Threat Response Plan

Kerry Slug *Geomalacus maculosus*

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Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government

Contents

Summary
This plan is prepared as part of Ireland's response to the judgement of the European Court of Justice in case C-183/05, and the requirement to establish a system of strict protection for the Kerry Slug *Geomalacus maculosus*, as one of the animal species listed in Annex IV(a) of the Habitats Directive.

The Kerry Slug is strictly protected in Ireland and a person who deliberately captures, kills or disturbs a specimen in the wild, or who damages or destroys its breeding site or resting place, is guilty of an offence.

A key issue affecting the Kerry Slug is the paucity of information about its full range, distribution and population as well as significant gaps in knowledge about its ecology in Ireland. Based on current knowledge the main pressures and threats to the species are considered to be:

- forestry management (including afforestation);
- invasion of woodland habitat by *Rhododendron ponticum;*
- agricultural reclamation, and
- fragmentation of habitat and isolation of populations by major infrastructure such as roads

A number of significant steps have been taken in recent years to secure the long term future of the Kerry Slug in Ireland:

- The Kerry Slug is listed as a selection feature for seven cSACs.. Most of these are large sites incorporating extensive blanket bog and peatland systems and some contain significant areas of deciduous woodland. The largest site is the Killarney National Park, Macgillycuddy's Reeks and Caragh River catchment cSAC which extends to over 76,711 hectares.
- A Species Action Plan (now superseded by this Threat Response Plan) was produced in 2008.
- The National Roads Authority has prepared guidance for the survey and protection of protected species including Kerry Slug during the planning and construction of national roads.
- Environmental schemes in both forestry and agriculture are providing incentives to landowners to manage land in a manner which is compatible with the conservation requirements of the Kerry Slug.

This plan sets out actions for a comprehensive programme of survey, monitoring and research as well as additional measures which should ensure the long term favourable conservation status of the Kerry Slug in Ireland.

1. Introduction

This plan supersedes the Kerry Slug Species Action Plan published by NPWS in January 2008. It is prepared as part of Ireland's response to the judgement of the European Court of Justice in case C-183/05, concerning *inter alia* Article 12 of the EU Habitats Directive 92/43/EEC and the requirement to establish a system of strict protection for the animal species listed in Annex IV(a) of the Directive. The Kerry Slug is one of the species named in Annex IV(a).

Article 12 of the Habitats Directive reads as follows:

> *1. Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:*
>
> > *(a) all forms of deliberate capture or killing of specimens of these species in the wild;*
> >
> > *(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;*
> >
> > *(c) deliberate destruction or taking of eggs from the wild;*
> >
> > *(d) deterioration or destruction of breeding sites or resting places.*
>
> *2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented.*
>
> *3. The prohibition referred to in paragraph 1 (a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies.*
>
> *4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.*

The Kerry Slug *Geomalacus maculosus* Allman is a member of the gastropod family Arionidae which is widely distributed in the Palaearctic but has its centre of distribution in western and southern Europe and particularly in the Iberian Peninsula (Castillejo *et al.* 1994). A total of four species of *Geomalacus* Allman are known: *G. anguiformis* (Morelet 1845); *G. maculosus* Allman 1843; *G. malagensis* Wiktor & Norris 1991; *G. oliveirae* Simroth 1891.

The Kerry Slug has a very small global range being restricted to north-western Iberia (Spain and Portugal) and south-west Ireland (Appendix 1, Map 1). Its

distribution has been described as "Lusitanian", as it inhabits the Atlantic region of Iberia and Ireland (Scharff, 1893). The species is closely associated with and restricted to the sandstone geology of west Cork and Kerry (Boycott 1931; Platts & Speight 1988; Moorkens & Killeen, 2009) where it has been recorded from 50 10km squares since 1965.

There is some evidence of a decline in its core Iberian range (Platts & Speight 1988). In view of this and the uncertainty of its status in Ireland the Kerry Slug was listed as a strictly protected fauna species in Appendix II of the Bern Convention and subsequently in Annex IV(a) of the EU Habitats Directive 92/43/EC. A recent conservation assessment in Ireland (NPWS 2008a) noted that there was no evidence of any recent range reduction in Ireland and concluded that the species was in Favourable Conservation Status. However, it was acknowledged that this assessment was based on limited data on population, distribution and habitat condition, particularly outside SACs (NPWS 2008a).
More recently the species was assessed as of least concern in Ireland under IUCN red list criteria (Byrne *et al.* 2009). The Kerry Slug was assessed as having a strong population that may be capable of expanding its range with global warming. It was acknowledged that the Irish population is important in a global context with the Iberian populations being severely threatened (Byrne *et al.* 2009).

2. Range

2.1 Overview

The Kerry Slug's principal area of distribution lies in the north-western quarter of the Iberian Peninsula and principally in Galicia in Spain and the northern part of Portugal (Castillejo *et al.* 1994).

As presently known, it occurs outside Iberia only in south-western Ireland (Appendix I, Map 1). A single individual was reputedly collected on 6 February 1868 by M. Taslé in western France "sous les feuilles mortes dans l'avenue de Conlo près Vannes (Morbihan)" (Desmars 1873). However since specimens belonging to *Arion* were incorrectly ascribed to *Geomalacus* from elsewhere in France at this time, and there are neither specimens deposited in museum collections nor any subsequent records, Platts & Speight (1988) and subsequently Falkner *et al.* (2002) have chosen to disregard the record.

