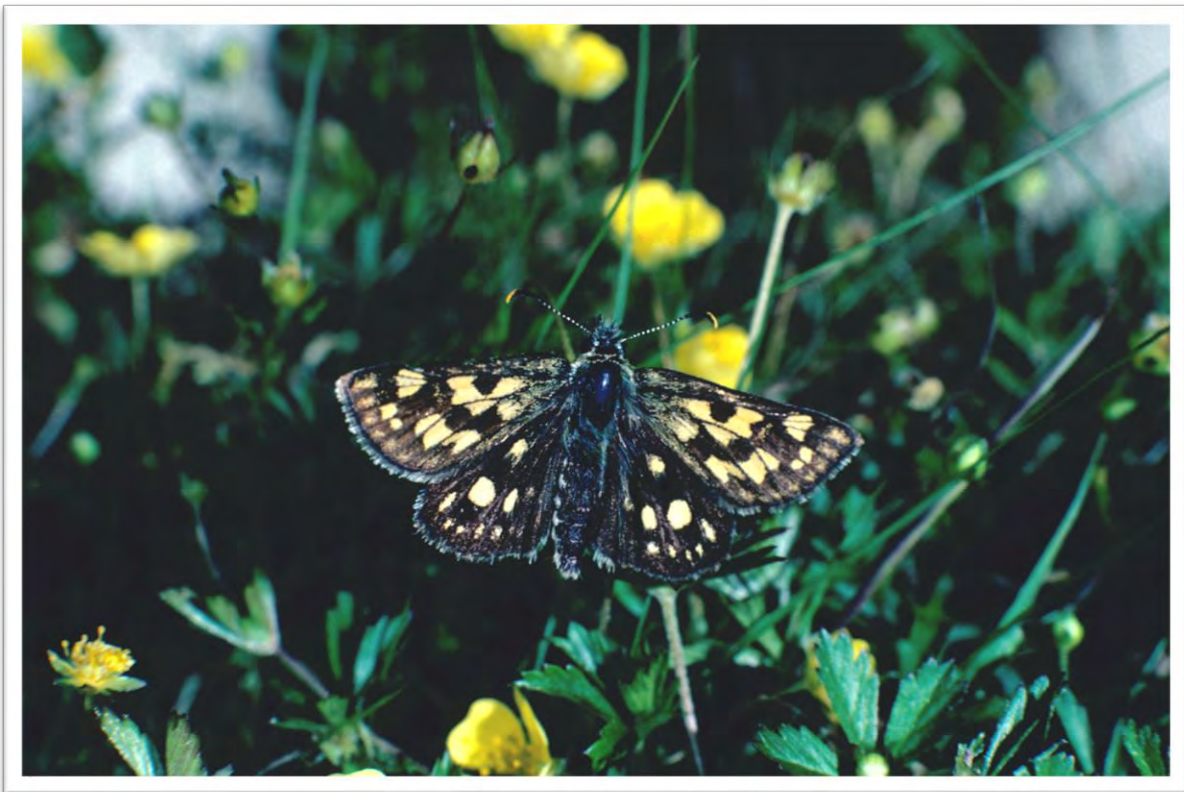




Forestry and
Land Scotland
Coilltearachd agus
Fearann Alba

Appendix XIV

Allt Mhuic Butterfly Reserve



Chequered skipper butterfly

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1 Location

The Allt Mhuic Butterfly Reserve is located in Loch Arkaig Forest approx. 8km WNW of Clunes hamlet and 14.5km NW of Spean Bridge in Lochaber. Grid Ref: NN 1207 9141.

2 Management proposals 2022 - 2032

2.1 Context

The site was acquired in 2003 and was managed in partnership with Butterfly Conservation Scotland (BCS) as a Butterfly Reserve formally until 2013. The working relationship between BCS and Forestry and Land Scotland (FLS) continued in an informal basis until 2022.

Management involved light cattle grazing using the local FLS in-house Highland Cattle herd, focussing on habitat for chequered skipper at the same time delivering good outcomes for other invertebrate habitat.

