

Action for pearl-bordered fritillary



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What we are doing

The pearl-bordered fritillary butterfly (*Boloria euphrosyne*) is one of the key woodland species identified for action under the Scottish Forestry Strategy 2006. This note summarises the action being undertaken by Forestry Commission Scotland, either ourselves or in partnership with others, to help conserve the pearl-bordered fritillary in Scotland. This note covers the period 2008/09 to 2010/2011 in depth, and in outline to 2015.

The pearl-bordered fritillary is primarily a spring butterfly of sheltered, sunny woodland glades and woodland edges. A UKBAP Priority species, it is one of the most rapidly declining butterflies in Britain and Ireland, although the declines in Scotland are less severe.

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The **Pearl-bordered Fritillary Species Action Framework Plan 2007-2012**, published by Scottish Natural Heritage (SNH), summarises action agreed by all relevant partners. This note explains in more depth how Forestry Commission Scotland will contribute to the overall effort.

Current status

The current status of pearl-bordered fritillary in Scotland is unclear, primarily due to under-recording. The only national survey covering Scotland was in 1997-8 when the population was estimated at around 150 colonies at 120 sites. The Scottish population makes up more than a third of the British total.

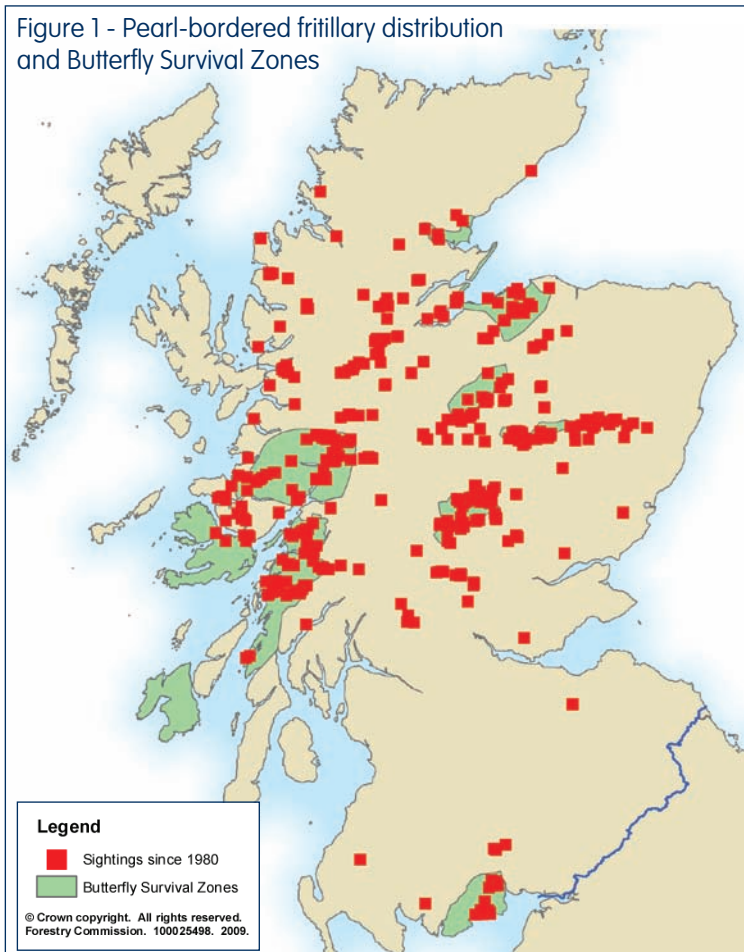
This survey highlighted how under-recorded the butterfly is in Scotland; over 30 of the Scottish colonies found were new discoveries, and more have been discovered in subsequent years. Under-recording is due to a number of factors, including a lack of recorders in the remoter parts of Scotland where the butterfly occurs; the short survey period of around three weeks and problems distinguishing it from the very similar and more widespread small pearl-bordered fritillary.

Comparing the populations recorded in the period 1995-2004 with those recorded in the period 1970-1982 shows that the pearl-bordered fritillary's range in Britain had contracted by 61%. Population declines were of a similar order. However, the recorded decline in Scotland was lower, though still cause for concern at 33%. These differing rates of decline increase the significance of the Scottish populations.

As a result of these dramatic declines the pearl-bordered fritillary was designated a UKBAP Priority Species and has both national, and in some parts of Scotland, regional action plans. The pearl-bordered fritillary is protected from sale under the 1981 Wildlife and Countryside Act. This makes it illegal to trade wild-caught material.