In Ireland, the Kerry Slug has been recorded from 43 10 km squares since 1970 with a further seven 10 km squares having older records which have not been verified more recently (Kerney 1999). Additional records from Kerney's Atlas

(from square V36) have not yet been verified, and are not represented on official distribution maps. Since Kerney's Atlas, most recent records relate to an undergraduate dissertation on distribution of the slug in the Killarney National Park (Barron 1998) and to environmental impact assessments on the re-alignment of the N22 Cork to Killarney carriageway at Ballyvourney, West Cork (Anderson unpublished). The known distribution is presented in Appendix I, Map 2. Density of records per 10-km square in Ireland is illustrated in Appendix I, Map 3.

2.2 Geographical restriction and geology

The current distribution of the Kerry Slug in Ireland is geographically restricted. Whilst it is not known for certain what constrains it within this range, climatic and geological factors are thought to contribute by the majority of authors.

Its range in Iberia is centred upon areas of old, weathered metamorphic rocks including granites (Portugal), slates, quartzite, schists, gneiss and serpentine (Galicia, Leon) of Silurian, occasionally of Cambrian or Ordovician age (Castillejo *et al.* 1994). There are also small areas of Lower Devonian outcropping. All these structures are heavily weathered, acid for the most part and low in soluble minerals.

Within Ireland, the Kerry Slug has been recorded mainly or only on Devonian Old Red Sandstone strata which are also acid and mineral-poor (Appendix I, Map 4). An aversion to more mineral-rich or basic rocks and soils has been noted by Boycott (1931) and Platts & Speight (1988) with reference to the areas around limestone reefs outcropping in the sandstone of the Killarney Valley in Kerry.

It is surprising that the Kerry Slug has not been recorded from a large area of Devonian sandstone further east from its known range (see Appendix I, Map 4). Climatic or some other factor may be at work here but its nature will remain speculative until more data are available on its occurrence in this area.

3. Habitat

Within its Irish range the Kerry Slug occurs in three broad habitat types:

- Deciduous woodland
- Blanket bog or unimproved oligotrophic open moor
- Lake shores

These habitats correspond to a number of Habitats Directive Annex I habitat types (NPWS 2008a). These are:

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*
8220 Siliceous rocky slopes with chasmophytic vegetation
7130 Blanket bog
4030 European dry heaths
4010 North Atlantic wet heaths with *Erica tetralix*
4060 Alpine and Boreal heaths
3110 Oligotrophic waters (shores of acid oligotrophic lakes)

Within these macro-habitats the Kerry Slug only occurs if particular micro-habitat requirements are met, such as sandstone boulders or rock outcrops, high humidity and sufficient lichen and moss growth for food and shelter. The Kerry Slug feeds predominantly on lichens and algae growing on rocks or on mature trees and timber (Boycott & Oldham 1930). It conceals itself in rock crevices, holes in tree trunks or under carpets of moss (Anderson unpublished).

Platts & Speight (1988) have drawn attention to the affinity the species shows for the vicinity of water at low altitudes, whether in forest or on open ground. It clearly has a need for high atmospheric humidity and this would help explain not only its preferences within the restricted range but also the overall geographical restriction. It is difficult otherwise to account for its restriction to the western part of the Devonian strata in West Cork (Appendix I, Map 4).

An allied question is which biotope the species evolved in and is best adapted to. In Ireland it has been found in both wooded localities and on more open, rocky ground. In Iberia, Castillejo *et al.* (1994) refer to captures on the bark of oaks and beeches and on the surface of stone walls in montane forests and oak groves, but mainly after dark. In daylight hours only juveniles were encountered. The other *Geomalacus* species occupy rocky places in *Quercus* and *Pinus* forest (Castillejo *et al.* 1994) so it is clear that the preferred biotope for the genus as a whole is woodland.

The large populations which exist on the open, rocky slopes of West Cork and Kerry may be atypical of its range as a whole in being on open ground. The Atlantic influence of the climate across this part of Ireland probably compensates for the lack of tree cover by maintaining consistently high atmospheric humidity.

Adults are said to appear during and after rain in daylight hours (Taylor 1907; Platts & Speight 1988) but otherwise normally only at night, as in Iberia. Juveniles appear less restricted and may be observed feeding on exposed rocks during daylight hours unless conditions are particularly sunny or dry (Anderson unpublished).

Recent field work (Anderson unpublished) on Kerry Slug populations in the vicinity of proposed road works at Ballyvourney, West Cork, has provided some detail on habitat preferences:

Within woodland:

- Occupied niches: under damp moss on horizontal or near-horizontal branches; deep in crevices on trunks where they were often detectable.
- Tree species tenanted, with number of specimens found: Rowan *Sorbus aucuparia* (2); Holly *Ilex aquifolium* (7); Downy Birch *Betula pubescens* (4); Ash *Fraxinus exelsior* (8); Sessile Oak *Quercus petraea* (10); Rhododendron *Rhododendron ponticum* (2); Douglas-fir *Pseudotsuga menziesii* (1).
- Woodland types with very low slug densities or where the slug may have been absent: *Rhododendron* thicket; close-canopy conifer plantation; mature beech woods.

Within Atlantic bog and heath:

- Under moss on rock slabs (7 adults, 4 juveniles).
- Under large rocks (1 adult, 6 juveniles)
- Feeding in the open on rocks (10 juveniles).
- Untenanted niches: open bog; rough grassland; improved land with boulders removed.

Within cultivated grassland:

- On trees on old stone walls (dykes): Sessile Oak *Quercus petraea* (3 juveniles); Holly *Ilex aquifolium* (2 adults).
- Untenanted niches: semi-improved pasture; recently disturbed stone piles in improved pasture; boulders moved as part of agricultural 'reclamation schemes'.