Setbacks to this management in recent times include:

- Exclusion of cattle from the Reserve during the two year development phase of the Allt Mhuic Hydro scheme.
- The sale of the FLS Highland Cattle herd removed full control of grazing management.

2.2 Objectives

- To cater for the diverse needs of the Reserve's key Lepidoptera.
- To maintain a mosaic of generally open yet sheltered habitats.
- To continue the focus on maintaining and enhancing the habitat for chequered skipper, preferably through light cattle grazing regime.

2.3 Partnership Agreements

- FLS and BCS will agree promotion of the reserve with the use both logos
- BCS will be invited by FLS to advise on the best management practice for the establishment and maintenance of butterflies and moths on the reserve.
- FLS retains the management responsibility for the reserve which may at times require interventions to manage deer and tree and pest control measures. BCS will be notified of such intervention.
- FLS will facilitate informal recreation by members of the public and interpretation of the butterfly and moth colonies within the reserve.

2.4 Proposed management to 2032

2.4.1 Target Lepidoptera and Habitat Requirements

Common name	Latin name	Habitat requirement
Chequered skipper	<i>Carterocephalus palaemon</i>	Open damp grassland/moorland dominated by purple moor-grass tussocks (sole food plant for the caterpillar), on the edges or in glades within woodland, bur also in damp hollows and slopes dominated by bog myrtle. This species is deemed to be the most important on the site.
Pearl-bordered fritillary	<i>Boloria euphrosyne</i>	Steep south facing dry sheltered slopes with light bracken cover and violets (sole foodplant for the caterpillar).
Large heath	<i>Coenonympha tullia</i>	Open, blanket bog with Hare's-tail cottongrass (caterpillar foodplant) interspersed with abundant cross-leaved heath (main adult nectar source).
Argent & Sable	<i>Rheumaptera hastata</i>	Sheltered boggy moorland, the shelter provided by the topography or adjacent woodland/trees. The main foodplant in Scotland is bog myrtle, but can occasionally use young birch.
Narrow-bordered Bee Hawk-moth	<i>Hemaris tityus</i>	Grassland and moorland where its larval food plant devil's-bit scabious grows alongside an array of nectar plants e.g. bird's-foot trefoil, lousewort.
Welsh clearwing	<i>Synanthedon scoliaeformis</i>	Open woodland or hillsides with scattered birch, the caterpillars feeding within the trunks, branches and roots on living tissue in sunny positions.

It should be noted that a further 20 butterfly and 200 moth species have been recorded from this site.

2.4.2 Management Table

Management type	Ideal means of delivery	Alternative means of delivery	Responsibility
Habitat	<p>Light cattle grazing via grazing lease to encourage regeneration for the creation of woodland edge habitat.</p> <p>(Remoteness of site and the low quality of the grazing may impact on securing cattle contract)</p>	<p>Human management of rank vegetation through use of clearing saws and brushcutters.</p> <p>Use of volunteer work parties using hand tools</p>	<p>FLS</p> <p>BCS.</p>
Butterfly monitoring	<p>Annual monitoring of target species – chequered skipper to determine the success of the habitat management.</p> <p>Best method is Butterfly Transect.</p> <p>Requires weekly walks on good weather days.</p> <p>Ideally throughout the butterfly season - April to September.</p> <p>(It is labour intensive and therefore is reliant on the recorder being committed, flexible and ideally local. The site is remote).</p>	<p>Restrict the Butterfly Transect work to coincide with the chequered skipper flight times which is the six week period from mid-May to end of June in a given year.</p> <p>Or</p> <p>Timed counts. Ideally two during the chequered skipper flight period, a week apart, or as close to the peak period of the species flight period as possible.</p> <p>(This is less time consuming but also a less precise method).</p>	<p>BCS</p>
Habitat monitoring	<p>Structured walk whereby positive and negative attributes are assessed at predetermined locations which are the same ones for chequered skipper monitoring.</p> <p>Supported by establishing a series of fixed point photograph locations.</p>	<p>None.</p>	<p>BCS</p>

