

**ENVIRONMENTALLY SENSITIVE  
AREAS  
IN NORTHERN IRELAND**

**Re-monitoring of –**

**The Mournes and Slieve Croob  
The Antrim Coast Glens and Rathlin  
The Sperrins  
Slieve Gullion**

**Biological evaluation of the ESA scheme  
between 1994 and 2000**

**SUMMARY REPORT**

## **MONITORING TEAM**

The ESA monitoring programme in Northern Ireland is funded by the Department of Agriculture and Rural Development (DARD) through its Science Service and carried out by Queen's University, Belfast (QUB).

**Co-ordinator**            Dr. J. H. McAdam    (DARD & QUB)

**Team members**        Dr. A. Cameron        (QUB)

Miss M. Flexen        (QUB)

Mr. R. J. Johnston    (QUB)

**Address**                Department of Applied Plant Science  
The Queen's University of Belfast  
Newforge Lane  
Belfast            BT9 5PX  
Northern Ireland.

**Tel:**                    028 90255525

**Fax:**                    028 90668372

**Email:**                jimmcadam@dardni.gov.uk

a.cameron@qub.ac.uk

## **ACKNOWLEDGMENTS**

Thanks are extended to DARD group staff for their invaluable help and advice in selecting monitoring sites and contacting farmers and landowners and also to DARD Countryside Management Division for their advice and support. We are also grateful to the farmers/landowners for their co-operation in allowing access to their land and to the Queen's University summer students who assisted with fieldwork.

# CONTENTS

	<b>Page</b>
<b>INTRODUCTION</b>	<b>1</b>
<b>Monitoring programme</b>	<b>1</b>
<b>Heather moorland management survey</b>	<b>1</b>
<b>MONITORING RESULTS</b>	<b>2</b>
<b>Antrim Coast &amp; Glens - heather moorland</b>	<b>2</b>
<b>Antrim Coast &amp; Glens - woodland</b>	<b>2</b>
<b>Rathlin Island heather - moorland</b>	<b>4</b>
<b>Mournes &amp; Slieve Croob ESA - heather moorland</b>	<b>4</b>
<b>Slieve Gullion ESA - heather moorland</b>	<b>5</b>
<b>Sperrins ESA - heather moorland</b>	<b>5</b>
<b>Heather moorland management survey</b>	<b>6</b>
<b>CONCLUSIONS</b>	<b>8</b>
<b>REFERENCES</b>	<b>9</b>

## INTRODUCTION

### **Monitoring programme**

Biological and landscape monitoring programmes were established in all ESAs in 1992 to determine if the ESA scheme is fulfilling its objectives of maintenance and enhancement of target habitats. A baseline biological monitoring programme in the West Fermanagh and Erne Lakeland ESA was completed in 1993 (Hegarty *et al.* 1994). Baseline surveys of the Mournes & Slieve Croob ESA, the Sperrins ESA, the Slieve Gullion ESA and the Antrim Coast, Glens & Rathlin ESA were completed in 1994 (Hegarty *et al.* 1995). These surveys provided baseline data on the wildlife value of a range of target habitats, from participant and non-participant farms within the ESA boundary. Plant and invertebrate species (ground beetles and spiders) were monitored as indicators of habitat quality and to determine the effects of ESA scheme prescriptions.

The West Fermanagh & Erne Lakeland ESA was re-surveyed in 1999 six years after baseline biological monitoring (Cameron *et al.* 2000). A complete re-survey of all of the other four ESAs was carried out in 2000. Data on plant and invertebrate species composition were compared between years for ESA participant and non-participant farms to determine the effects of ESA scheme prescriptions on heather moorland in the Mournes and Slieve Croob ESA, the Sperrins ESA, the Slieve Gullion ESA and heather moorland and woodland in the Antrim Coast, Glens and Rathlin ESA.

### **Heather management study**

Heather moorland has been traditionally managed by rotational burning of small patches of older heather to create a mosaic of uneven aged stands. A combination of mature heather and young developing heather has been shown to be the most desirable combination for production and for species conservation (Gimingham 1985). There is little history of controlled heather management on ESAs in Northern Ireland. In 1997 baseline monitoring was carried out on a number of heather sites that had recently been either burned or flailed. These were re-surveyed in 2000 to provide information on the suitability and effectiveness of these management practices in Northern Ireland.