The Kerry Slug has been observed to consume a wide range of foods typically found on tree branches or exposed rocks: lichens, fungi, algae, mosses and

liverworts (Boycott & Oldham 1930; Platts & Speight 1988; Rosas *et al.* 1992; Rodriguez *et al*. 1993; Speight 1996).

Castillejo (1996) lists Kerry Slug as a species which in Spain has been known to damage cultivated vegetables. The listing is not, however, supported by other evidence and there is no indication that this is an issue in Ireland apart from a spurious reference by Godan (1983) to it damaging sugar beet seedlings.

4. Population

There is no information on the total population of the Kerry Slug in Ireland, while data on the abundance of the species is restricted to observations at a handful of sites. This section provides detail on a proposed methodology for obtaining population data for the species.

4.1 Published abundance estimates

Present information on abundance is restricted to anecdotal observations and limited field work performed recently (2007, 2008) for studies associated with a proposed road route at Ballyvourney, West Cork (Anderson unpublished).

Densities found from captures during field work are:

- Vicinity of large boulders in bog/heath biotopes – up to 2 adults per sq. m. of exposed lichen or moss-clad rock
- For suitable native broadleaf woodland – up to 10 adults in the bottom 2 m of stem of a 15-20 m ash or oak tree.

It was not possible to determine absolute abundance during this work so the figures represent significant under-estimation of absolute values.

4.2 Methodology

The estimation of abundance is particularly difficult in the absence of a recognized, efficient method for trapping the species which is applicable in different types of terrain, but particularly in woodland. Since the object of population studies in the present context is to estimate change in population size, absolute values of abundance are unnecessary. Desirable characteristics of a Kerry Slug monitoring scheme include:

- Ease of use. The large land area to be monitored will render either very technical or very labour intensive systems unworkable

- Flexibility. The Kerry Slug can occur equally in open range and in dense woodland. Any monitoring technique should work equally in these biotopes.
- Repeatability. Monitoring by its nature will be repeated at intervals and temporal congruence requires that results should be as reproducible as possible.
- Non-destructive. The target organism is a protected animal, and therefore methods should be non-destructive.
- Accuracy. To comply with the requirements of the Habitats Directive, any method will have to be sufficiently accurate to allow population trends to be estimated over time.

Options:

- Mark-re-capture. Estimates of abundance in slugs can now be made by mark-recapture using a fluorescent dye (Foltan & Konwicka 2008). This is a technical, expensive method applied to studies in intensive agriculture. Wallin & Latty (2008) have also used coloured elastomers in mark-capture-recapture involving slugs and Grimm (1996) has used magnetic transponders.
    - Conclusion: non-destructive but expensive; not suited to large geographical areas; labour intensive.
- Refuge traps (Hommay *et al.* 2002; Archard *et al.* 2005). Like the previous, this method has been applied to populations in easily accessible arable and other cropping systems. Traps consist of slate, ceramic or wood tiles (10 x 10cm) held in place on the ground surface by wire pegs. Comparison between sites and estimates of density can be made (Hill *et al.* 2005). The tiles are placed randomly at an average density of 4 per m^2 in suitable terrain. A total of >150 tiles per site is required to give reproducible results and measurements made on three dates within a given year. The tiles are set in warm wet weather and lifted the next day.
    - Conclusion: non-destructive but very labour intensive and weather dependent; does not work in woodland biotopes.
- Pitfall traps. Traps are set with 1 cm ethylene glycol trapping medium in straight transects of 10 traps with 5 m intervals. Traps are lifted at either two week or one month intervals and should be set during periods of maximum slug activity i.e. spring and autumn. There is an abundant literature on the efficiency of pitfalls in relation to trapping of slugs and other invertebrates (Ward *et al.* 2001). Habitat structure has been shown not to interfere with efficiency of slug capture in wilderness (Melbourne *et al.* 1997), but the method clearly cannot access slugs living on tree boles.

    - Conclusion: destructive but reproducible; easily set up and not excessively labour intensive; not applicable to woodland biotopes.
- Baited traps may be a suitable option for trapping Kerry Slug. Brady and Perace (2007) successfully collected large numbers of *Pallifera* species in Ohio, U.S.A. using pitfall traps baited with venison and propylene glycol as a preservative. The authors postulated that the slugs were attracted by the propylene glycol as opposed to the venison because the species is a strict herbivore. Slugs within the genus *Pallifera* are known to feed on lichens in forests, so a similar but modified trapping technique might be suitable for the Kerry Slug in Ireland. The preservative propylene glycol could be placed in small wire-covered containers inside pitfall traps to prevent poisoning of the slugs attracted to it.
    - Conclusion: non-destructive and reproducible but so far untried; easy to set up but may not be applicable to slugs living on trees.
- Hand search. The least technical and perhaps most widely applicable method. However, some knowledge of slug habits is a pre-requisite and some niches (under-side of large boulders; tree boles above 2 m) are not searchable.
    - Conclusion: non-destructive but not very reproducible unless tied to a strict protocol; labour intensive but not excessively so; applicable to woodland biotope.

NPWS has commissioned research into the effectiveness and practicality of the various options described above for survey and monitoring the Kerry Slug. This research started in 2010 and is due to be completed in 2011 and one expected outcome is a recommendation on the most appropriate survey and monitoring methodology for the species.