2.5 Aspirational management

See P.19 – Aspirational Management Map

Location	Current crop	Proposed management
Allt Mhuic west below forest road	Area – 17.5ha. PAWS site. Felled and currently regenerating as native woodland. Some non-native regeneration is occurring. Part lies outwith PAWS area planted with native species in 2014.	Fell-to-recycle non-native regeneration. Respace some areas of birch to vary the woodland habitat and woodland structure.
Allt Mhuic east below forest road	Area – 21.3ha PAWS site. Felled and currently regenerating as native woodland. Some non-native regeneration is occurring.	Fell-to-recycle non-native regeneration. Respace some areas of birch to vary the woodland habitat and woodland structure.
Allt Mhuic east below forest road	Area – 7.4ha. Lies adjacent to a PAWS area. Plantation of a mixture of sitka spruce, norway spruce, larch and douglas fir. Birch is regenerating through this crop.	Fell-to-recycle some of the sitka spruce and larch to favour the naturally regenerating birch. Prioritise retention of benign conifer species such as douglas fir and Norway spruce over sitka spruce especially within proximity to the PAWS site.

The above operations will improve the woodland surrounding the Butterfly Reserve especially around the woodland edge and will help to increase resilience for native habitats in this location.

Appendix 1: History of the Reserve

1.0 Background

1.1 Ownership and partnerships

The Butterfly Reserve is owned and managed by Forestry and Land Scotland (FLS). It was acquired from Donald Cameron on 11/05/2003 and forms the central part of the wider Allt Mhuic forest block which was acquired from Locheil Estates in 1955. The Reserve under previous ownership formed part of an extensive area of hill ground grazed by sheep and deer.

The Reserve was officially opened on 02/06/2003 to become the Butterfly Conservation Scotland's first nature reserve in Scotland. The Butterfly Conservation is the lead partner providing advice, surveys and monitoring services.

Forest Research was involved to monitor both vegetation and butterflies at Allt Mhuic to determine the effects of light cattle grazing on chequered skipper (CS) and pearl bordered fritillary (PBF) habitats and populations. The intention is to transfer the lessons learned from management at Allt Mhuic to other sites.

1.2 The Reserve

Allt Mhuic Butterfly Reserve is 69ha in size and consists of a mosaic of native woodland (14.6ha) and open habitats including upland heathland, wet heath/mires/Molinia, bracken/dry heaths. It is protected by a perimeter fence which separates it from the larger woodland habitats to the immediate east and west.

The site has a moderate southerly aspect rising from 50m elevation at the public road near the northern shores of Loch Arkaig to 210m. A forest road dissects the site and as such provides specific management below the road (lower reserve) and above the road (upper reserve).

The Reserve's management control area, Allt Cheanna Mhuir, lies 1.2km west on the outer perimeter of the forest block at NN 1057 9191. It is unprotected by fencing and is 15.5ha in size. It is comprised of ancient semi natural woodland (ASNW) dominated by oak woodland species on the lower slopes, birch woodland in the upper riparian zone with the open habitat comprising of bracken and upland heathland habitats. It has a moderate to steep southerly aspect rising from 45m to 265m elevation.

The site is important primarily for its populations of chequered skipper and pearl bordered fritillary butterflies.

1.3 UKBAP Priority Species

The management of the reserve's habitat aims to support two butterflies classified as threatened species – chequered skipper (main species), and pearl bordered fritillary. These

species and associated habitat have biodiversity action plans (BAP) aimed to aid recovery and prompt three to five yearly progress reports.

These key woodland species were identified for action under the Scottish Forestry Strategy 2006. At that time Forestry Commission Scotland, now Scottish Forestry, developed species action notes to explain in greater detail how they and FLS would contribute to the overall effort. They remain the current best practice for management of these species in woodlands. Both species require sheltered open glades within woodlands or along woodland edges.

1.3.1 Chequered skipper

The chequered skipper (*Carterocephalus palaemon*) used to be found in many parts of the UK. Today it is found within a 25 mile radius of Fort William where the relative mild winters and damp warm summers provide the perfect conditions for the purple moor grass (*Molinia caerulea*) which is the sole food plant for the caterpillar, to remain green until autumn which is long enough to enable the caterpillar to fully develop.

