.

Distribution

There has been an apparent decline in the Region, and, while this may be due primarily to under-recording, it has declined by more than 40% overall within the UK (Fox & Asher, 2000). Its status at former sites needs urgent investigation to ascertain if the losses are real.

North Not recorded.

Central Apparently recorded from Glasgow and Hamilton in the 19th century, but now confined to coastal sites between Ayr and Loch Ryan. Despite intensive surveys, only two sites have been confirmed in since 1995.

South Currently recorded at around six coastal and four inland sites.

Threats

Cessation of grazing and scrub encroachment, or over-grazing.
Afforestation. Loss of habitat through development.

Site Safeguard & Management

Warm, sheltered sites with some bare ground for basking seems to be a prerequisite on the drier sites. Maintenance of semi-natural or unimproved grassland where its food plants can flourish.

Research & Survey

There has been some targeted survey by the Branch during recent years.

Monitoring

The Dingy Skipper is present at Mabie Forest, but the colony is not on the transect.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2002	LBAPs, owners
Provide guidance to land management advisers	2002	LBAPs
Provide owners of all core sites with management guidelines	2002	FWAG, SWT
Survey all known and potential sites	2002	LBAPs
Establish monitoring on at least one core site	2002	FE, LBAPs

Large Heath (*Coenonympha tullia*)

Ecology

A species of lowland raised bog, damp acidic moorland and upland blanket bog where the larval foodplant, hare's-tail cottongrass (*Eriophorum vaginatum*) occurs in tussocks. It has declined at the southern and eastern edges of its range in the UK through the loss of lowland peat bogs. For detailed information on ecology and management see Bourn & Warren (1997).

Status

A UK Species of Conservation Concern. Listed in the Bern Convention as a European species under threat, and listed as threatened in Europe in the new European Red Data Book (Swaay & Warren, 1999). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

Widely distributed throughout the Region, its current status is difficult to assess due to under-recording.

<i>North</i>	Currently reported from Coll, Mull, Islay, Jura, and a few sites in North Kintyre, North Argyll, and Arran.
<i>Central</i>	There are fewer records for the Dunbartonshire and Loch Lomond/Trossachs areas than in the earlier recording period. Intensive coverage of Ayrshire has yielded many new sites which would not be expected if this species was in serious decline in the Region.
<i>South</i>	Currently maintaining its stronghold around Dumfries and sites to the east. There are few reports available from much of Galloway where it was formerly widespread. Further survey is urgently needed in this area.

Threats

Habitat loss through peat extraction. Drainage, for either agricultural improvement or forestry. Over-grazing.

Site Safeguard & Management

No examples of management specifically for this species are known in the Region, although measures to conserve lowland mosses e.g. Flanders Moss, should secure colonies of the Large Heath. Eales (1999) and Eales and Dennis (1998) provide detailed information on habitat requirements.

Research & Survey

No systematic survey has been attempted.

Monitoring

It has occurred on ITE's Butterfly Monitoring Scheme transects at Taynish but there is insufficient data available to detect trends. A transect was undertaken at Dalmellington Moss (SWT) in 1992 and 1993.

Action

Note that in general, action to conserve lowland raised and blanket mires will help to conserve the Large Heath. However, restoration of some lowland mires has caused problems when water levels have been raised too high (Joy & Pullin, 1997).

Action	BC's Targets	Potential Partners
Identify and protect core sites on lowland mosses	2002	FC, FE, LA, owners, SWT
Provide guidance to land management advisers	2002	SNH, FC
Provide owners of all core lowland moss sites with management guidelines	2002	FC, FWAG, SAC, SNH, SWT
Survey all lowland moss sites with no post- 1995 records, and potential sites	2002	LBAP, SWT
Establish monitoring on at least two core lowland moss sites	2002	LBAP, SWT

Marsh Fritillary (*Euphydryas [=Eurodryas] aurinia*)

Ecology

This is a species of unimproved, lightly-grazed, species-rich acid grassland, with abundant devil's-bit scabious (*Succisa pratensis*), the larval foodplant. For detailed information on ecology and management see Barnett & Warren (1995a).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1995). Fully protected under Schedule 5 of the Wildlife and Countryside Act. Listed on Annex II of the EC Habitats Directive, and Appendix II of the Bern Convention, and threatened in Europe (Swaay & Warren, 1999).

Distribution

Apart from a few colonies in Lochaber (Highland Region), the Scottish populations of this species are now confined to the north sub-region of this Region, currently reported from about 40 10 km squares. A review of historical data up to 1994 (Pearce *et al.*, 1996), identified 70 colonies in 44 10 km squares. Nature reserves with the Marsh Fritillary include Taynish and Glasdrum NNRs and Shian Wood (SWT).

- North* Occurs on the mainland between Glen Creran in the north and West Loch Tarbert on the Kintyre peninsula in the south, and on the islands of Mull, Colonsay, Islay and Jura.
- Central* In the past, recorded at about half a dozen locations from near Kilwinning, around Loch Lomond and Loch Ard, but no recent records.
- South* Formerly recorded in the Dumfries area. No recent confirmation of an isolated colony near Caulkerbush on the Solway coast, recorded in the period 1970-82. This may have been a temporary colony established by strays from colonies (now extinct) near the Solway coast in Cumbria.

Threats

agricultural improvement and drainage
over-grazing
cessation of grazing, and resultant loss of foodplant
afforestation

Site Safeguard & Management

Sites require grazing at low stocking rates, preferably by cattle rather than sheep. Open sunny sites are required for larval development.

Advisory

SNH has produced an advice note. Management for this species is also likely to benefit the Narrow Bordered Bee Hawk-moth (see below).

Research & Survey

This species has been the subject of intensive surveys by SNH and Butterfly Conservation from 1996 onwards, especially on Islay (Ravenscroft & Gaywood 1996; Ravenscroft 1996c, 1997b; Stuart *et al.*, 1998).

Monitoring

Represented on the BMS currently only at Taynish NNR, Argyll. Also monitored by RSPB at Loch Gruinart, Islay.

Action	BC's Targets	Potential Partners
Identify core sites	2001	SNH
Protect core sites from damage or inappropriate management	2001	SNH, FC, SERAD, owners
Provide guidance to land management advisers	2001	SNH
Provide owners of all core sites with management guidelines	2001	SAC, SNH, SWT
Survey all sites with no post-1995 records	2001	LBAP, SNH
Re-survey all core sites	2005	SNH
Encourage research on habitat management	2001	RSPB, SAC, SNH
Establish monitoring on at least three core sites	2001	RSPB, SNH, SWT

Mountain Ringlet (*Erebia epiphron*)

Ecology

This is a montane or sub-montane species which favours slightly base-rich grassland habitats at 350-800m altitude (McGowan, 1997). The larvae feed on the mat-grass (*Nardus stricta*), and possibly other species. Little is known about its habitat requirements, but it seems to be associated with herb-rich grassland. For information on ecology and management see Ravenscroft & Warren (1996b), although a great deal remains to be discovered.

Status

A UK Species of Conservation Concern. It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

This species has a west/central distribution in the Scottish Highlands, and occupies the mountainous area where the three Butterfly Conservation Regions meet.

It has been recorded from about 50 10 km squares in Scotland (Pearce *et al.* 1996) and is currently known from 11 10 km squares in the Region, but has previously been recorded from a further seven. The proportion of the whole UK distribution falling into the Region is probably over 20%.

Numbers fluctuate widely from year to year and may be undetectable in low years. This, coupled with its montane habitat, and its penchant for only flying in numbers in full sunshine, mean it is certainly under-recorded.

<i>North</i>	Occurs from Benderloch area in the west across Glen Orchy and south to the mountains around Loch Awe.
<i>Central</i>	Centred on the Breadalbane Hills. There is an apparently isolated population around Ben Lomond. However Pearce <i>et al.</i> (1999) give records indicating populations between these two areas.
<i>South</i>	Not recorded.

Threats

Over-grazing, and perhaps, under-grazing.
Climate change
Afforestation

Site Safeguard & Management

The precise habitat requirements are as yet little known, but most sites tend to be south-facing, contain species-rich flushes, and are lightly sheep-grazed.