Distribution

The pearl-bordered fritillary has localised populations across many parts of Scotland. Between 1995 and 2004 it was recorded from 119 ten-kilometre squares in Scotland (see figure 1). Pearl-bordered fritillary appears in eight of the ten Butterfly Survival Zones in Scotland announced by Butterfly Conservation Scotland (BCS). These zones are deemed the most important landscape areas for priority butterflies and moths in Scotland.



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Pearl-bordered fritillary identification

The pearl-bordered fritillary is one of four fritillary butterflies that occur in Scotland. Given a good view, the dark green fritillary and the marsh fritillary are readily distinguishable but the pearl-bordered fritillary is easily confused with the small pearl-bordered fritillary, a widespread and often common butterfly in Scotland.

The key features for distinguishing between these two species are the flight period and the pattern on the underside of the hindwing (see table and photos below). Despite their names there is very little difference in size, so size is an unreliable feature.

Pearl-bordered fritillary v. small pearl-bordered fritillary identification

Characteristic	Pearl-bordered fritillary	Small pearl-bordered fritillary	Comments
Markings on underside of hindwing	Small black dot 2 "white cells"	Large black dot 7 "white cells"	White cells may not all look completely white, especially in worn individuals
Flight period	Mid May to mid June	Late May to late July	Overlap in flight periods late May to mid June
Habitat	Dry woodland glades/edges often on south facing hillsides. Caterpillars feed predominately on dog violet but can use marsh violet	Wet open moorland, damp grassland/ woodland. Caterpillars feed on marsh violet	Habitat requirements often exist side by side at the same site

It is recommended that a butterfly net is used to gain a close look at the features described above. In most cases an individual can be identified from reasonable photographs, particularly of the underwings. For more information on identification see the [UK Butterflies web site](#).

Pearl-bordered fritillary



© David Whitaker



© Alan Barnes

Small pearl-bordered fritillary

Pearl-bordered fritillary (showing underwing)



© Ern Emmet



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Small pearl-bordered fritillary (showing underwing)

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Threats

The main threats to remaining populations of the butterfly are inappropriate management, leading to loss of colonies, and fragmentation of the habitat between colonies, causing isolation of colonies. This is important for species like the pearl-bordered fritillary, which exist in a metapopulation, i.e. a network of geographically discrete colonies which are linked by the dispersal of individuals between the colonies to form a single large population.

The management of small, isolated sites is generally unsustainable in the long term. If a colony at any one site goes extinct, the chances of recolonisation are low if other colonies are more than 5 km away. Therefore, it is important that management of individual colonies is planned in a wider landscape context.

The butterfly's dependence upon bracken means its management is a major and often sensitive issue. Bracken eradication often leads to the extinction of colonies, whilst a lack of control can lead to it blanketing out both larval and adult food plants.

Colonies have often been lost from sites that have been managed to encourage tree regeneration, as the glades and open spaces occupied by the butterfly have filled with young trees. In some cases colonies have become fragmented as intervening woodland between the colonies has matured and become too dense to permit connectivity.

Over-grazing, particularly by sheep, can lead to both a loss of nectar plants and an excessive increase in bracken extent and density.

The effects of climate change on colonies is unclear but could be detrimental in pushing colonies further uphill into more unsuitable and marginal habitat. It could increase the area with frost-free winters, which may be beneficial. Research will be needed to understand and predict these interactions.

Habitat requirements

It is essential that pearl-bordered fritillary colonies have the right habitat requirements for all the life-cycle stages of the butterfly.

In Scotland the pearl-bordered fritillary is a butterfly of woodland edges or the open spaces within woodlands. It requires sunny, sheltered sites, normally south-facing hillsides. Favoured sites also tend to have short vegetation and light bracken cover. The dead bracken litter heats up in the spring sunshine and provides a vital warm microclimate for the caterpillars. Violets are the caterpillar's sole food plant, primarily common dog-violet *Viola riviniana*, though occasionally marsh violet *Viola palustris* is used.



The pearl-bordered fritillary has a one year life-cycle. The adult butterflies are on the wing in the spring, usually from the middle of May until the middle of June. However, this can vary by around three weeks between years and between sites.

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In May and June, eggs are usually laid on dead bracken adjacent to, rather than on, the larval food plant. The caterpillars start to hibernate in September, often beneath the bracken litter and usually re-emerge during the first sunny days of March. The black caterpillars bask on the dead and dry bracken litter to raise their body temperature, before they can become active and feed and digest their food. Occasionally leaf litter, rock and bare ground are used as a substitute for the bracken but there are probably less than a handful of occupied colonies in Scotland that are not reliant upon bracken.