Further information on the chequered skipper and its habitat requirements can be found in Appendix 2.

1.3.2 Pearl bordered fritillary

The pearl bordered fritillary (*Boloria euphrosyne*) is one of the fastest declining butterflies in the UK. The decline is not as marked in Scotland where it has localised populations. Its favoured habitat is short vegetation with light bracken cover (the dead bracken layer heats up in the spring sunshine providing a warm microclimate for caterpillar survival), and the sole food plant dog violet.

Further information on the Pearl bordered fritillary and its habitat requirements can be found in Appendix 3.

2 Management history

The reserve was managed in partnership with Butterfly Conservation Scotland (BCS) as a Butterfly Reserve formally from 2003 to 2013. It has since continued informally from the lapse of the Agreement until 2022.

The primary aim of the management has been to promote conservation of the butterfly and moth species present.

2.1 Broad Objectives

- Maintain wood pasture on the lower site with chequered skipper and pearl bordered fritillary habitat (in glades) in good condition.
- Maintain nectar plants throughout the reserve.
- Encourage natural regeneration of native trees in the upper site to increase shelter and increase the area of butterfly habitat.

2.2 Main Outcomes

1 – Lower reserve.

- Keeping the area (bracken and molinia habitats), from closing with tree regeneration whilst avoiding overgrazing of Molinia habitat.
- Spreading out the bracken litter by trampling so that it keeps a layer which brings warmth to the Pearl bordered fritillary larvae during spring and summer but also lets violets grow.

2- Throughout the reserve

- Increasing the amount of nectar plants such as lousewort and bluebell.

3 – Upper reserve

- Promote tree regeneration to increase shelter

2.3 FLS Management

FLS used their own herd of Highland cattle under light grazing management with the focus on maintaining and enhancing the habitat for chequered skipper. The cattle were successful at maintain wood pasture and setting back dense bracken.

Site maintenance included:

- Fence maintenance
- Site safety inspections three times per year.
- Maintenance of the nature trail.

2.4 Butterfly Conservation Scotland Management

- BCS undertook chequered skipper larval surveys to determine the occupation of suitable breeding habitat every five years commencing 2006. This also include monitoring of larvae in the permanent M26 quadrats.
- They were also tasked with encouraging their members and visiting entomologist to survey the reserve to gain insight into the full extent of its invertebrate community.
- They were tasked to provide a reserve leaflet which would last the lifespan of the initial 10 year plan.
- They were also tasked with raising the profile of the reserve to increase visitors to the site. This was to be achieved through local distribution of the reserve leaflet, submission of articles to media, visits to local schools and events, and delivering talks. Promote the research findings to appropriate audiences.
- Administrative duties included the review and revision of the management plan; the presentation of a summary annual report the outcome of which would drive the work programme for the next year; provide advice for the 2007 Forest Design Plan.

2.5 Forest Research

- Forest research studied the butterflies and the habitat in the reserve.
- The research was conducted to gain a better understanding of the effects of light cattle grazing management regimes on Chequered skipper and Pearl Bordered Fritillary habitat.
- The lessons learned was intended to inform Chequered skipper management elsewhere on both public and private land.

Appendix 2: Chequered Skipper

Background

Where is it found?

The Chequered skipper (*Carterocephalus palaemon*) is a small butterfly with a flight phase confined to late spring. It favours damp, sheltered sunny woodland glades and woodland edges. Once found in other parts of the UK it is now confined to an area within a 25-mile radius of Fort William, however, it may be unrecorded out with this area. The relatively mild winters and damp summers associated with this area is conducive for the lush growth of Purple Moor-Grass that can stay green into the autumn period allowing the caterpillars to complete their development.

Current Status

Chequered skipper is a UKBAP priority species.

According to the Scottish Forestry “Chequered skipper Species Action Note”, it occurs in two of the ten Butterfly Conservation Zones, as determined by Butterfly Conservation Scotland. These zones are Scotland’s most important landscape areas for priority butterflies and moths.

What are its characteristics?