5. Scientific Monitoring

In its judgment C-183/05, the European Court of Justice found against Ireland that the monitoring in place for the Kerry Slug was inadequate. An outline of the actions required in respect of research and monitoring for the species was established in the Kerry Slug Species Action Plan (NPWS 2008b). It is recognised that a more detailed systematic approach to data collection is now required and this is set out below.

5.1 Previous monitoring

Species monitoring is a process in which distribution and status of the subject is evaluated systematically over time. Under this definition no monitoring of the Kerry Slug has yet been undertaken in Ireland. Such studies as have been

undertaken are limited in time e.g. environmental risk assessments of the impact of carriageway construction on the N22 (Anderson unpublished) and an evaluation of the impact of rhododendron on the Kerry Slug within the Killarney National Park (Barron 1998). The findings of these studies have added to our understanding of the ecology of the Kerry Slug but do not constitute repeatable exercises which could be interpreted as monitoring.

5.2 Monitoring targets

Data deficiency has been identified with respect to a number of variables governing the distribution and abundance of the Kerry Slug. The following are considered to be suitable subjects for future monitoring.

5.2.1 Short-term monitoring targets:

- Confirming the present range of the species
    - All accessible and localised older (pre-1980) sites and records should be re-visited and the species searched for by hand search.
    - Apparent gaps in range should be investigated e.g. outer parts of the Dingle Peninsula and 10-km squares V97, V94, V93 and V82 where the geology is suitable and the slug is likely to occur but has not been recorded. This again, by hand search.
    - Eastern limits of range should be investigated in 10-km squares W37, W36 and W35 and areas to the east of this on sandstone rocks, where considered appropriate, and by hand search.
- Investigate habitat utilization and population dynamics of the Kerry Slug. This project should carry out investigations over a range of habitats of varying quality in order to determine appropriate local population densities, how numbers surveyed vary with weather conditions and the most apposite times for survey work.
- Setting up of effective monitoring protocols within SACs designated for the slug:
    - Hand-search transects to be followed bi-annually on each SAC for a period of two weeks in August-September.
    - First year of the scheme to act as a baseline for subsequent years.
- A re-examination of rhododendron clearance areas. It is recommended that at least three sites which have been cleared for different lengths of time, say 5, 10 and 15 years, are designated for further study. The occurrence of the Kerry Slug should be determined by hand search along transects of equal length at the sites. The longer term effects of rhododendron on occurrence of the Kerry Slug and the extent to which clearance mitigates this, can then be estimated.

- Assess impact of Cherry Laurel *Prunus laurocerasus* on the occurrence of the Kerry Slug in broadleaf woodlands on mineral soils. Little is known of the incidence of the invasive Cherry Laurel in broadleaf woods occupied by the Kerry Slug. It has a similar wide distribution to rhododendron, especially in south-west Ireland and has been shown to have similar destructive effects upon ground flora and upon mosses and lichens through shading (Invasive Species Ireland 2008). Incidence of Cherry Laurel in lowland broadleaf woods within the range of Kerry Slug should be investigated and a small subset of 5 sites surveyed to assess the potential effect upon Kerry Slug populations.

5.2.2 Long-term monitoring targets:

- Long term monitoring of the Kerry Slug should cover its whole range in Ireland in order to assess conservation status. The surveillance programme should be consistent with Article 17 of the Habitats Directive which requires Member States to report on implementation every six years. The following protocols are suggested:
    - 20 sites selected randomly from the list of known sites within its current range, and following completion of the first tranche of short-term monitoring, should be used to provide extra data on its occurrence.
    - Each site to be visited in either spring (April-May) or autumn (September-October).
    - In woodland biotopes the boles of 30 broadleaf trees other than beech to be selected.
        - All moss on the trunks and side branches up to 2 m off the ground to be removed and searched.
        - With the aid of a torch all crevices on the bole to be examined for slugs.
        - All loose bark to be lifted and examined.
    - Slug numbers and maturity (size) to be recorded.
    - In open range an area of not less than 60 m^2 of exposed rock faces, preferably imposed on at least 10 separate rocks or rock faces, to be selected for examination within a given site.
        - On moss-covered surfaces all moss to be examined for slugs living underneath.
        - On surfaces without moss, surface to be examined for immature slugs.
        - Loose stones around the outcrops to be lifted and examined for slugs.

- Slug numbers and maturity (size) to be recorded.
- Weather conditions on each visit to be recorded: maximum daytime temperature; precipitation; cloud cover in tenths; wind direction and strength.

Because so little is known of the problems that might be encountered in survey work, the protocols detailed above should be regularly reviewed. It must be emphasised that survey results are likely to be meaningful only if conducted in roughly similar atmospheric conditions e.g. cloudy overcast, some rain. Achieving this should not place too heavy a burden on surveyors in the prevailing climatic regime.

5.3 Future Action

- By 2010 evaluate the effectiveness of survey and monitoring methodologies described in Section 5.2.1
  ACTION: NPWS

- By 2011 initiate monitoring of the Kerry Slug based on the findings of the evaluation of the methodologies
  ACTION: NPWS

- Encourage co-operation between international scientists towards projects involving genetic studies in order to understand genetic difference between populations in Spain, Portugal and Ireland and genetic variability within populations which could highlight critical population or habitat sizes that should be maintained in order to avoid genetic drift.
  ACTION: NPWS

- Encourage survey work and collection of records for the Kerry Slug and provide data to National Biodiversity Data Centre. A website www.kerryslug.com has been created to allow for online reporting of the species and to disseminate information on the species
  ACTION: Heritage Council, Local Authorities, NPWS, NBDC, NUI Galway

6. Protection

6.1 Special Areas of Conservation and National Parks

The Kerry Slug is listed on Annex II and Annex IV of the EU Habitats Directive (92/43/EEC). The Annex II listing requires Member States to designate Special Areas of Conservation (SACs) for the protection of the species. The Kerry Slug is listed as a selection feature for seven cSACs. These are set out in Table 1 below

Table 1 cSACs which list Kerry Slug as a selection feature.