© Helen Rowe

The caterpillars pupate amongst the bracken litter. The adult butterflies emerge two to three weeks later and are only active in warm or sunny weather. They are regularly encountered at nectar plants, especially bugle, dandelion, bluebell (wild hyacinth) and bird's-foot trefoil.

The pearl-bordered fritillary is a fairly mobile butterfly but most individuals will rarely move more than 1 km in their lifetime; however, movements of up to 5 km have been recorded between colonies. Such movements are important for maintaining the viability of populations within a landscape. For example, if a colony is in decline, it can be boosted by dispersing immigrants. Importantly, this dispersal ability means that new habitat created through positive management may be colonised.

Pearl-bordered fritillary management should aim to enhance the habitat in each of the colonies in a metapopulation, and to remove barriers to dispersal between colonies. Ideally, efforts should also be made to create new colonies nearby. For example, if the number of colonies in a square kilometre is increased from 5 to 10, it is much more likely that pearl-bordered fritillaries will persist in that area.



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Information on management can be found on the [BCS website](#). In summary:

- The ideal management of sites for pearl-bordered fritillary is often light cattle grazing. This helps keep glades open whilst also keeping areas flower-rich.
- Trampling by cattle can help prevent bracken from spreading and becoming too dominant, as well as providing suitable ground conditions for the establishment of violets.
- If grazing is not possible, some other form of bracken management is often required to maintain the appropriate levels of bracken: too much and the food plants are shaded out; too little and there is insufficient dead bracken material for basking caterpillars.
- The maintenance of open space within woodlands allows pearl-bordered fritillaries to fly between colonies. In many cases the open 'corridors' have to be created or re-established.

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- Rides and paths running east to west have a greater proportion of warmer south-facing edges. The inclusion of scalloped bays at intervals along the south-facing edge provides additional sheltered habitat.
- The regular cutting of regrowth on wayleaves provides suitable sheltered and open habitat, and their linear nature means that they can act as ideal corridors along which individuals can fly to neighbouring colonies.

Pearl-bordered fritillary conservation action in Scotland to date

Recent conservation action for pearl-bordered fritillary in Scotland has been co-ordinated by BCS. The focus has been on raising awareness of the butterfly and its conservation, and management advice has been given at some sites. Examples of activities to date include:

- Producing a leaflet “**Learn about the pearl-bordered fritillary**”.
- Running training, workshops and demonstration days to promote monitoring and management of pearl-bordered fritillary and other butterflies.
- Establishing the S9 pilot woodland grazing trial to increase understanding of livestock grazing in woodland to enhance biodiversity.
- Monitoring pearl-bordered fritillary populations through weekly butterfly transects at a number of sites including some on the national forest estate.

The pearl-bordered fritillary species action plan

Pearl-bordered fritillary is a **UK BAP priority species** for which Butterfly Conservation is lead partner. The UK steering group comprises many partners including Forestry Commission. In Scotland, work is co-ordinated through a close working partnership between BCS, SNH and Forestry Commission Scotland. Forestry Commission Scotland will contribute significantly to achieving the targets set out in the UK BAP for pearl-bordered fritillary, which are to:

- Maintain the core range of the species
- Maintain viable networks within this core range
- Increase the number of occupied sites within each network.

Targeting our pearl-bordered fritillary conservation actions

Our work on pearl-bordered fritillary will be targeted towards sites within the eight Butterfly Survival Zones designated by BCS that have pearl-bordered fritillary metapopulations. We will aim to work at a landscape scale, which will require collaborative working with a number of partners and neighbours to create functioning and viable metapopulations of pearl-bordered fritillary.

As a lower priority, we will also work on sites outwith the Butterfly Survival Zones where this can maintain and increase the range of pearl-bordered fritillary in Scotland.

The following sections describe in more detail what we will do for for pearl-bordered fritillary.

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Pearl-bordered fritillary management on the national forest estate

We will manage two nature reserves on the national forest estate; Mabie Forest in Dumfries and Galloway and Allt Mhuic on the north shores of Loch Arkaig, Lochaber, where we will undertake sympathetic management to enhance pearl-bordered fritillary populations. At Allt Mhuic, Forest Research will conduct research to gain a better understanding of the effects of the management regime, light cattle grazing, on pearl-bordered fritillary habitat.

A partnership project at Glen Creran will monitor and manage the south-facing hillside to improve the viability of the pearl-bordered fritillary metapopulation. This includes national forest estate, land in private ownership and land managed by SNH. The majority of the land is designated as a Site of Special Scientific Interest (SSSI), with pearl-bordered fritillary being one of the notified features. This is the only SSSI specifically designated for pearl-bordered fritillary in Scotland.