The Chequered skipper is a small butterfly with a fast darting flight. It can sometimes be mistaken as a moth but its clubbed antennae confirm that it is a butterfly. It holds its hind wings flat with the forewings half raised. The golden or silver chequered pattern on a dark brown background on both wings is distinctive.

They exist in a metapopulation which is a network of colonies that are geographically discrete that are linked by the dispersal of individual Chequered skipper between colonies. This forms a large population.

Lifecycle

- The females lay eggs on the blades of Molinia tussocks under Bog myrtle, light birch scrub or the edge of stands of bracken.
- Three weeks later the eggs hatch and the caterpillar feeds on the Molinia.
- The caterpillar hibernates over winter.
- Pupates in April.
- Emerges as an adult in May and lasts until the end of June.
- It has a one year cycle.

Habitat Requirements

- Needs the right habitat requirement for all of its lifecycle stages.
- Associated with damp woodland glades and woodland edges.
- Requires sunny, sheltered normally south facing sites which tend to be below 200m elevation.
- Requires Purple Moor-Grass (*Molinia caerulea*) – the sole foodplant for the caterpillar – on flushed sites in association with Bog myrtle, light birch scrub or the edge of bracken stands.
- Requires nectar plants such as Bugle, bluebell and marsh thistle for the adults.
- Males establish favoured perches such as small birch scrub edges and congregate around nectar sites to form loose colonies.
- The females travel further, sometimes over several kilometres laying eggs as they pass through suitable habitat.

What are the threats?

- Fragmentation between colonies or loss of colonies through inappropriate management or lack of management of their habitat.
- Management of colonies at an individual scale runs the danger of colony loss as management is required at a wider landscape context. Recolonisation is low if other colonies are more than 5km away.
- Tree regeneration within woodland glades and woodland edge causes a loss of Chequered skipper habitat and therefore impacts on the colony.
- Overgrazing of the desired habitat for caterpillar food as well as the loss of nectar plants which support the adults.

Good management practices

The aim is to enhance the habitat in each colony in a metapopulation removing the barriers to the dispersal of Chequered skipper between colonies and ideally create new colonies nearby.

These aims can be achieved through the following management methods:

- Light grazing by cattle or deer is ideal to maintain open glades and keep areas rich in nectar plants. Alternating rotational scrub clearance can also achieve similar results.
- Control bracken to prevent its encroachment into the breeding and nectar habitats.
- Maintain open space within woodlands to enable the Chequered skipper to fly between colonies. This may require re-establishing or creating new open corridors.
- Rides and paths that run east/west provide the greatest proportion of south facing sunny edge.
- The inclusion of scalloped bays at intervals along such south facing edges will provide extra sheltered habitat.

- The routine clearance of scrub along utility wayleaves can provide excellent opportunities for sheltered open habitats and their linear nature will act as corridors for individual Chequered skipper to fly to neighbouring colonies.

Appendix 3: Pearl Bordered Fritillary Background

Where is it found?

The pearl bordered fritillary (*Boloria euphrosyne*) is a butterfly of the springtime found on sunny, sheltered woodland glades and woodland edges and rough hillsides with bracken. It is in rapid decline in the UK, but the decline is less severe in Scotland.

Current Status

Pearl bordered fritillary is a UKBAP priority species.

According to the Scottish Forestry “Pearl bordered fritillary Species Action Note”, it occurs in eight of the ten Butterfly Conservation Zones, as determined by Butterfly Conservation Scotland. These zones are Scotland’s most important landscape areas for priority butterflies and moths.

What are its characteristics?

The Pearl bordered fritillary is sometimes confused with the Small pearl bordered fritillary which is a much more common butterfly in Scotland. Both have orange backgrounds with brown/black markings. They are similar in size but are distinguished from each other by flight periods and the pattern on the underside of the hind wing.

The Pearl bordered fritillary is in flight from mid-May to mid-June in comparison to the small which flies late May to late July. It is also distinguishable by its two large silver pearls and a row of seven smaller outer pearls with red chevrons around the seven pearls on the underside of its hind wing. It tends to fly close to the ground.

They exist in a metapopulation which is a network of colonies that are geographically discrete that are linked by the dispersal of individual Pearl bordered fritillary between colonies. This forms a large population.