Site number	Site name	County
000090	Glengarriff Harbour and Woodland	Cork
000093	Caha Mountains	Cork/Kerry
000102	Sheep's Head	Cork
000365	Killarney National Park, Macgillycuddy's Reeks and Caragh River catchment	Cork/Kerry
000370	Lough Yganavan and Lough Nambrackdarrig	Kerry
001342	Cloonee and Inchiquin Loughs, Uragh Wood	Kerry
002173	Blackwater River (Kerry)	Kerry

These cSACs collectively cover some 95,337 hectares of land within the range of the Kerry Slug. While not all habitats within the area are suitable, this represents a significant proportion of the known range of the species (Appendix 1, Map 2).

Conservation Plans and objectives are currently in preparation for all of these sites. These plans will include a specific objective for the maintenance of the species' habitat and population within each cSAC.

A number of other cSACs within the range of the Kerry Slug also support the species, including two sites where it is referred to in the site synopses –
001873 – Derryclogher (Knockboy) Bog, and
002189 – Farranamanagh Lough
A Conservation Plan (2006-2011) has been published for Derryclogher Bog. The plan also refers to the presence of the Kerry Slug and the objectives for maintaining and enhancing the blanket bog habitat are of direct relevance to the species.

Where Kerry Slug is a cSAC qualifying feature, it is important that more detailed quantitative conservation targets and objectives based on favourable

conservation status are set. The development of these targets and objectives will depend on a more detailed understanding of conservation status, threats and ecological requirements within each site.

Future Action

- By 2011, publish an *Irish Wildlife Manual* with up to date life history, description of evaluated and recommended survey and monitoring techniques, management prescriptions and relevant knowledge on the Kerry Slug to be used by management staff in SACs for the species.
  ACTION: NPWS, NUI Galway

- By 2011, initiate training of conservation staff in the approved monitoring and survey techniques.
  ACTION: NPWS

- By 2012 set quantitative conservation objectives and targets, based on favourable conservation status, for Kerry Slug in each of the cSACs where it is a qualifying feature.
  ACTION: NPWS

The Killarney National Park, which extends to 10,236 hectares and is situated within the main distribution of the Kerry Slug, forms part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment cSAC. The current management plan for the National Park provides for actions which will directly benefit the Kerry Slug. For example, the management plan highlights the importance of *Rhododendron* clearance to enhance the species' status and distribution within the National Park (NPWS 2005).

6.2 Catchment management plans

Catchment management plans are being developed for 27 SAC populations of Freshwater Pearl Mussel (*Margaritifera margaritifera*). Currently these plans are in a final draft stage. These come under the umbrella of the Water Framework Directive River Basin Management Plans and contain management measures to tackle the range of existing and future pressures in the catchments. Of the 27 Freshwater Pearl Mussel catchments, eight overlap with the range of the Kerry Slug. There is significant overlap between the measures required under the Freshwater Pearl Mussel catchment management plans and for the Kerry Slug, in particular, the conservation and/or restoration of blanket bog and heath habitats. The eight overlapping catchments are:

Munster Blackwater (upper catchment); Bandon (parts of) Co Cork; Owenmore Co Kerry; Owenreagh, Co Kerry; Caragh, Co Kerry; Kerry Blackwater, Co Kerry ; Cummeragh/Cappal, Co Kerry; Ownagappul Co Cork

6.3 Regulation 23 - Strict protection

Annex IV listing requires Member States to implement a system of strict protection for the species.

The species received some protection under national legislation prior to the introduction of the Habitats Directive. Although not included as a protected species in the Schedules of the Wildlife Act 1976, it was added to Schedule 5 by the Wildlife Act 1976 (Protection of Wild Animals) Regulations 1990 (S.I. No.112/1990). This prohibited all deliberate damage to the slug and its habitat, but did not cover indirect damage or activities that are licensed by other authorities.

Under the provisions of Regulation 23 of the European Communities (Natural Habitats) Regulations 1997 a more comprehensive protection framework was established. This applies both to processes and activities requiring consent (such as through the planning process), in addition to the general activities of landowners and third parties.

The following offences relating to Annex IV (a) are set out in Regulation 23(2):

> *A person who in respect of the species set out in Part I of the First Schedule—*
>
> *(a) deliberately captures or kills any specimen of these species in the wild,*
> *(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,*
> *(c) deliberately takes or destroys the eggs from the wild, or*
> *(d) damages or destroys a breeding site or resting place of such an animal,*
>
> *shall be guilty of an offence.*

This follows closely the provisions of Article 12 of the Habitats Directive. In relation to (a) to (c) above, it is clear that to obtain a conviction in a court, it would be necessary to establish that the person concerned committed the action deliberately.

In the case of Regulation 23 (d) of the Habitats Regulations, it is not required that the person damaging or destroying a breeding site or resting place should have done so deliberately or knowingly. This places an onus of due diligence on those concerned to inform themselves of the risk of such damage or destruction that their plans, operations or activities might cause.

In order to clarify the practical implications of Regulations 23 and the derogation process under Regulation 25, National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government issued a Circular to Local Authorities in May 2007 (Appendix 2).