Research & Survey

McGowan (1997) has reported the results of a three-year study by the CEH into habitat preferences. Butterfly Conservation encouraged recording in 1999, using returnable postcards.

Monitoring

Not monitored on any site in the Region, and currently only two sites in Britain are monitored for this species. Adverse weather during the flight season and the remoteness of most sites means that monitoring of adults is particularly difficult.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2004	LBAP, owners
Provide guidance to land management advisers	2004	CEH, NTS
Provide owners of all core sites with management guidelines	2004	FWAG, SAC, SWT
Survey all sites with 20 th C. records	2004	CEH, LBAPs
Encourage research on habitat requirements	2004	CEH
Establish monitoring on at least one core site	2004	LBAPs

Northern Brown Argus (*Aricia artaxerxes*)

Ecology

This species, which has its stronghold in eastern Scotland, is largely coastal in the South West. It requires sunny south-facing, lightly-grazed or ungrazed slopes where the foodplant common rock-rose (*Helianthemum nummularium*) is present. Many sites are small, less than one hectare in extent. For detailed information on ecology and management see Ravenscroft & Warren (1996b) and Norman, P.(1999).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

The Northern Brown Argus is for the most part localised in small discrete colonies, due primarily to the distribution of its foodplant. It has been subject to intensive recent survey which has increased the number of known sites, and it is currently recorded from over 20 10 km squares in the Region. Many populations appear to be probably stable, although it is now almost entirely absent from agricultural land.

<i>North</i>	Not recorded.
<i>Central</i>	Largely confined to a few coastal sites south of Ayr.
<i>South</i>	Present on the western Galloway coast around Portpatrick, and on the Solway coast between Burrow Head and Dumfries. Recorded from three inland 10 km squares near New Galloway, and from a single site in South Lanarkshire.

Threats

Over-grazing, and more rarely under-grazing
Habitat loss. Afforestation.

Site Safeguard & Management

Management prescriptions are outlined by Ellis (1998) who studied six sites in Scotland. At most sites appropriate management is likely to depend on maintaining low intensity grazing levels, although this species also occurs on a number of thin-soiled sites which are not grazed. Attempts to restore grassland with common rock-rose are underway at Mabie Forest, in order to encourage re-colonisation by the butterfly.

Advisory

The species' requirements should be built into prescriptions for grassland supporting common rock-rose.

Research & Survey

The SDLP (Pearce *et al.* 1999) searched many sites with common rock-rose without records of the Northern Brown Argus, looking for adults and eggs. A high proportion of these searches were successful.

Monitoring

Not represented on any BMS transects in the Region. Monitoring has been carried out in the past by the National Trust for Scotland at Rockcliffe. Monitoring by egg-counts is practical for this species.

Action	BC's Targets	Potential Partners
Identify core sites	2002	LBAP, SNH
Protect core sites from damage or inappropriate management	2002	SNH, FC, LA, owners
Provide guidance to land management advisers	2002	LBAPs, SNH
Provide owners of all core sites with management guidelines	2002	FWAG, SNH, SWT
Survey all sites with no post-1995 records	2002	LBAPs, SNH
Establish monitoring on at least two core sites	2002	LBAP, NTS, SNH

Pearl-bordered Fritillary (*Boloria euphrosyne*)

Ecology

This species occurs in bracken (*Pteridium aquilinum*) and scrub mosaics, woodland edge and open woodland. Coppice woodland and young conifer plantations can also support colonies, and electricity powerline wayleaves can also be a valuable habitat in closed canopy woodland.

The main larval foodplant is common dog-violet (*Viola riviniana*), but almost all sites are sunny, south-facing, and have a bracken component. For detailed information on ecology and management see Brereton *et al.* (1999) and Barnett & Warren (1995b).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1995). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

Intensive surveys by Butterfly Conservation (Brereton *et al.*, 1999) have confirmed the presence of the Pearl-bordered Fritillary in over 20 10 km squares within the Region, largely in the north. It appears to be absent from most of the central and southern areas except for a few colonies to the west of Dumfries, but more survey work is required. Many colonies are small, and it is likely that some colonies may be overlooked. Nature reserves with Pearl-bordered Fritillary include Glasdrum NNR and Mabie Forest.

<i>North</i>	Stronghold in north Argyll, with around 75% of the current Regional records. Its status on Mull, where it was formerly reported, is unclear.
<i>Central</i>	Currently known from only one 10 km square in the Trossachs/Loch Lomond area, where formerly more widespread. No current records from either the coast or inland sites in Ayrshire.
<i>South</i>	Reported from five 10 km squares in the Dumfries area, but no recent reports from eight other 10 km squares where it was previously recorded.

Threats

Scrubbing over of woodland glades e.g. in woodland regeneration programmes where grazers are excluded.

Afforestation of grassland/bracken habitats.

Over-grazing in open woodland, or woodland edge habitats.

Bracken eradication in some areas, in others, a lack of bracken management.

Site Safeguard & Management

This species requires short sparse vegetation in sheltered sunny sites with an abundance of violets. Management requires spatial and temporal continuity of clearings in woodland, maintenance of light to moderate bracken cover (Brereton & Warren 1998). Plantation management should ensure the removal of brash following felling operations from south-facing sites to encourage violets (MacKay, 1999a).

Prescriptions with special reference to the west Highlands were researched in 1997-98 (Ravenscroft 1997a, Brereton & Warren 1998). The main recommendations are:

1. Wayleave management should be undertaken, cutting on a 5-15 year rotation
2. Maintain extensive light grazing to prevent over-dominance by bracken
3. Careful planning and control is needed of bracken-spraying, where this is used

Advisory

Ongoing work with FC, especially with respect to woodland grant schemes. An advice note has been prepared for SNH on distribution, ecology and conservation by Butterfly Conservation.

Research & Survey

Butterfly Conservation organised a major project through 1997-8, carrying out surveys and researching habitats at Glasdrum NNR and Loch Awe (Brereton *et al.*, 1999). More information is required on how to maintain suitable open habitat within both semi-natural broadleaved woodland, and conifer plantations.

Monitoring

Currently represented on the BMS by only one transect, at Mabie Forest, Dumfries. Formerly monitored at Glasdrum NNR.

Action	BC's Targets	Potential Partners
Identify core sites	2001	LBAPs
Protect core sites from damage or inappropriate management	2001	SNH, FC, LA, SERAD, owners
Provide guidance to land management advisers	2001	SNH
Provide owners of all core sites with management guidelines	2001	FC, FWAG, SAC, SNH, SWT
Survey all sites, including those with no post-1995 records, and potential sites	2004	LBAP, SNH
Encourage research on management methods within woodland	2001	FC, FE, SNH
Establish monitoring on at least two core sites	2001	FE, SNH, WdT

Small Blue (*Cupido minimus*)

Ecology

The UK's smallest butterfly, it is a species of sheltered, lightly-grazed or ungrazed base-rich grasslands, disused railway cuttings and coastal dunes, where its larval foodplant, kidney vetch (*Anthyllis vulneraria*), is abundant. For detailed information on ecology and management, see Bourn & Warren (2000).

Status

A UK Species of Conservation Concern. It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

Formerly distributed on widely-scattered coastal sites from North Argyll to the Solway. Although it disappeared from many locations by the beginning of this century, its decline from the Solway coast has been protracted. The last confirmed record was in 1980 at Rockcliffe, and it may now be extinct. It has occasionally been confused with the common day-flying moth, the Chimney Sweeper (*Odezia atrata*).

North Formerly recorded on the Argyll coast near Oban, and on the south side of Arran.

Central Formerly reported from Dumbarton, Govan, the coast between Ardrossan and Monkton, and around Stirling. There have been unconfirmed reports since 1980 from sites at Hunterston, Prestwick, Irvine and near Girvan.

South Persisted at Portpatrick, Corsemaizie and Port William area until 1939. There are three reports from sites near Rockcliffe between 1960 and 1980. Doubts have been expressed by local observers on the validity of some of these records (e.g. Rankin, 1997).

Threats

Habitat loss through development.

Succession leading to the scrubbing over of sites, or over-grazing

Site Safeguard & Management

The Small Blue requires a sward of varied height, to provide perching and roosting sites, as well as open, sunny but sheltered areas for basking. Some bare ground is probably needed to allow the germination of kidney vetch seedlings. On some sites grazing by rabbits is sufficient to maintain a suitable sward, however high rabbit numbers can decimate colonies by feeding on the flowers of kidney vetch in which the eggs are laid, and the larvae develop.