Lifecycle

- Eggs are normally laid on dead bracken close to larva food plants in May and June.
- Caterpillars start to hibernate in September usually under bracken litter.
- They re-emerge in the first sunny days in March and bask on the dead dry bracken litter to increase their body temperatures in order to become active and to feed and digest their food.
- The caterpillars pupate in the bracken litter around the end of April, emerging two to three weeks later as adults.
- It emerges as an adult around the middle of May and lasts until the middle of June and only active in warm or sunny weather.
- It has a one year lifecycle

Habitat Requirements

- Needs the right habitat requirements for all stages of their lifecycle.
- Associated with woodland glades or woodland edges on sunny, sheltered and south facing hillsides.
- Favoured sites contain short vegetation with light bracken cover.
- The dead bracken litter heats in the spring sun to provide a warm microclimate for the caterpillars.
- Sole foodplant for the caterpillar is dog-violet
- Adults require nectar plants such as bugle, dandelion, bluebell and bird's-foot trefoil.

What are the threats?

- Fragmentation between colonies or loss of colonies through inappropriate management or lack of management of their habitat.
- Management of colonies at an individual scale runs the danger of colony loss as management is required at a wider landscape context. Recolonisation is low if other colonies are more than 5km away.
- Management of bracken can have detrimental impacts for colonies. Eradication of bracken will destroy colonies, whilst undermanagement of dense bracken will shade out the nectar plants.
- Tree regeneration within woodland glades and woodland edge causes a loss of Pearl bordered fritillary habitat and therefore negatively impacts on the colony and the flight paths between colonies.
- Overgrazing can lead to the loss of nectar plants which support the adults, and it can lead to an excessive increase of bracken, both in extent and density which also impacts on nectar plants.

Good management practices

The aim is to enhance the habitat in each colony in a metapopulation removing the barriers to the dispersal of Chequered skipper between colonies and ideally create new colonies nearby.

These aims can be achieved through the following management methods:

- Light grazing by cattle or deer is ideal to maintain open glades and keep areas rich in nectar plants. Alternative sensitive bracken management will be required in the absence of cattle.
- Trampling by cattle can help to halt the bracken from spreading and becoming over dominant, at the same time allowing conditions suitable for dog-violets to thrive.
- Maintain open space within woodlands to enable the Pearl bordered fritillary to fly between colonies. This may require re-establishing or creating new open corridors.

- Rides and paths that run east/west provide the greatest proportion of south facing sunny edge.
- The inclusion of scalloped bays at intervals along such south facing edges will provide extra sheltered habitat.
- The routine clearance of scrub along utility wayleaves can provide excellent opportunities for sheltered open habitats and their linear nature will act as corridors for individual Chequered skipper to fly to neighbouring colonies.