6.4 Regulation 25 – Derogations

Where there is no satisfactory alternative to continuing with an operation or activity which might affect an Annex IV species, a derogation licence must be sought from the Minister under Regulation 25 of the Habitats Regulations before any works can proceed. The criteria under which a derogation licence can be issued by the Minister are narrow. They can only be granted where there is no satisfactory alternative and where the derogation is not detrimental to the population of the species.

It is important to note that the derogation provisions of Section 23 (7) of the Wildlife Act do not apply to Annex IV animals (see Regulation 2(3) of the Habitats (Amendment) Regulations 2005, which amended the Wildlife Acts).

The derogation provisions for Annex IV species including the Kerry Slug are set out in Regulation 25 of the Habitats Regulations as follows:

25. (1) Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a derogation from complying with the requirements of the provisions of section 21 of the Principal Act and Regulations 23 and 24 where it is—

> *(a) in the interests of protecting wild fauna and flora and conserving natural habitats, or*
> *(b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property, or*

(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment, or
(d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants,

(e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent (if any) specified therein, which are set out in the First Schedule (Annex IV(a) species).

(2) The Minister shall forward to the Commission every two years a report, in accordance with a format established by the Commission, on the derogations to which paragraph (1) relates.

(3) The report referred to in paragraph (2) shall specify—

- *(a) the species which are subject to the derogations and the reason for the derogation, including the nature of the risk with, if appropriate, a reference to alternatives rejected and scientific data used;*
- *(b) the means, devices or methods authorised for the capture or killing of animal species and the reasons for their use;*
- *(c) the circumstances of when and where such derogations are granted;*
- *(d) the authority empowered to declare and check that the required conditions obtain and to decide what means, devices or methods may be used, within what limits and by what agencies, and which persons are to carry out the task;*
- *(e) the supervisory measures used and the results obtained.*

A person convicted of an offence shall be liable on summary conviction to a fine not exceeding £1,500 or to 6 months imprisonment or to both.

To date two applications have been received for derogation licences in respect of Kerry Slug.

7. Enforcement

NPWS Conservation Rangers are the main enforcement mechanism for wildlife offences including offences relating to Annex IV species. As Killarney National Park also supports a population of the Kerry Slug, National Park rangers are also in a position to enforce park byelaws and national legislation. Rangers regularly patrol within and outside areas designated for nature protection and are in regular contact with members of the public as well as colleagues in other enforcement agencies in order to combat breaches of wildlife laws.

The maximum penalty for summary conviction under the 2000 Wildlife Amendment Act has been increased to €1,904 and/or 12 months imprisonment and, on indictment, is €63,487 and/or two years imprisonment. It should be noted that fines may be imposed in relation to each offence committed, so operations involving many animals or repeated offences can potentially accrue large fines. In addition, items which may constitute evidence of the commission of an offence may be seized and detained. However, as in any Member State, prosecutions must be taken within the constraints of the law and with sufficient evidence to support a prosecution.

There is no indication that the Kerry Slug is a pest species in Ireland and so intentional destruction of the animal or its habitat on these grounds is unlikely. Infringements under the Wildlife Acts and Habitats Regulations in relation to this species are more likely to arise as the incidental result of land-use activities such as agriculture, forestry or development, particularly where no derogation licence has been sought or issued. These issues are considered further in Section 8 below.

8. Threats and pressures

Introduction

The Kerry Slug is vulnerable to changes in its preferred habitats and it has been found in Spain that this can lead to its disappearance (Ramos 1998). Moorkens (2006) described the threats to this species, with the key pressures being intensification of land-use, tourism and general development pressure, expansion of commercial forestry and the spread of invasive species such as *Rhododendron ponticum* into its woodland habitat.

The key pressures/threats listed in the Kerry Slug Conservation Status Assessment Report (NPWS 2008a) expand upon the threats identified by Moorkens. The specific pressures/threats identified are:

103 – Agricultural improvement (reclamation)
110 – Use of pesticides
142 – Overgrazing by sheep
153 – Removal of scrub
160 – General forestry management
162 – Artificial planting (gardens)
180 – Burning
403 – Dispersed habitation
502 – Routes/auto routes
702 – Air pollution
954 – Invasion by a species (*Rhododendron ponticum)*

There is little or no information on the relative significance of these pressures on the Kerry Slug in Ireland. All are likely to occur to some extent within the known range of the species.

A significant proportion of the range of the Kerry Slug is contained within Natura 2000 sites. The tests established by Article 6 of the Habitats Directive and transposed by the Habitats Regulations 1997- 2005 in relation to plans or projects affecting Natura 2000 sites should safeguard Kerry Slug habitat within designated areas. However, more subtle factors such as the effects of invasive species and grazing animals can adversely affect the species even within designated National Parks or Natura 2000 sites.

The species' dependence upon atmospheric humidity and lichens and bryophytes as food sources points to a vulnerability in changes to air quality and atmospheric condition. The rural and largely undeveloped nature of much of its range in south west Ireland might reduce the significance of factors such as urbanisation or industrialisation. However, localised factors such as tree removal or overgrazing may affect the micro-climate and atmospheric conditions in some situations.

Based on available knowledge of the distribution and ecology of the Kerry Slug in Ireland and the nature of land-use in west Cork and Kerry, the principal pressures and threats for the slug are considered to be:

- forestry management (including afforestation);
- invasion of woodland habitat by *Rhododendron ponticum;*

- agricultural improvement (reclamation), and
- fragmentation of habitat and isolation of populations by major infrastructure such as roads

An introduction to each of these threats is followed by a statement of the actions recently completed or currently underway to address the threat. This is followed by a section on future actions. These are actions deemed necessary to ensure that any outstanding elements of the identified threat are fully managed and that no significant negative impact to the favourable conservation status of the Kerry Slug arises.