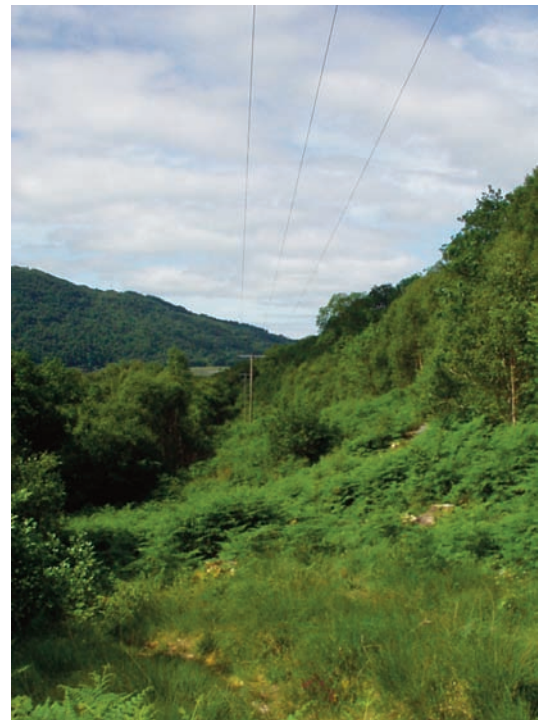
Lessons learned at these sites will be used to inform pearl-bordered fritillary management elsewhere.

Forty sites on the national forest estate have been identified as having post-1980 records of pearl-bordered fritillary. In addition, a further 35 sites have been identified within 1km of the national forest estate. We will target conservation effort to these sites, both by managing the national forest estate and working with neighbours to encourage a landscape-scale approach.

Good forest design and operational practice such as the maintenance of suitable open ground and appropriate bracken control will often benefit pearl-bordered fritillary. Although a large amount of this kind of work will be carried out on the national forest estate, it is not possible to attribute a cost to it that is relevant to a single species like the pearl-bordered fritillary. Work will include:

- Identifying core colonies and undertaking annual monitoring
- Improving habitat at extant colonies
- Identifying national forest estate that falls within the Butterfly Survival Zones for pearl-bordered fritillary and ensuring that suitable management is implemented to improve connectivity between colonies.

This work will be undertaken in partnership with BCS who will act as specialist advisors.



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Management of private woodlands for pearl-bordered fritillary

The Scotland Rural Development Programme (SRDP) can provide grant support for management to help pearl-bordered fritillary. This includes (*SRDP option in italics*):

- Reducing the density, extent and/or depth of bracken litter to enhance habitat condition for pearl-bordered fritillary. (*Bracken Management Programme for Habitat Enhancement*)
- Eradication of rhododendron. Can benefit pearl-bordered fritillary at certain sites. (*Control of Invasive Non-native Species*)
- Woodland creation. Will be used to provide more shelter at exposed sites and to help create sheltered connectivity between colonies at very open and less wooded sites. (*Woodland Creation*)
- Forest plan preparation. Pearl-bordered fritillary populations and their habitat are dynamic systems, changing as natural succession progresses. Management is often cyclical and has to be carefully planned to ensure that, at any point in time, suitable linked habitat is retained. (*Woodland Improvement Grant – Long term forest planning*)
- Respacing natural regeneration. Used to open up dense stands of regeneration to allow better dispersal between colonies. (*Woodland Improvement Grant – Improving woodland habitats and species*)
- Small scale woodland thinning. Used to provide clearings (up to 0.25ha) to create or maintain suitable pearl-bordered fritillary habitat or keep colonies linked. (*Woodland Improvement Grant – Improving woodland habitats and species*)

We will work with SGRPID, BCS and SNH to promote and support suitable management prescriptions in SRDP applications, and will provide technical guidance to help grant applicants. We will promote the measures where they help to maintain viable metapopulations within Butterfly Survival Zones, or help to increase the range of the species. Priority will be given to applications in the eight Butterfly Survival Zones for pearl-bordered fritillary.

We are developing a woodland grazing toolkit based on a series of pilot areas which will provide guidance on woodland grazing for butterflies. We hope to develop grant support based on this by 2010.

We are working with Forest Research to monitor both the vegetation and butterflies at the joint Forestry Commission Scotland and BCS nature reserve at Allt Mhuic. This work is helping to determine the effects of light cattle grazing on chequered skipper and pearl-bordered fritillary habitat and populations. It is hoped that lessons learnt here will be transferable to other sites.