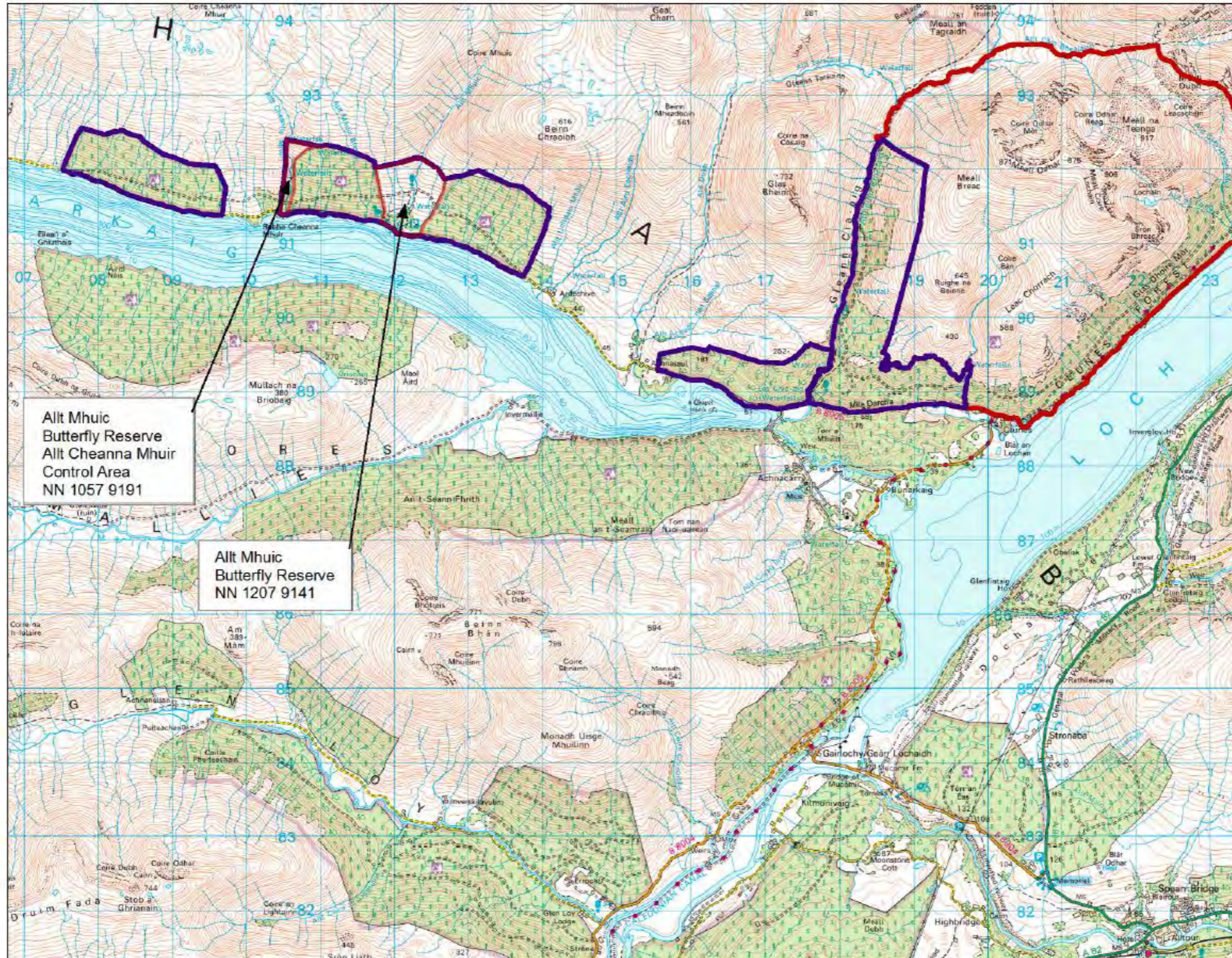
Location map

Loch Arkaig Forest-Allt Mhuic

Author: Catriona MacLennan
Scale @ A3: 1:50,000
Date: 18/07/2023

Legend

- Blocks
- Clunes
 - Loch Arkaig



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Allt Mhuic Butterfly Reserve aerial map



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Land Scotland

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Loch Arkaig Forest-Allt Mhuic

Author: Catriona MacLennan

Scale @ A3: 1:12,500

Date: 18/07/2023

Legend

■ Rec - Car Parks

Blocks

□ Clunes

□ Loch Arkaig

0 0.05 0.1 0.2 0.3 0.4 km



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Allt Cheanna Mhuir
Butterfly Reserve Control Area
15.5ha
NN 1057 9191

Allt Mhuic Butterfly Reserve
69ha
NN 1207 9141

Allt Mhuic Butterfly Reserve
car park accessed from the
C1153

Allt Mhuic Butterfly Reserve Management Map



Forestry and
Land Scotland

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Loch Arkaig Forest-Allt Mhuic