Climate change has not been cited as a particular threat to the Kerry Slug. The Kerry Slug Action Plan (NPWS 2008b) referred to the lack of evidence of climate change as a threat. A reduction of humid conditions could affect the species' ecology, although this is more likely to be a factor in Spain or Portugal than Ireland, where warmer, drier summers and milder, wetter winters have been predicted. Climate change predictions for Ireland also suggest that both the number of frost-free days and the land area which is completely frost free will increase (DOEHLG 2007). This could increase the area of land in the eastern part of West Cork which is suitable for the Kerry Slug and these factors could potentially increase the global significance of the Irish population over time.

Threat 1 Afforestation and Forestry Management

Background

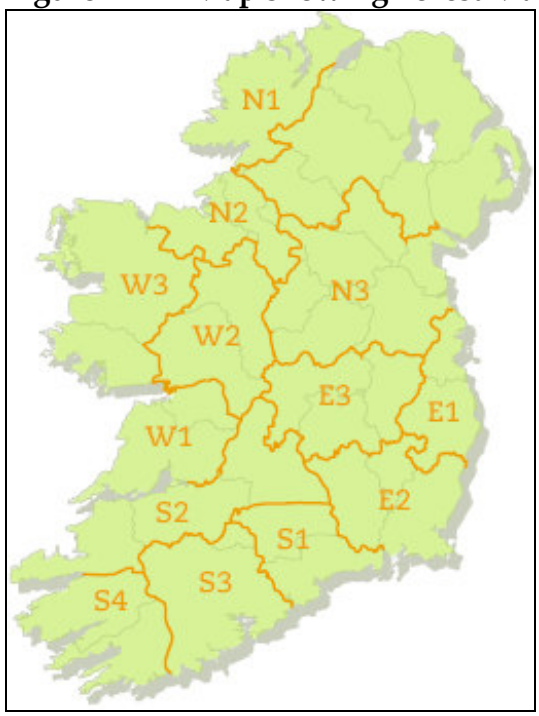
The widespread planting of commercial conifer forestry is likely to have had a detrimental effect on the Kerry Slug. The dense canopy which forms within most commercial plantations inhibits the growth of many species of bryophytes and lichens on the rocks and boulders underneath, and as the canopy closes, the habitat becomes unsuitable for the slug. Similarly under-planting of native woodland with conifers could be detrimental depending on the density of inter-planting (Anderson unpublished).

Coillte is the body responsible for managing the State's forestry estate. The estate is divided into Forest Management Units (FMUs) which are combined into 13 forest management districts (Figure 1). The vast majority of the known range of the Kerry Slug is contained within District S4 – Southwest Peninsulas. The Dingle peninsula which forms the northern part of its range falls within District

S2 – Lower Shannon, while the easternmost part of its range extends into District S3 – Cork.

Large scale state afforestation took place in District S4 in the 1960s and 1970s, with private forestry becoming significant more recently in the 1980s and 1990s. Coillte now owns some 27,865 hectares of forest within the District (Coillte 2006). The Forest Service Inventory results showed that the total stocked forest area for Kerry is 41,300ha, of which 17,470ha is public and 23,830ha is privately owned. (Forest Service, 2007).

Figure 1 Map showing Forest Management Districts in Ireland

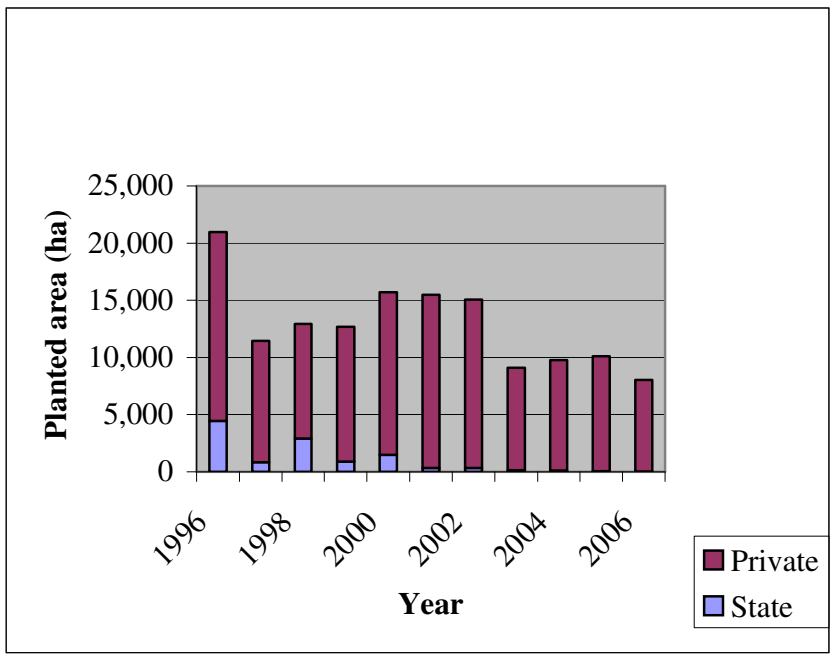


Targets for the expansion of the forestry sector were set out in the government's strategic forestry plan "Growing for the Future". Strategic targets of 25,000 hectares per annum (1996 – 2000) and 20,000 hectares (2001 – 2030) were proposed (DAFF 1996). These targets have not been achieved, and afforestation rates have declined (Malone 2008). Very little new afforestation has been undertaken by Coillte since a European Commission decision in 1999 which prevented Coillte from claming forest premiums. Since then virtually all afforestation has been undertaken by the private sector (Figure 2).