## MONITORING RESULTS

### **Antrim Coast and Glens - heather moorland**

Although the Antrim Coast, Glens & Rathlin form one ESA, Rathlin Island has been considered separately due to the distinct composition and character of the flora and fauna. Generally the picture in the Antrim Coast & Glens is positive with species diversity being maintained between 1994 and 2000. There was an increase in species diversity in terms of the number of species recorded and a slight increase in heather cover. The proportion of stress-tolerator plant species i.e. the species most vulnerable to environmental change also remained stable on participant sites. Another positive indicator was an increase in the number of carabid beetle and spider species on participant farms. Possible areas of concern were an increase in grassland species and mat grass (*Nardus stricta*) on sites that had been previously heavily grazed. Increases in these species are usually due to grazing pressure. Further decreases in stocking rate may be beneficial on sites that were heavily grazed prior to ESA agreement.

### **Antrim Coast & Glens - woodland**

The main objective of the ESA woodland prescription of fencing to exclude livestock is to increase tree regeneration. The aim is also to increase or maintain the plant species diversity of the ground flora. The results of the monitoring programme have shown a decrease in the number of plant species in ESA participant woodland sites between 1994 and 2000. The mean number of plant species recorded (excluding mosses and lichens) decreased significantly between the years. Although certain woodland indicator species may have disappeared or declined from some sites, other ecologically important species were newly recorded in 2000. The small size and fragmented nature of many of the woodland sites is also likely to make colonisation by new species very slow. Several of the species not re-recorded on participant sites were non-desirable in conservation terms which is a positive indicator. Reduction of grazing pressure may be allowing aggressive plant species to become dominant. These then shade out smaller or less competitive species. There may also be a shading effect from increased shrub growth in the under-storey since grazing exclusion. Some grazing and trampling by livestock may therefore have a positive effect in maintaining species diversity as it keeps a check on certain species such as bramble and coarse grasses.

A significant decrease in bare ground cover was recorded between 1994 and 2000 probably due to the absence of trampling and poaching by livestock on most participant sites. The abundance of primrose (*Primula vulgaris*) decreased possibly due to competition from other

species. In general there was a decrease in grass cover on sites that were grazed in 1994 but not in 2000. Other studies have shown a general increase in cover of woody species at the expense of grasses and herbs when woodland is fenced (Latham & Blackstock, 1998).

The proportion of ruderal species (i.e. those that exploit disturbed habitats) decreased on participant sites indicating a reduction in disturbance. There was also a decrease in the proportion of desirable stress-tolerating species and an increase in undesirable competitor species on non-participant sites. Observations on presence and abundance of seedlings and saplings suggest that although there was successful seedling recruitment at several sites these were not often surviving to sapling stage. This may be due to competition from more aggressive plant species in the field layer or increased shading by shrub cover following grazing exclusion. A level of ground disturbance by livestock may be important for the regeneration of certain tree species as it reduces competition and creates niches for seedling establishment (Pigott, 1983). There was also a lack of canopy gaps where trees can become established. Ash and sycamore were the most frequent regenerating tree species in ungrazed sites. No oak regeneration was observed. The small number of actively grazed sites means that no real comparison can be made with ungrazed woodlands. Although fenced a number of sites were subject to occasional light grazing due to stock trespass. Studies on regeneration in broad-leaved woodland in Scottish ESAs have shown that seedling and sapling numbers may be more strongly influenced by natural variations of climate and seed production than by stock enclosure (Henderson *et al*, 1997).

The woodland sites in the Antrim Coast and Glens ESA vary considerably from semi-natural woodland and scrub to species-poor broad-leaved plantation. They have different structures, species composition, past management regimes and environmental conditions. It is difficult therefore to generalise about the effects of excluding livestock as several factors as well as grazing interact to determine species diversity and tree regeneration. The variability between woodland sites in the Antrim Coast Glens & Rathlin ESA means that, ideally, site-specific management plans should be implemented for successful enhancement of biodiversity and natural regeneration. Low levels of grazing by large herbivores provides a greater diversity in vegetation structure and species composition than either overgrazing or the absence of grazing in fenced woods (Mitchell and Kirby, 1990). For example the Forestry Commission recommend a stocking density of 0.5 sheep per ha for upland mixed ashwoods in order to improve regeneration, ground flora and structure (Mayle, 1999). Most studies on the effects of livestock exclusion on broad-leaved woodland have been over long time periods, for example

up to 26 years (Piggott, 1983). In general, it can be concluded that permanent complete exclusion is not necessary to ensure regeneration. Longer term monitoring should determine the success of woodland exclosure in the Antrim Coast & Glens although effects will vary between individual sites.