Survey

There have been numerous attempts locally, especially in Dumfries & Galloway to relocate this species (Rankin 1997, R. Mearns pers.com.).

Action	BC's Targets	Potential Partners
Survey sites with credible 20 th C. records, and any potential sites	2002	LBAP
Publicise the loss of the species, if confirmed	2002	LBAP

4.3 Medium Priority Species

Grayling (*Hipparchia semele*)

Ecology

A butterfly of habitats with sparse vegetation and bare ground, on sites which are sunny and well-drained, such as dry heath, cliffs, dunes, and also “post-industrial” sites. The larvae feed on fine-leaved grasses e.g. sheep’s and red fescues (*Festuca ovina* and *rubra*).

Status

Not listed in the UK BAP. Appears to be declining.

Distribution

There has been an apparent decline, and while this may be due to under-recording, significant declines have been recorded in other parts of the UK, particularly on inland sites. Its status at inland sites needs urgent investigation to ascertain if the apparent losses are real.

North Recorded from Mull, Islay, Jura, Arran, Bute and north Argyll. Formerly recorded from Coll and Tiree.

Central Almost continuous coastal distribution from Cumbrae to Loch Ryan. A few small inland colonies in Ayrshire and along the River Clyde, and a large colony on the site of the former steelworks at Ravenscraig near Motherwell.

South Scattered distribution from the Rhinns of Galloway along the coast to Dumfries, but sites previously further east and inland currently unreported.

Threats

Recreational pressures in some sand-dune habitats. Reduction in grazing pressure and/or succession leading to scrub development. Over-grazing. Development such as housing.

Site Safeguard & Management

The requirement for sparse vegetation with areas of bare ground may be provided by grazing, but at some sites trampling (e.g. along paths) may suffice.

Research & Survey

No systematic survey has been made, although some detailed survey work at the Ravenscraig site was undertaken in 1998/99.

Monitoring

Occasionally recorded on the Tainish BMS transect.

Action	BC's Targets	Potential Partners
Provide guidance to land management advisers	2003	LBAPs
Survey all inland sites with no post-1995 records	2003	LBAPs
Establish monitoring on at least two inland sites	2003	LBAPs

Scotch Argus (*Erebia aethiops*)

Ecology

A species of sheltered, lightly-grazed damp grasslands, woodland edges and plantations. Within moorland it tends to be confined to sheltered marshy areas or burn sides. Purple moor-grass (*Molinia caerulea*) has been assumed to be the predominant larval foodplant in Scotland, but it does use other species elsewhere (Kirkland, 1995).

Status

Not listed in the UK BAP.

Distribution

There are two centres of population in the Region, one covering much of northern sub-region, and the other, the southern uplands, where it is widespread and common, but with a large gap in distribution over much of the central sub-region. Although it occurs in open habitats, it is at its highest density in open, sunny woodland, and along woodland edges. The Region probably holds more than 30% of the 10 km squares of the British population.

North Common and widespread throughout Argyll, Mull and Arran, but not recorded on Islay, Coll, Tiree, or, surprisingly, on Jura. Possibly also absent from southern Kintyre.

Central Occurs at few sites to the north of Loch Lomond, and elsewhere in Dunbartonshire, but found in almost every 10 km square in southern Ayrshire.

South Found in contiguous distribution in the central area of Galloway and Dumfriesshire, but curiously absent from the coast (although there are historical coastal records). Also occurs to the north-east of Dumfries around Eskdalemuir.

Threats

Drainage and “reclamation” of moorland

Over-grazing.

Loss of open areas within woodland.

Site Safeguard & Management

Most sites are ungrazed or only very lightly-grazed.

Monitoring

Recorded on BMS transects at Taynish NNR and occasionally at Brodick Country Park.

Action	BC's Targets	Potential Partners
Provide guidance to land management advisers	2005	LBAPs
Continue monitoring on at least two sites	annually	NTS, SNH

Small Pearl-bordered Fritillary (*Boloria selene*)

Ecology

This is a species of damp, lightly-grazed or ungrazed semi-natural grassland, open deciduous woodland, marsh and moorland habitats. Marsh violet (*Viola palustris*) is the larval foodplant on wetter sites, while on dry sites, common dog-violet (*V. riviniana*) is used. For detailed information on ecology and management see Barnett & Warren (1995b).

Status

A UK Species of Conservation Concern, due to large-scale, recent and rapid declines in lowland England.

Distribution

Widespread and locally common, though absent from large parts of the central sub-region. Reported from nearly 150 10 km squares during the current survey, and it is almost certainly under-recorded from the north sub-region.

<i>North</i>	On Mull, Jura and Arran, but apparently absent from Islay, Coll and Tiree.
<i>Central</i>	Still widely distributed including sites within the City of Glasgow. Many new sites recently reported for Ayrshire.
<i>South</i>	Widespread and locally common.

Threats

Agricultural improvement and site drainage. Succession following abandonment of grazing. Housing & industrial development. Afforestation of wetland margins.

Site Safeguard & Management

Maintenance of open rides and clearings within plantations. Maintenance of light cattle grazing in damp grassland, flushes and open moorland sites.

Monitoring

Represented on BMS transects at Mabie Forest and Taynish NNR. This species is targeted by the City of Glasgow's LBAP, and transect monitoring began at Cathkin Braes in 1998, and at Commonhead Moss in 1999.

Action	BC's Targets	Possible Partners
Provide guidance to land management advisers	2005	LBAPs
Continue monitoring established sites	annually	LBAPs

5 Species Accounts: Moths

5.1 Rationale

The format of the accounts broadly follows those for the butterflies (see section 4.1).

The species accounts for the moths are necessarily shorter than those for the butterflies as usually far less is known about ecology, distribution, management requirements and threats. With the exception of the rarer Burnet and Forester moths (*Zygaenidae*), being tackled by the Burnet Study Group (see below), few moth species are currently being targeted for active conservation measures in South West Scotland.

Thus in several cases, the only specific action points that have been suggested are for surveys to clarify distribution, and sometimes to carry out basic research into habitat requirements and larval foodplants. In virtually every species the most urgent need is for more comprehensive information on distribution.

Potential Partners

The **Burnet Study Group** is made up of individuals and organisations involved in the conservation of the rarer Burnet moths in Scotland. Members include SNH, NTS and Butterfly Conservation. The Convenor is Dr Mark Young of Aberdeen University.

5.2 High Priority Species

Argent and Sable (*Rheumaptera hastata*)

Ecology

This moth, which can be seen flying in the daytime over open moorland and bogs, where the larval foodplant is bog-myrtle (*Myrica gale*). It can also occur in woodland where it is thought the larvae feed on birch (*Betula* spp.).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999b).

Distribution

The apparent declines have been predominantly amongst the woodland populations.

<i>North</i>	Found on Mull, Colonsay, Arran and two mainland locations; Knapdale and near the head of Loch Fyne.
<i>Central</i>	Only two recent records: from near Barrhead and Flanders Moss. Formerly recorded from other parts of the Trossachs.
<i>South</i>	A number of old records, and recent records from the Otterpool, Newton Stewart and New Galloway areas.

Threats

Over-grazing, and lack of birch and/or bog-myrtle regeneration.
Drainage and/or afforestation of wetland habitats.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2002	FC, SNH
Provide guidance to land management advisers	2002	SERAD, SNH
Provide owners of all core sites with management guidelines	2002	FWAG, SAC, SNH, SWT
Survey all known and potential sites	2002	SNH
Encourage research on habitat requirements	2002	SNH
Establish monitoring on at least two core sites	2002	LBAP, SNH

Barred Tooth-striped (*Trichopteryx polycommata*)

Ecology

Inhabits open woodland and heathland with shrubs. The larvae feed on ash (*Fraxinus excelsior*) in Scotland, but also on wild privet (*Ligustrum vulgare*) in England and Wales.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999b).

Distribution

Apparently always a local though widespread species within Britain. In Scotland, reported from Ardnamurchan, Inverness-shire, Kirkcudbright, Arran and Canna.