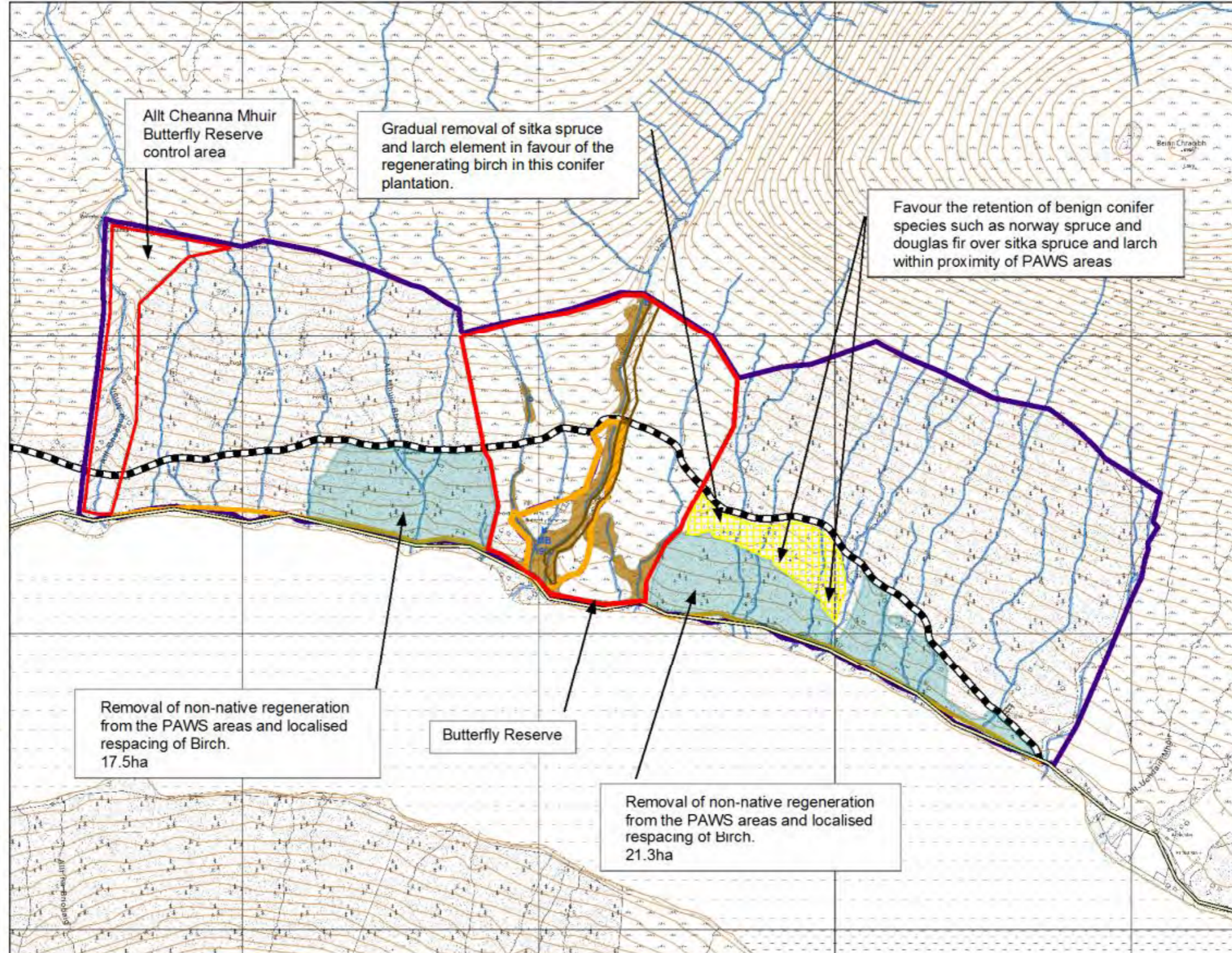
Author: Catriona MacLennan

Scale @ A3: 1:12,500

Date: 09/08/2023

Legend

	Agreements (Active) (Active Agreements)		Ash
	Minor Roads (GB)		Beech
	Conservation Sites		Birch
	Rec - Car Parks		Oak
	Rec - Linear Assets		Native Mixed/Other Broadleaves
	Clunes		Other/Mixed Broadleaves
	Loch Arkaig		Other/Mixed Conifers
	Forest Roads		Douglas Fir
	Watercourses		Larch
	OS 50k Contours (GB)		Lodgepole Pine
			Norway Spruce
			Scots Pine
			Sitka Spruce
			No Species



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