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Figure 2 shows pearl-bordered fritillary distribution in relation to RPAC areas. Links to those RPAC areas relevant to pearl-bordered fritillary are provided below

Highland

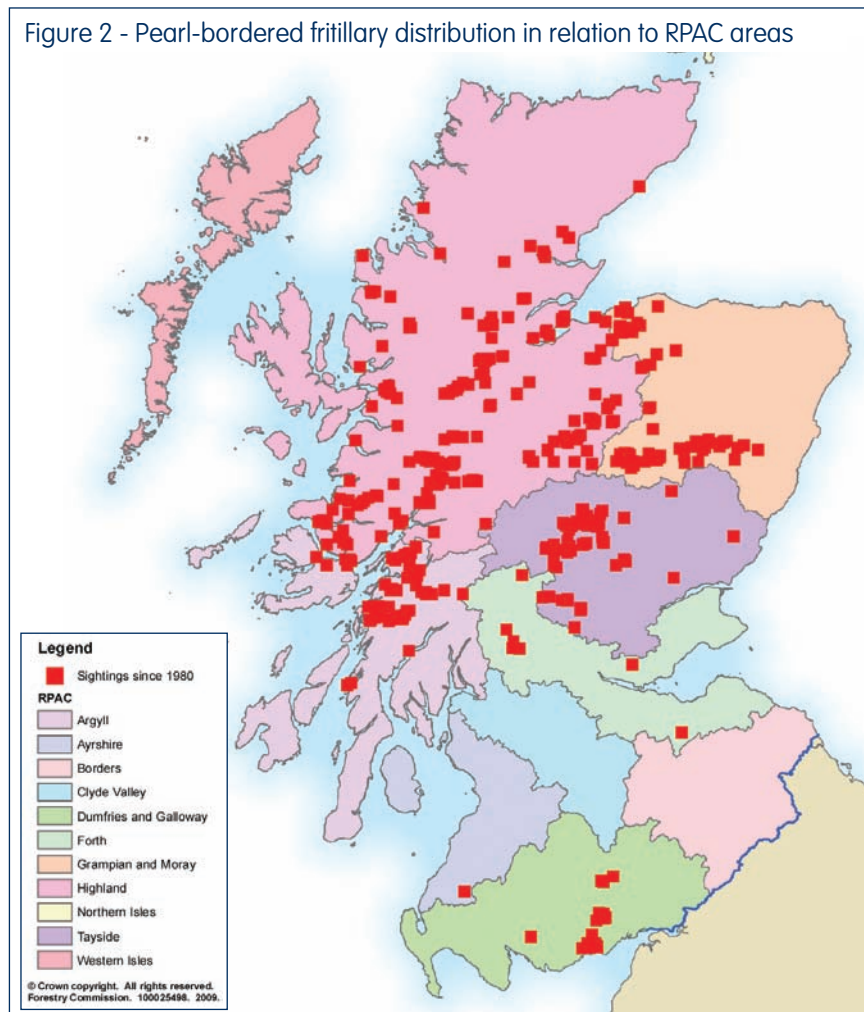
Grampian

Tayside

Argyll

Dumfries and Galloway

Figure 2 - Pearl-bordered fritillary distribution in relation to RPAC areas



Reporting and review arrangements

An annual report of progress in carrying out the actions in this programme will be summarised on this site, and in more detail in the **Species Action Framework**. This programme plan will be revised if required and will be reviewed in 2011/12.

Looking for pearl-bordered fritillary

Adult pearl-bordered fritillaries are usually on the wing in Scotland from mid-May until mid June. Choose a sunny, warm and if possible calm day. Look for them on sunny and sheltered woodland edges or glades on south-facing hillsides, particularly in the glens of Highland, Grampian, northern Perthshire and Argyll. Sites usually have a light bracken cover. Adults tend to congregate in areas of nectar plants and are particularly fond of bugle. Observe them closely and take care not to confuse them with the very similar, but far more widespread, small pearl-bordered fritillary. The use of a butterfly net or camera is recommended to confirm identification.

Good colonies of pearl-bordered fritillary can be seen at the following sites:

- Mabie Forest nature reserve in Dumfries and Galloway
- Allt Mhuic Nature Reserve nature reserve on the north shores of Loch Arkaig in Lochaber
- Glasdrum National Nature Reserve owned and managed by SNH and the adjacent Glen Creran Woods owned and managed by Forestry Commission Scotland.

Contacts

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