North A single record from north Argyll, and pre-1980 record from Arran.

Central Not recorded.

South A recent record from Thornhill, and old records from Kirkcudbright.

Threats

Not known

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	SNH
Identify and protect core sites	2004	FC, SERAD, SNH
Provide guidance to land management advisers	2004	SERAD, SNH
Provide owners of all core sites with management guidelines	2004	FWAG, SAC, SNH, SWT
Encourage research on habitat, mobility and population structure	2004	FC, SNH
Establish monitoring programme	2004	SNH

Cousin German (*Paradiarsia sobrina*)

Ecology

This moth is associated with birch woodland and old, open Caledonian pine forest. The larvae feed initially on bilberry/blaeberry (*Vaccinium myrtillus*) or heather/ling (*Calluna vulgaris*), but are thought to switch to birch (*Betula* sp.) to complete their development.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

Distribution

Its distribution in the Region needs clarification. One old record from Loch Lomond area.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2004	LBAP, SNH

Lunar Yellow Underwing (*Noctua orbona*)

Ecology

Found on sand dunes, in open woodland on light soils, and moorlands, it has undergone steady decline throughout its range in UK. The larvae feed on grasses including cock's-foot (*Dactylis glomerata*) and common couch (*Elytrigia repens*), and a variety of herbaceous plants, such as buttercups (*Ranunculus* spp).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999b).

Distribution

Distribution requires clarification. No recent records, but several old records from the Oban area, near Loch Lomond, and the Galloway coastline.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2004	LBAP, SNH

Narrow-bordered Bee Hawk-moth (*Hemaris tityus*)

Ecology

This diurnal moth occurs on unimproved wet grasslands, the margins of peatbogs, moorland and occasionally woodland. The larval food plant is devil's-bit scabious (*Succisa pratensis*), and this species does sometimes occur on the same sites as the Marsh Fritillary (see above).

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

Distribution

Formerly widespread in Britain, but has declined in recent years. It is now largely confined to western Britain.

North Recent records from Mull, Lorne, Knapdale, Kintyre and Islay.

Central There are seven pre-1980 10 km square records, but no recent sightings.

& South

Threats

Agricultural improvement/drainage of wet grassland, heathland and bogs. Over-grazing. Afforestation. Cessation of grazing, and subsequent loss of foodplant.

Site Safeguard & Management

Light grazing is assumed to be the preferred management, retaining the foodplant in the sward, but exact requirements are not known.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2001	FC, SERAD, SNH
Provide guidance to land management advisers	2001	SERAD, SNH
Provide owners of all core sites with management guidelines	2001	FWAG, SAC, SERAD, SNH
Survey all known and potential sites	2001	LBAP, SNH
Encourage research on habitat requirements	2001	SNH
Establish monitoring on at least two core sites	2001	LBAP, SNH

Northern Dart (*Xestia alpicola alpina*)

Ecology

Essentially a montane species, occurring in association with the its main larval foodplant, crowberry (*Empetrum nigrum*) at altitudes over 450 metres. Occurs sporadically at light traps at lower altitudes, which may give false impression of its true distribution.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

Distribution

Distribution requires confirmation. A single pre-1980 record from the Southern Uplands.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2004	LBAP

Slender Scotch Burnet (*Zygaena loti scotica*)

Ecology

This diurnal moth is associated with mosaics of grass and heath on south-facing slopes on the coast, where the larval foodplant, common bird's-foot-trefoil (*Lotus corniculatus*) grows. Land slips, erosion or grazing are essential in maintaining a short sward with bare ground.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

Distribution

Currently its entire UK distribution is restricted to the islands of Mull and Ulva. Formerly recorded on the mainland in Morven (Highland Region).

Threats

Under-grazing, leading to spread of bracken and scrub, and on one site, an exotic cotoneaster (*Cotoneaster* sp.).

Isolation of colonies.

Site safeguard and management

Cattle have been re-introduced to the main site recently, which will help maintain the habitat, but little management has taken place on other sites.

Research and Survey

Several research projects have been undertaken in recent years, notably by students of Aberdeen University. Detailed surveys have also been carried out on behalf of the Burnet Study Group (BSG) and funded by SNH.

Monitoring

The target in the DETR plan is for the monitoring of core colonies each year, and although not achieved in 1999, a great deal of data has been collected in recent years.

Action	BC's Targets	Potential Partners
Provide guidance to land management advisers	2001	Burnet Study Group, FC, SERAD
Ensure all colonies receive appropriate management	2001	BSG, FC, SERAD
Re-survey all known sites every three years	2001	BSG
Survey potential sites and sites with no post-1980 records	2001	BSG
Continue monitoring of at least the core sites	Annually	BSG

Square-spotted Clay (*Xestia rhomboidea*)

Ecology

This species occurs in broad-leaved woodland, where the larvae feed on birch (*Betula* spp.), blackcurrant (*Rubus fruticosus*) and other species.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999b).

Distribution

Known from only 15 sites in Scotland, the few recent records are all from this Region. Several need confirmation.

North Recent records from single sites at Knapdale and Loch Creran.

Central A recent record from the Ayrshire coast.

South Recent records from the Gatehouse of Fleet and north of Dumfries.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	LBAP, SNH
Ensure all colonies receive appropriate management	2004	FC, SERAD,SNH
Encourage research on habitat requirements and foodplants	2004	FC, SNH

Sword-grass (*Xylena exsoleta*)

Ecology

This moth is found on moorland and in open woodland, but little is known of its ecology. The larval food plants in the wild are not known, although it may feed on grasses initially, then move on to broad-leaved species. In captivity, larvae will eat on blackthorn (*Prunus spinosa*) and bird cherry (*P. padus*). Local but widespread in Scotland.

Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

Distribution

There are few, but widely-separated records for this Region, implying that this species is much under-recorded. It has been recorded in the lowlands and uplands. The adults apparently come more readily to sugar than light (Mark Young, pers. comm.).

North One recent record from Oban, and an old record from Mull.

Central An old record from the Trossachs.

South A recent record from the Gatehouse of Fleet.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	SNH
Encourage research on habitat and ecology	2004	SNH

5.3 Medium Priority Species

Belted Beauty (*Lycia zonaria atlantica*)

Ecology

This is a machair and dune species, restricted in Scotland to the Inner and Outer Hebrides (albeit in extensive colonies) as far south as Islay (Greatorex-Davies 1980). The larval food plants include common bird's-foot trefoil (*Lotus corniculatus*), yellow flag (*Iris pseudacorus*) creeping willow (*Salix repens*) and burnet rose (*Rosa piminellifolia*).

Status

Although the Belted Beauty appears on the list of UK Priority Species, it has been decided that this only applies to the Welsh populations, termed *Lycia zonaria britannica*. The Scottish populations (deemed to be a separate subspecies, *L. zonaria atlantica*) are regarded as less threatened, and are placed on the list of Species of Conservation Concern. Not all Lepidopterists accept the division into these subspecies.

Distribution

North Recorded from Coll, Tiree, Mull, Colonsay and Islay.

Management

Management plans designed to conserve machair are likely to benefit the Belted Beauty.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Broad-bordered White Underwing (*Anarta melanopa*)

Ecology

A montane species, occurring at over 600 metres often associated with *Rhacomitrium* heath, with its main stronghold is in the Cairngorms. Larvae feed on crowberry (*Empetrum nigrum*) and other members of the heather (*Ericacea*) family.

Status

A UK Species of Conservation Concern.

Distribution

South Reported from two sites in the Kirkcudbright area, current status unclear.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Broom-tip (*Chesias rufata*)

Ecology

This species inhabits moorland, heathland, and coastal areas with established broom (*Cytisus scoparius*) bushes, the larval food plant.

Status

A UK Species of Conservation Concern.

Distribution

Widespread in Scotland, particularly in the east, but apparently in decline.

Central There are old records from Ayrshire, and a recent larval record from the Trossachs.

South Locally common, with regular records during the 1990s.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Forester Moth (*Adscita statures*)

Ecology

Most Scottish sites are coastal grasslands with flushes that typically support sharp-flowered rush (*Juncus acutiflorus*), and have an abundance of the larval foodplants; common sorrel (*Rumex acetosa*) and sheep's sorrel (*R. acetosella*). Related to the burnet moths, the adults are diurnal.