#### **Rathlin Island – heather moorland**

Moorland sites on Rathlin had greater plant and invertebrate species diversity in terms of mean numbers of species per unit area than the other ESAs. There were no significant changes in mean numbers of plant, higher plant or carabid beetle and spider species between 1994 and 2000 for ESA participants or non-participants indicating that species diversity is being maintained on heather moorland sites on Rathlin. There were differences in plant species composition between years as the proportion of stress-tolerating species increased slightly and the proportion of competitive species decreased by the same amount, both positive indicators of the effects of the Scheme. Although not statistically significant, the mean cover of heather and bell heather increased between years on ESA participant sites. The heather on Rathlin is very short due to climatic suppression, so effects of grazing on *Calluna* height are difficult to determine.

#### **Mournes & Slieve Croob ESA - heather moorland**

There were no significant changes in mean numbers of plant, higher plants, carabid beetle or spider species between years for ESA participants or non-participants indicating that species diversity has been maintained. The total number of plant species recorded increased slightly. Dwarf shrub cover was low on the Mournes sites and has decreased between 1994 and 2000. Heather (*Calluna vulgaris*) cover on participant and non-participant sites has not increased within the existing heath/grassland mosaics, however it should be noted that the sample size was too small to determine if there was any statistical significance. There has also been an increase in purple moor grass (*Molinia caerulea*) on all sites. There was a slight decrease in the proportion of stress-tolerators and an increase in the proportion of generalist species on participant sites.

These results are indicative of high grazing intensity, leading to a general increase in grass species and a decline in ericaceous species. There is also evidence of previous uncontrolled burning at some sites, which may have been a contributory factor. Monitored sites in the Mournes & Slieve Croob were mainly heavily grazed prior to ESA agreement and heather

cover was extremely low (6-10%) at baseline monitoring. As in the Antrim Coast & Glens further decreases in stocking rate may be beneficial on such sites.

The spider species *Neon reticulatus* was recorded in the Mournes & Slieve Croob and is a new record for Northern Ireland.

### **Slieve Gullion ESA - heather moorland**

The plant species diversity of heather moorland on Slieve Gullion for ESA participant or non-participant sites was maintained between 1994 and 2000. There were no significant changes in mean numbers of plants per site or the total number of species recorded. There were indications of positive change in plant species composition on ESA participant sites as most of the species not re-recorded in 2000 were characteristic of nutrient rich grassland i.e. perennial rye-grass (*Lolium perenne*) and ragwort (*Senecio jacobea*). New species recorded on non-participant sites in 2000 were mainly non-heathland species indicating a reduction of habitat quality for non-participant heather moorland.

Heather cover increased significantly on ESA participant sites. Together with a significant decrease in mat grass (*Nardus stricta*) indicating a reduction of grazing pressure on sites under ESA agreement. The cover of western gorse (*Ulex gallii*) also increased, suggesting a possible spread due to low grazing intensity. Another species likely to increase in the absence of grazing on dry heathland sites in Slieve Gullion is bracken (*Pteridium aquilinum*). Although not apparent from the current re-monitoring, the spread of bracken is a potential cause for concern as it can lead to shading out of heather and other species.

There was no significant change in the numbers or species composition of carabid species in the Slieve Gullion ESA although numbers of spider species increased significantly on ESA participant farms.

### **Sperrins ESA - heather moorland**

The overall plant and invertebrate species diversity of heather moorland in the Sperrins on both participant and non-participant sites was maintained between 1994 and 2000. There were some indications of an increase in diversity and improvement in habitat quality on ESA participant sites with a significant increase in the mean number of plant species, a slight increase in the proportion of stress-tolerating species and a decrease in ruderal species. Increases in species number was due to bryophytes and lichens, possibly caused by a

reduction of trampling by stock. There was also a significant increase in the mean cover of *Sphagnum* species and a slight increase in *Calluna* on participant sites, further indications of improved habitat quality. The Sperrins ESA had lower species diversity in terms of mean numbers of higher plants per site than the other ESAs as most of the sites were on blanket bog which has a naturally lower species compliment.

On both ESA participant and non-participant sites most of the higher plants not re-recorded in 2000 were non-heath species characteristic of fertile grassland, indicating improvements in the species composition of the heather moorland. There were very few 'new' species recorded suggesting overall habitat stability and possible improvement.