Status

A UK Species of Conservation Concern.

Distribution

Its current distribution in Scotland appears to be restricted to this Region, although there are historical records from the Borders.

- North* Recent records from Mull and adjacent coast of north Argyll. Old records from Seil and Jura.
- South* Prior to 1992, known from single locality near Dumfries, but an additional seven colonies have been located during recent surveys (MacKay, 1999b; pers. comm.).

Threats

Agricultural improvement and drainage
Afforestation

Action	BC's Targets	Potential Partners
Identify and protect core sites	2002	FC, LA, LBAP, SERAD, SNH
Provide guidance to land management advisers	2002	LBAP
Provide owners of all core sites with management guidelines	2002	FWAG, SAC, SWT
Survey all known and potential sites	2002	LBAP, SNH
Establish monitoring on at least one core site	2002	LBAP, SNH

Grey (*Hadena caesia mananii*)

Ecology

This coastal species, whose larvae feed on sea campion (*Silene uniflora* - formerly *S. maritima*), is confined in Scotland to the Inner Hebrides and Ardnamurchan. (It is also found on the Isle of Man and coastal Ireland, although it has a montane distribution in Europe).

Status

A UK Species of Conservation Concern.

Distribution

North Recorded from Islay and Mull.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Grey Scalloped Bar (*Dyscia fagaria*)

Ecology

This is a moorland species feeding on heather/ling (*Calluna vulgaris*), but little is known of its habitat requirements.

Status

A UK Species of Conservation Concern

Distribution

Widely distributed in Scotland, the apparent decline in this species may be due to under-recording.

North There are records from Coll, Mull, Arran and Kintyre, and old records from Islay and Lorne.

Central Recent records from Ayrshire, and old records from the Trossachs and Clyde area.

South Recent records from the Dumfries coast, and older records from sites further west.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Northern Arches (*Apamea zeta assimilis*)

Ecology

A species of upland moorland, where the larval foodplant is thought to be purple moor-grass (*Molinea caerulea*).

Status

A UK Species of Conservation Concern.

Distribution

North Reported from single locations in north Argyll and on Arran.

Central Reported from a single location in the Trossachs.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Rannoch Brindled Beauty (*Lycia lapponaria*)

Ecology

This moth occurs on bogs and moorland, where the larvae feed on various heaths and bog-myrtle (*Myrica gale*), and possibly also sallows (*Salix* spp.).

Status

The species qualifies as RDB3 "Rare", but no declines are apparent. Not listed in the UK BAP.

Distribution

North Recorded from single location in north Argyll.

Central Recorded from single location - Flanders Moss NNR, from where it has been known since 1924 (Young & Knill-Jones, 1987).

South not recorded

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Slender-striped Rufous (*Coenocalpe lapidata*)

Ecology

This species occurs in rough, damp, semi-upland pasture and moorland, often with rushes (*Juncus* spp.). The larval foodplants are uncertain, but may be buttercups (*Ranunculus* spp).

Status

A UK Species of Conservation Concern.

Distribution

Sparsely-distributed in Scotland, most records are from the far north and the central Highlands. One old record for this region, from Mull.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

Transparent Burnet (*Zygaena purpuralis*)

Ecology

The Transparent Burnet is a day-flying moth with almost transparent grey-black wings marked with crimson streaks, and is on the wing between mid June and the end of July. It breeds primarily on coastal, south-facing slopes with short turf and patches of bare ground, which support the larval foodplant, common thyme (*Thymus praecox*).

Status

Known to be declining through survey work in recent years by the Burnet Study Group.

Distribution

In the UK, it occurs in 30-40 colonies from Skye (Talisker Bay) to Dun Ban at the tip of Kintyre.

North Several colonies have been discovered in recent years, due to more thorough survey. A large colony exists on the NTS property at Burg Farm on Mull.

Central & South Not recorded

Threats

Lack of grazing.

Isolation of colonies.

Afforestation.

Research & Survey

The moth was studied at Talisker Bay and other sites by Bourn (1995). Research, survey, management and monitoring is co-ordinated by the Burnet Study Group, whose members include SNH, NTS, Butterfly Conservation and expert entomologists.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2002	BSG, FC, LBAP, SERAD
Provide guidance to land management advisers	2002	BSG
Provide owners of all core sites with management guidelines	2002	BSG
Survey potential sites and known sites	2010	BSG, LBAP
Establish monitoring of at least one core site	2002	BSG, LBAP

Welsh Clearwing (*Synanthedon scoliaeformis*)

Ecology

This species is dependent on native woodland, where silver and hairy birch (*Betula pendula* and *B. pubescens* respectively) historically form a component of the Caledonian Pine Forest. The larvae feed on the inner bark of older birch.

Status

A UK Species of Conservation Concern.

Distribution

In Scotland, the species has been long been recorded in Perthshire and Sutherland, but was recently discovered in East Inverness-shire and the Trossachs, (Barbour & Bland 1996). Under-recorded but probably scarce.

Threats

Woodland management that leads to the loss of old, “over-mature” birch.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2003	LBAP

6 Important Areas for Butterflies and Moths in the Region

The three sub-regions that have been used to consider the regional status of butterflies and moths are very different from each other:

North

The north sub-region is only sparsely-populated, intensive agriculture is limited and grazing predominates. Large tracts of upland and rough grassland have been converted to conifer plantation during the 20th century. Some of the islands in this area are still farmed in traditional ways and various “agri-environment” schemes have been put in place to ensure that important wildlife sites are not lost. Though many of these schemes have been focused on specific habitats and certain bird species, there have been benefits in maintaining invertebrate populations including Lepidoptera. This area holds populations of UK importance for some species, notably Marsh Fritillary and Slender Scotch Burnet, but remains under-recorded.

Central

The central sub-region is mountainous with large areas of semi-natural habitats only in the north, particularly around Loch Lomond and the Trossachs. It contains a large urban and industrial belt in the centre from which most natural habitats survives only as tiny fragments enabling isolated colonies of Small Pearl-bordered Fritillary and Grayling to survive within the city boundaries of Glasgow. There are large areas of intensive agriculture in the south.

South

The south sub-region is dominated by agriculture and much woodland, upland and peatland have been drastically altered by large-scale conifer plantations. This has almost certainly had a marked effect on inland populations of Pearl-bordered Fritillary, Dingy Skipper, Large Heath, and other species, though hard data are lacking to support this.

Important Areas

The following is an attempt to highlight the richest and most distinctive areas, but may require revision when further information is available. Map 2 shows key areas for butterflies and moths within the Region. In some cases these are contiguous, but distinctive in their butterfly and moth fauna.

The Argyll Islands

Together these islands support a significant proportion of the UK total of Marsh Fritillary (some of the largest colonies in the UK are on Islay), and important populations of Large Heath, together with populations of Small Pearl-bordered Fritillary (on Mull and Jura), and Grayling. Mull and Ulva hold the only UK sites for the Slender Scotch Burnet. The islands also support populations of Argent and Sable, Forester, the Grey and Belted Beauty.

North Argyll

This area supports all the populations of Chequered Skipper and over half of those of the Pearl-bordered Fritillary in the Region. Narrow-bordered Bee Hawk-moth, Barred Tooth Striped, Square-spotted Clay, Northern Arches and Rannoch Brindled Beauty also occur here, while the Lunar Yellow Underwing has been reported in the past.

Knapdale

Knapdale has suffered from extensive conifer planting, as well as intensifying agriculture, but parts still support colonies of Marsh Fritillary, Small Pearl-bordered Fritillary, Large Heath, Argent and Sable, Narrow-bordered Bee Hawk, and Square-spotted Clay.

Loch Lomond and the Trossachs

A varied area, to be Scotland's first National Park. The Pearl-bordered Fritillary may still be present at Glen Finglas. Also recorded in the area are Small Pearl-bordered Fritillary, Welsh Clearwing, Sword-grass, Northern Arches, and Argent and Sable.

Flanders Moss

The largest area of lowland raised peatland in the UK is of great importance for Lepidoptera, and invertebrates in general. A well-known site for the Large Heath, Argent and Sable, and the Rannoch Brindled Beauty.

Ayrshire Coast

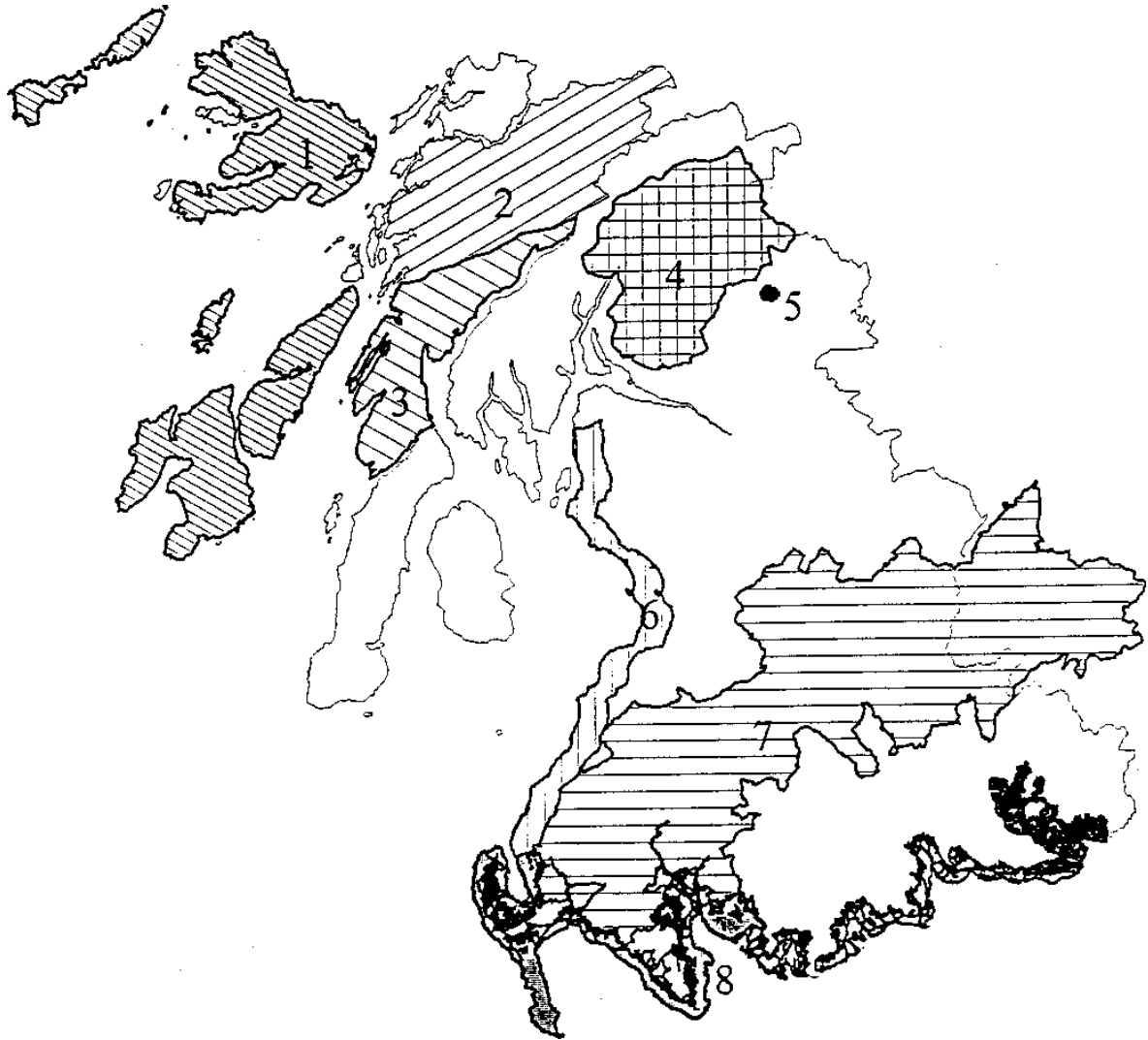
The Ayrshire Coast supports over a quarter of the Region's populations of Northern Brown Argus, and also populations of Grayling. This area is also the current northern limit of the Large Skipper.

Southern Uplands

The Small Pearl-bordered Fritillary and Scotch Argus can be found throughout this area at lower levels, from the Ayrshire coast into the southern half of Dumfries & Galloway. Pearl-bordered Fritillary, Dingy Skipper and Large Heath all occur but have declined.

Solway Coast and hinterland

Most of the Region's populations of Northern Brown Argus occur here, and there are important colonies of Forester Moth and Large Heath inland. Mabie Forest near Dumfries has 20 resident species of butterfly, making it one of the richest sites in Scotland. The Solway Mosses are important areas in the south for the Large Heath, Small Pearl-bordered Fritillary, and possibly Argent and Sable. Many have however been damaged by drainage and forestry.



Map 2. Important areas for Butterflies and Moths in the Region

- 1 The Argyll Islands
- 2 North Argyll
- 3 Knapdale
- 4 Loch Lomond and the Trossachs
- 5 Flanders Moss
- 6 Ayrshire Coast
- 7 Southern Uplands
- 8 Solway Coast and hinterland

7 Survey

Butterflies

A great deal of information on scarce day-flying Lepidoptera was collated during 1994-95 by the SDLP (Pearce et al. 1996), building on the existing published datasets (Heath et al., 1984; Emmet & Heath 1989, and succeeding volumes).

Substantial progress has been made since then in recording the distribution of butterflies through the '*Butterflies for the New Millennium*' project. This has provided a dramatically improved coverage across the UK compared to Heath *et al.* (1984), and provides a more than adequate baseline with which to compare distribution to the late 1970's/early 80's, and determine trends (see Appendix IV).

Nevertheless, as noted in the species accounts, it is likely that some colonies of the priority butterflies listed in this plan remain to be (re)located, and that several species are significantly under-recorded. Any developments that will increase the general level of recording, such as the establishment of Biological Record Centres in Argyll and Dumfries and Galloway, should be encouraged.

Moths

Coverage for moths remains decidedly patchy and still tends to reflect visits to well-known sites. The National Scarce Moth Recording network, co-ordinated by Butterfly Conservation, is currently being expanded, and we hope that the result will be significantly increased recording of scarce moths. For more information on the network, contact Dave Green (01929 400209; dgreen@butterfly-conservation.org).

The best-recorded group remains the Burnet moths (*Zygaenidae*), thanks to the work of the Burnet Study Group.

8 Monitoring

The most important monitoring of butterflies and moths within our Region is carried out currently within two UK-wide schemes.

Butterflies

For butterflies, there is a network of transect-monitoring sites forming the Butterfly Monitoring Scheme (BMS). At some sites the data set extends back to the late 1970's, although transect recording has lapsed at a number of sites, notably Glasdrum NNR, and there are currently only three operating in the Region (Greatorex-Davies & Roy, 1999):

- Taynish NNR, Argyll, monitored by SNH;
- Mabie Forest, near Dumfries, monitored by FE; and
- Brodick Country Park, Arran, monitored by NTS.

There are also several non-BMS transects using similar methodology in the Region, but data sets are much less complete. These include Rockcliffe, Dumfries and Galloway; Mugdock Country Park, East Dunbartonshire/Stirling; Cander Moss in South Lanarkshire; Cathkin Braes and Commonhead Moss, City of Glasgow; and Cashel, Loch Lomond, Stirling.

However, this is an inadequate number of transects to determine regional, species or habitat trends. Butterfly Conservation is currently developing software, materials and the infrastructure to encourage and support more transect recording, and to collate data from transects that operate outside the BMS. Data on butterfly monitoring in Scotland is now being collated by Butterfly Conservation, and we are keen to hear of any ongoing butterfly monitoring in the Region (see Appendix VII, Contact Points).

Moths

For moths, the problems of long-term monitoring are even more acute. As stated above, valuable monitoring of Burnet moths (*Zygaenidae*) has been carried out by the Burnet Study Group. For the vast majority of non day-flying species, the best monitoring is currently provided by the UK network of light-traps run by the Rothamsted Insect Survey. However, Rothamsted traps are designed to catch only a small representative sample from the local moth fauna, thus are not ideally suited for monitoring rare species.

In recent years, Butterfly Conservation has been running training workshops in conjunction with Kindrogan Field Centre to encourage more surveying and monitoring of moths.