The carabid beetle species *Carabus nitens*, identified as an indicator species during baseline monitoring, decreased in frequency on non-participant sites. Numbers of spider species and individuals increased significantly on both participant and non-participant farms in the Sperrins and this increase was greater on participant farms. The spider *Sintula cornigera* was recorded in the Sperrins in 2000 and is a new Irish species record. Three other spider species recorded in the Sperrins *Micrargus subaequalis*, *Meioneta beata* and *Bathyphantes setiger* are new records for Northern Ireland.

A potential cause for concern in the Sperrins was a significant increase in the amount of dead *Calluna* recorded. One possible cause of this is damage caused by the heather beetle (*Lochmaea suturalis*), the larvae of which feed on young heather shoots. A heavy outbreak causes plants to suffer water stress, turn orange-brown and die (MacDonald, 1990). This species was trapped in large numbers at some sites and will be particularly noted in future monitoring. High incidences of heather beetle attack have been recently observed in England and Scotland. The Heather Trust recommends that no remedial action is necessary other than good heather management.

### **Heather management study**

Monitoring was carried out to assess the suitability of burning and flailing as heather management techniques in Northern Ireland. Species diversity and composition were compared on flailed and burned sites, and respective controls, between 1997 and 2000. In 2000 there were no significant differences in the number of plant species recorded between burned or flailed sites and the controls. Thus regeneration and re-colonisation of the heathland

appears to have been successful in both cases. As expected, bare ground significantly decreased as the abundance of heather and other colonising species increased. The species composition of burned and flailed sites and the controls were very similar although the abundance of certain species still varied four years after management. Burning of dry heath is known to cause an increase in grasses, whereas on wetter peat purple moor-grass, deer-grass and cotton-grasses often increase. These species may be encouraged by burning as their growing points are underground or protected by the tussocky growth form. In general this was the case for the sites in this study. Burning or cutting of the drier sites led to an increase in bent grasses and sedges. Wet heath and blanket bog sites showed an increase in cotton-grasses, in particular *Eriophorum vaginatum*.

The effects of burning and flailing on the re-growth of *Calluna vulgaris* were examined. An initial comparison in 1998, two years following management found that regeneration was occurring more rapidly on burned than flailed sites. This trend appears to be continuing as a slightly higher cover of *Calluna vulgaris* was found on burned sites in 2000. Other experimental studies comparing the effectiveness of cutting to burning have found that flailed sites had a time lag of one year in achieving a particular cover value (Cotton and Hale, 1994). If increase in heather cover remains constant it will have recovered to the levels of controls by 2005/6, i.e. nine or ten years after management.

Several factors play a part in the regeneration of heather, which has led to management being more successful on some sites than others. Those sites which heather management was studied included dry heath, wet heath and blanket bog vegetation. The effects of burning or flailing are likely to be different depending on the vegetation type and soils. The age of stand before burning or cutting will affect the regeneration of heather. In this study all sites had mature and in some cases degenerate heather. The flailing process left behind some mature bushes and lower stems. Old bushes are less likely to regenerate from stem base (MacDonald, 1990). Heather stands also have the capacity to recover from damage by regeneration from seed. For seed germination to be successful the underlying peat surface needs to be exposed. This may be an explanation for the higher regeneration of heather by burning rather than flailing, as burning removes more litter and the ground layer of mosses.

A major factor in determining the effects of management on heather is the interaction with grazing. Levels of grazing within the study varied considerably. Some sites were under ESA agreement and had relatively low levels of grazing, with winter exclusion of livestock. Other

sites were under higher and more constant grazing pressure, which has possibly had a limiting effect on heather re-growth. Sheep will preferentially graze areas that have been recently burned or cut where heather is shorter than surrounding mature bushes (Grant, 1968). In this study only fairly small patches of heather were burnt or flailed leading to overgrazing on some sites. Heather regeneration was less successful at sites where high grazing pressure was apparent due to sheep being attracted to these areas. A system such as that used in Scotland where a proportion of the area is burned every year should alleviate this problem and create the desired mosaic of differing ages of heather stand.

## CONCLUSIONS

In general, species diversity has been maintained on heather moorland in the Antrim Coast Glens & Rathlin, Slieve Gullion and the Sperrins. There are indications of positive effects of the ESA scheme such as increases in heather cover on participant sites and increases in bryophytes indicating reduced trampling by stock. There were negative indicators on non-participant sites such as increases in grass species and indicators of heavy grazing such as mat grass *Nardus stricta*. Some sites in the Mourne & Slieve Croob ESA that had been grazed heavily (with only 6-10% heather cover) have shown little improvement and it may be that further reduction of stock on areas such as this will be necessary to initiate recovery.