9 Land Management

Nature Reserves

So far there appears to have been relatively little habitat management specifically for butterflies and moths within the Region. This is probably more to do with the relatively large areas of semi-natural habitat remaining, and the apparently relatively healthy state of colonies of some of the key species (compared to England for example), than due to species' requirements not being considered.

Thus some of the nature reserves which have important colonies of key species, for example Taynish NNR, Glasdrum NNR, Mabie Forest Nature Reserve and Loch Gruinart (RSPB), monitor their butterflies even though management has often not been carried out specifically for particular species.

These reserves are rich in many species, and species-specific management would have to be justified in the management plan, whereas often the ideal will be larger-scale habitat management, sensitive enough to cater for a whole range of species. However, where this is the case, species known to be vulnerable to change, or to have very specific requirements, should be monitored to ensure population trends are satisfactory.

The Wider Countryside

However, the majority of sites for key species are in private ownership, principally on farmland or in private forestry. Thus an important emphasis will be placed on liaison with and provision of advice through agencies such as FC, SNH, SAC and FWAG. Sometimes, for important colonies of key species, Butterfly Conservation will provide advice direct to landowners and managers.

Advice and information will also be supplied to FE, National Farmers' Union, Scottish Landowners' Federation and conservation organisations such as SWT, RSPB, Woodland Trust and NTS, Ranger Services and LBAP teams, to enable them to advise on the management of sites with key species present or with the potential to colonise. Much of this work will be done by Butterfly Conservation staff.

Two significant new developments are the targeting of the new agri-environmental scheme (the Rural Stewardship Scheme" more towards UK BAP and LBAP habitats and species; and the preparation of a "Butterfly Plan" by Forest Enterprise for their estate. Both provide great potential to influence management in the "wider countryside" for butterflies and moths in general, and often the fine-tuning necessary to cater for threatened species.

Currently, the Species Action Plans prepared by Butterfly Conservation through its "Action for Butterflies" project provide the main means of disseminating ecological information (see Appendix VI). Consideration will be given as to how this information can be updated and more accessible, possibly through our website (www.butterfly-conservation.org).

10 Other Activities

The following other activities are also seen as priorities for Butterfly Conservation Glasgow Branch:

Expansion of membership and promotion.

The current membership is around 120, with an active core of around 20 members. The Branch needs to encourage more people to participate in its work and raise the profile of the plight of Lepidoptera in the Region.

- The Branch will continue to involve wildlife and natural history groups, raise awareness of the Branch's activities, and encourage their membership to join in our activities.
- The Branch will produce information on its activities tailored to encourage new members to join.
- The Branch will help to promote UK and Scotland-wide Butterfly Conservation campaigns, as well as its own initiatives, through its own newsletter and also through local and regional press releases.
- The Branch will hold workshops to aid identification and stimulate butterfly and moth recording.

Liaison with Local Authorities re. Local Biodiversity Action Plans.

Branch members are already playing an active part in most LBAPs in the Region. For example, in Dumfries & Galloway, plans have been produced for three species; Forester Moth, Northern Brown Argus and Pearl-bordered Fritillary, and more are in preparation. Both the City of Glasgow and North Lanarkshire have picked the Small Pearl-bordered Fritillary as an action plan species, North Lanarkshire have also picked the Large Heath.

- Further involvement by Branch members in the preparation and implementation of local species action plans are likely to be essential to deliver the targets set out within this Plan.
- Other initiatives will also provide opportunities to safeguard butterflies and moths, and promote their conservation.

Liaison with other countryside agencies, landowners and advisory services

- The Branch will develop a strategy for contacting and maintaining good working links with key landowners and managers, and the staff of the advisory agencies within the Region.

11 Review

The progress on this Action Plan will be reviewed annually by the Glasgow Branch committee. A major review of the plan will be carried out in 2005/6.

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Appendix I

UK BAP species in Scotland occurring by Region.

Butterflies

PRIORITY SPECIES		Highlands & Islands	South West	East
Chequered Skipper	<i>Carterocephalous palaemon</i>	+	+	
Marsh Fritillary	<i>Euphydryas (=Eurodryas) aurinia</i>	+	+	
Northern Brown Argus	<i>Aricia artaxerxes</i>	+	+	+
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>	+	+	+
SPECIES OF CONSERVATION CONCERN				
Large Heath	<i>Coenonympha tullia</i>	+	+	+
Mountain Ringlet	<i>Erebia epiphron</i>	+	+	+
Small Blue	<i>Cupido minimus</i>	+	?	+
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	+	+	+

+ present

? possibly extinct

Moths

PRIORITY SPECIES		Highlands & Islands	South West	East
Argent and Sable	<i>Rheumaptera hastata</i>	+	+	+
Barred Tooth-striped	<i>Trichopteryx polycommata</i>	+	+	+
Cousin German	<i>Paradiarsia sobrina</i>	+	+	+
Dark Bordered Beauty	<i>Epione vesperterea</i> (= <i>parallelaria</i>)	+		+
Lunar Yellow Underwing	<i>Noctua orbona</i>	+	+	+
Narrow-bordered Bee Hawk	<i>Hemaris tityus</i>	+	+	
Netted Mountain	<i>Macaria</i> (= <i>Semiothisa</i>) <i>carbonaria</i>	+		+
Northern Dart	<i>Xestia alpicola alpina</i>	+	+	+
Slender Scotch Burnet	<i>Zygaena loti scotica</i>	+	+	
Square-spotted Clay	<i>Xestia rhomboidea</i>	+	+	+
Sword Grass	<i>Xylena exsoleta</i>	+	+	+
SPECIES OF CONSERVATION CONCERN				
Belted Beauty	<i>Lycia zonaria</i>	+	+	
Broad-bordered White Underwing	<i>Anarta melanopa</i>	+		+
Broom Tip	<i>Chesias rufata</i>	+	+	+
Forester	<i>Adscita statices</i>		+	
Goat	<i>Cossus cossus</i>	+		
Grey	<i>Hadena caesia mananii</i>	+	+	
Grey Scalloped Bar	<i>Dyscia fagaria</i>	+	+	+
Kentish Glory	<i>Endromis versicolora</i>	+		+
Mountain Burnet	<i>Zygaena exulans</i>	+		+
Northern Arches/Exile	<i>Apamea zeta assimilis</i>	+	+	+
Rannoch Sprawler	<i>Brachionycha nubeculosa</i>	+		+
Slender-striped Rufous	<i>Coenocalpe lapidata</i>	+	+	+
Small Dark Yellow Underwing	<i>Anarta cordigera</i>	+		+
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	+	+	+

N.B. The critically endangered New Forest Burnet (*Zygaena viciae*) occurs in western Scotland at a confidential location.

Appendix II UK BAP Priority Species in Scotland by Habitat

Much work on implementing the UK BAP will be carried out through the Habitat Action Plans published by DETR. While some species' requirements will be satisfied by implementing general habitat prescriptions, many will require more specific forms of management.

It should be noted that the habitats of several species are poorly understood, particularly in Scotland, and some species are likely to occur in other habitats than those identified. In addition, some important habitats in Scotland were not recognised in the UKBAP, notably birch woodland, aspen stands (outside of "wet woodland") and species-rich bracken stands. These have been included in the table below.

Habitat	Priority BAP species	Association
Aspen stands	Dark Bordered Beauty	P
Birch woodland	Argent and Sable Cousin German Square-spotted Clay Pearl-bordered Fritillary	P P P S
Blanket bog	Argent and Sable Marsh Fritillary Narrow-bordered Bee Hawk	P S S
Bracken (species-rich, south-facing)	Pearl-bordered Fritillary	P
Coastal dunes (includes grassland & heath)	Lunar Yellow Underwing Northern Brown Argus Marsh Fritillary	P S S
Lowland calcareous grassland	Northern Brown Argus	P
Lowland heathland	Argent and Sable Marsh Fritillary Narrow-bordered Bee Hawk	P S S
Lowland raised bog	Argent and Sable Dark Bordered Beauty	P S
Lowland wood pasture and parkland	Pearl-bordered Fritillary	P
Maritime cliff and slope (vegetated cliffs and lichen-dominated cliffs)	New Forest Burnet Northern Brown Argus Slender Scotch Burnet	P P P
Native pine woodland	Cousin German Argent and Sable Pearl-bordered Fritillary	P S S
Purple moor grass and rush pasture	Marsh Fritillary Chequered Skipper Narrow-bordered Bee Hawk Sword-grass Argent and Sable	P P P P P
Upland calcareous grasslands	Northern Brown Argus Slender Scotch Burnet	P S
Upland heathland & moorland	Pearl-bordered Fritillary Netted Mountain Northern Dart Sword-grass Argent and Sable	P P P P S
Upland mixed ash woodland	Barred Tooth-striped Chequered Skipper Pearl-bordered Fritillary	P P P
Upland oakwood	Pearl-bordered Fritillary Chequered Skipper	P P
Wet woodland	Dark-bordered Beauty	P

P = principle habitat; S = secondary habitat

Appendix III Micro-moths in need of conservation in the Region.

Taken from Bland & Young (1996).

Category 1A	“Very restricted distribution, potentially in urgent need of protection”
<i>Scrobipalpa murinella</i>	
Category 1B	“Potentially in need of conservation”
<i>Acrolepiopsis betulella</i> <i>Coleophora genistae</i> <i>Elachista orstadii</i> <i>Levipalpus hepatariella</i> <i>Epinotia crenana</i> <i>Acleris lipsiana</i> <i>Eudonia alpina</i>	
Category 2A	“Very restricted distribution, in urgent need of protection”
<i>Stigmella spinosissimae</i> <i>Periclepsis cinctana</i> <i>Pselnophorus heterodactyla</i>	

Appendix IV Assigning Regional Priorities

Methods

The number of 10 km squares recorded for 16 target species (*Chequered Skipper*, *Dingy Skipper*, *Green Hairstreak*, *Purple Hairstreak*, *Small Blue*, *Northern Brown Argus*, *Small Pearl-bordered Fritillary*, *Pearl-bordered Fritillary*, *Dark Green Fritillary*, *Marsh Fritillary*, *Speckled Wood*, *Mountain Ringlet*, *Scotch Argus*, *Grayling*, *Large Heath* and *Ringlet*) were determined for each of the three Scottish Regions from a sub-set of Final Provisional Maps for the New Millennium Atlas (18 Jan 2000), covering northern Britain, for the period 1995-99 (Kinnear, 2000).

These were compared with the number of 10 km squares determined for the same regions from the 1970-82 atlas, taken directly from the *Atlas of Butterflies in Britain and Ireland* (Heath, Pollard and Thomas, 1984), to determine apparent changes, rate of decline, rarity and proportion of UK (or Great Britain) population, using the criteria set out in Butterfly Conservation's *Guidelines for producing Regional Action Plans* (Bourn, Warren & Kirkland, 1996). In addition, the status of several common species was checked using the same criteria.

This method works best if coverage levels and patterns are similar in both data sources. Although this is not exactly the case, we have decided that coverage is good enough to give a broad indication of trends, which allow regional priorities to be assigned with a degree of confidence. In fact, as the coverage levels are much better for the Millennium Atlas, comparisons are likely to under-estimate any declines.

Under-recorded Species

Several species qualified on apparent rate of decline, but there is a consensus among recorders that these declines are due more to under-recording, than due to habitat loss. However, efforts should be made to improve the recording of these species, so that any real changes in distribution become clearer.

Species at the edge of their range

Some species are rare because they are at the edge of their UK range, and are more common further south. From a UK perspective these species do not need resources directed to them.

Appendix V List of Butterflies of the Region

Resident butterflies recorded during the period of the Millennium Atlas (1995-1999) in the South West Scotland Region, in taxonomic order.

Common Name	Latin Name
Chequered Skipper	<i>Carterocephalus palaemon</i>
Large Skipper	<i>Ochlodes venata</i>
Dingy Skipper	<i>Erynnis tages</i>
Large White	<i>Pieris brassicae</i>
Small White	<i>Pieris rapae</i>
Green-veined White	<i>Pieris napi</i>
Orange-tip	<i>Anthocharis cardamines</i>
Green Hairstreak	<i>Callophrys rubi</i>
Purple Hairstreak	<i>Neozephyrus (=Quercusia) quercus</i>
Small Copper	<i>Lycaena phlaeas</i>
Northern Brown Argus	<i>Aricia artaxerxes</i>
Common Blue	<i>Polyommatus icarus</i>
Small Tortoiseshell	<i>Aglais urticae</i>
Peacock	<i>Inachis io</i>
Small Pearl-bordered Fritillary	<i>Boloria selene</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>
Dark Green Fritillary	<i>Argynnis aglaja</i>
Marsh Fritillary	<i>Euphydryas (=Eurodryas) aurinia</i>
Speckled Wood	<i>Pararge aegeria</i>
Wall	<i>Lasiommata megera</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Scotch Argus	<i>Erebia aethiops</i>
Grayling	<i>Hipparchia semele</i>
Meadow Brown	<i>Maniola jurtina</i>
Ringlet	<i>Aphantopus hyperantus</i>
Small Heath	<i>Coenonympha pamphilus</i>
Large Heath	<i>Coenonympha tullia</i>

Appendix VI Butterfly Conservation Species Action Plans

Plans published for species occurring in Scotland:

Species	Date published
Chequered Skipper	1996
Northern Brown Argus	1996
Small Pearl-bordered Fritillary	1995
Pearl-bordered Fritillary	1995
Marsh Fritillary	1995
Mountain Ringlet	1996
Large Heath	1997
Small Blue	2000
Dingy Skipper	2000

Copies of these plans are available from Butterfly Conservation (Scotland), Balallan House, Allan Park, Stirling, FK8 2QG, price £5 each (includes p+p).

Appendix VII Butterfly Conservation Contact Points & Objectives

Contact Points for Glasgow & South West Scotland Branch

Branch Organiser	Pru Williams	Seacroft, Eglinton Terrace, Skelmorlie, PA17 5ER	01475 520916	Pru@compuserve.com
Branch Recorder	Richard Sutcliffe	Art Gallery & Museum, Kelvingrove, Glasgow, G3 8AG	0141 287 2660	richard.sutcliffe@cls.glasgow.gov.uk
Butterfly Monitoring (Scotland)	Pete Kinnear	20 East Queen St., Newport-on Tay, Fife, DD6 8AY	01382 541383	

Butterfly Conservation Objectives

The British Butterfly Conservation Society (Butterfly Conservation) is the largest insect conservation body in the world and is devoted to the conservation of our native butterflies and moths, and their habitats.

Butterfly Conservation:

- takes a leading role in conserving butterflies and moth populations, particularly through the preparation of Species Action Plans
- campaigns to save threatened habitat
- carries out research on threatened butterflies and moths
- is a member of the influential Biodiversity Challenge Groups and Wildlife Links
- acquires and manages nature reserves
- has branches covering the whole of the UK which promote conservation at a local level
- surveys, records and monitors butterflies and moths throughout the UK
- works in partnership with other conservation bodies
- encourages an interest in and awareness of butterflies, moths and their conservation
- advises landowners on habitat management
- promotes invertebrate conservation generally
- publishes *Butterfly Conservation News* three times a year
- lobbies government at all levels to influence planning and policy decisions

Our ultimate goal is the restoration of a balanced countryside, with butterflies and other wildlife returned to the profusion they, and we, once enjoyed.

Appendix VIII Abbreviations

BMS	Butterfly Monitoring Scheme
BSG	Burnet Study Group
CEH	Centre for Hydrology (formerly the Institute of Terrestrial Ecology)
DETR	Department of the Environment, Transport and the Regions
FC	Forestry Commission
FE	Forest Enterprise
FWAG	Farming & Wildlife Group
JNCC	Joint Nature Committee for Conservation
LBAP	Local Biodiversity Action Plan
LA	Local Authorities
NTS	National Trust for Scotland
NNR	National Nature Reserve
RSPB	Royal Society for the Protection of Birds
SAC	Scottish Agricultural College
SDLP	Scottish Diurnal Lepidoptera Project
SERAD	Scottish Executive, Rural Affairs Department
SLF	Scottish Landowners' Federation
SNH	Scottish Natural Heritage
SWT	Scottish Wildlife Trust
WdT	Woodland Trust