In the Sperrins there has been a loss of grass species on participant farms and an increase in *Calluna*, *Sphagnum* spp. and stress-tolerator species, all indicators of a decrease in grazing pressure and an improvement in habitat condition. There has also been an increase in dead heather in the Sperrins. This is of potential concern as it may lead to long-term loss of heather cover even if positive grazing management has been implemented. This may have been caused by damage by the heather beetle and this species will be particularly noted in future monitoring.

Reduced grazing pressure has had a positive influence on heathland vegetation in the Slieve Gullion ESA with an increase in *Calluna* and a decrease in grassland species. Western gorse has also increased, probably as a result of decreased trampling. It should also be noted that in this area a decrease in stocking levels may in some instances lead to increases in bracken.

The effects of grazing exclusion on woodlands in the Antrim Coast Glens & Rathlin ESA are as yet unclear. Changes in woodland occur over an extended period of time and at present

there are both positive and negative effects of grazing exclusion. Due to the diverse nature of the woods in this ESA, ideally site specific management plans should be implemented for each wood. Previous studies suggest that permanent total grazing exclusion is not necessary to ensure woodland regeneration.

Examination of the effects of burning and flailing for heather moorland management indicated that heather regenerated more rapidly after burning but both methods gave satisfactory results and could be used depending on prevailing circumstances. A rotational system of burning part of the moor each year should be adopted to maintain the desired mosaic of uneven heather stands and prevent congregation and overgrazing by sheep on recently burned patches.

The ESA scheme has been in operation in its present form for eight years and there is evidence to suggest that it has been instrumental in the maintenance and enhancement of target habitats. Monitoring has also determined that on some areas, such as severely degraded heath, modifications to the ESA prescriptions may prove beneficial.

## REFERENCES

**Cotton, D.E. & Hale, W.H.G. (1994).** Effectiveness of cutting as an alternative to burning in the management of *Calluna vulgaris* moorland: results of an experimental field trial. *Journal of Environmental Management*, **40**, 155-159.

**Cameron, A., Flexen, M., Johnston, R.J. & McAdam, J. H. (2000)** *Environmentally Sensitive Areas in Northern Ireland. Remonitoring of the West Fermanagh & Erne Lakeland ESA. Biological evaluation of the ESA scheme between 1993 and 1999.* Queen's University of Belfast.

**Gimingham, C.H. (1985).** Muirburn. In: *Vegetation management in northern Britain*, ed.R.B. Murray, 71-75. British Crop Protection Council (Monograph No.30).

**Grant, S.A. (1968).** Heather regeneration following burning: a survey. *British Grassland Society Journal*, **26**, 26-33.

**Hegarty, C., McFerran, D., Cameron, A. Mulholland, F. & McAdam, J.H. (1994).** Environmentally Sensitive Areas in Northern Ireland. Biological Monitoring Report Year One – 1993.

**Hegarty, C., McFerran, D., Cameron, A. Mulholland, F. & McAdam, J.H. (1995).** Environmentally Sensitive Areas in Northern Ireland . Biological Monitoring Report Year Two – 1994.

**Henderson, D.J., Nolan, A.J., Madden, S. & Still, M.J. (1997).** The effects of domestic livestock enclosure on broadleaved woodland regeneration in three Scottish Environmentally Sensitive Areas. *Scottish Forestry* **51** (1), 6-14.

**Latham, J. & Blackstock, T. (1998).** Effects of livestock exclusion on ground flora and regeneration of *Alnus* woodland. *Forestry*, **71** (3), 191-197.

**MacDonald, A. (1990).** *Heather damage: a guide to types of damage and their causes.* Research and survey in nature conservation No.28. Nature Conservancy Council, Peterborough.

**Mayle, B. (1999).** *Domestic stock grazing to enhance woodland biodiversity.* Forestry Commission, Edinburgh.

**Mitchell, F.J.G. & Kirby, K.J. (1990).** The impact of large herbivores on the conservation of semi-natural woods in the British Uplands. *Forestry* **63**(4), 333-353.

**Piggott, C.D. (1983).** Regeneration of oak-birch woodland following exclusion of sheep. *Journal of Ecology* **71**, 629-646.