In District S4, there is little potential for any significant increase in the estate managed by Coillte. New afforestation in the District is approximately 20 hectares per annum through Farm Partnership (Coillte 2006).

Private afforestation is encouraged by DAFF through a number of incentive-based schemes including the Afforestation Scheme which aims to increase the area under forest in Ireland. The scheme applies to agricultural land including unenclosed areas used for extensive grazing. However, there is a low risk of afforestation impacting on the habitat of the Kerry Slug as its habitat is not in general suited for commercial afforestation. The risk is also reduced by the presence of designated sites such as Special Areas of Conservation where the afforestation scheme would not be permitted and by the decline in the overall rate of afforestation.

Figure 2 Public vs. Private Planting in Ireland 1996-2006 [Source, DAFF & Malone 2008]



In addition, limiting forest cover on peat sites is a measure included in the draft River Basin Management Plan for the South Western River Basin District with the aim of preventing eutrophication and sedimentation of watercourses. Limiting forest cover on these areas could reduce potential for conflict with the Kerry Slug.

The management of existing forests is now largely guided by principles of sustainable forest management and biodiversity is a key consideration for forest design and management. Grant aid for private afforestation is dependent upon compliance with these principles and guidelines.

Certain aspects of forestry management carry a potential threat to existing populations of the Kerry Slug and/or prevent the re-colonisation of former areas. For example, the statutory requirement for automatic re-planting of areas cleared under a general felling licence could restrict opportunities for the species to re-colonise areas which may have been suitable prior to afforestation and which are still suitable for the species.

Outside commercial woodland, the main issues affecting Kerry Slug are grazing pressure and invasive species such as *Rhododendron ponticum.* The latter is dealt with separately in Threat 2 below. Grazing pressure by escaped sheep, resident goats and wild deer can be a significant factor in preventing natural regeneration, for example within Killarney National Park. In addition to suppression of natural regeneration, over-grazing can affect the bryophyte communities within the woodland. Where areas recently cleared of *Rhododendron* are affected by over-grazing, there is reduced scope for Kerry Slug populations to benefit from the clearance (Barron 1998).

<u>Current Action - Within SACs</u>

Indicative Forestry Statement

The Indicative Forestry Statement (IFS) provides high-level, national guidance in relation to the suitability of land for afforestation and facilitates the establishment of high quality forests serving a variety of purposes. The areas available for forest expansion will require further examination at a local level including site inspections by the Forest Service Inspectorate to identify whether the status of environmental, heritage and landscape features at the site are such that the area is amenable to forest establishment. The IFS identifies four categories, of which Category 3 is 'suitable, where appropriate, for nature conservation and/or amenity forests'. Category 3 areas occur mainly along the western seaboard and exposed uplands of the north west and south east and comprises designated areas (including cSACs/SPAs) and areas of high landscape sensitivity. Any forest management activities in these designated areas must be undertaken in agreement with the NPWS. While fragments of forest and semi-natural woodland occurring within Category 3 do not tend to have significant wood

production potential, they can be of particularly high biodiversity and wildlife value. Conservation and the protection of biodiversity and habitat are the primary objectives of management in forests located within designated areas. This type of forest management is supported and incentivised by the Forest Service mainly through the Native Woodland Scheme and also the FEPS and Afforestation scheme.

Appropriate assessment
On a site specific level, proposals for commercial afforestation within designated sites are scrutinised rigorously. Under Regulation 31 of the European Communities (Natural Habitats) Regulations 1997, any proposed afforestation scheme which is likely to have a significant effect on an SAC/SPA either alone or in combination with another plan or project, must be subject to an appropriate assessment of its implications in view of the site's conservation objectives. In practice therefore, all forestry proposals either within or outside but with potential to affect an SAC/SPA are screened for appropriate assessment. Any forest management activities within SPAs/cSACs must also be subject to screening for appropriate assessment and agreement with NPWS.

Notifiable Actions Process
Within Natura 2000 sites, there are certain activities or operations that can only be undertaken by owners or occupiers with the Minister's consent. These are called Notifiable Actions and vary depending on the type of habitat or the species that is present on the site. Landowners are sent copies of the Notifiable Actions that are relevant to their lands. The activities listed in the Notifiable Actions are not necessarily prohibited in all cases but require the landowner/occupier to consult (in practice with the local Conservation Ranger).
The planting or seeding of trees and the removal of trees are standard Notifiable Actions for many SACs.

Practical management
Within Killarney National Park woodland management forms a core part of ongoing management work. This includes control of invasive non-native species such as *Rhododendron* (see Threat 2 below). There is also a programme of removal of conifers from some areas of the park. In recent years over 26 hectares of clear felled conifer forestry has been replanted with oaks or left to regenerate naturally (NPWS 2005).

The Native Woodland Scheme managed by Forest Service of the Department of Agriculture, Fisheries and Food in partnership with other bodies, provides

support for landowners to manage existing and establish new native woodlands. The scheme is open to landowners within designated areas (such as SAC, SPA, NHA) provided that, following consultation with NPWS, the scheme is assessed to be compatible with the conservation objectives of the designated site (Forest Service 2008).

Current Action – Outside SACs

Control of forestry practice

In Ireland, under the 1946 Forestry Act, the Forest Service (Department of Agriculture, Fisheries and Food) licenses the felling or removal of trees with some exceptions. All initial afforestation requires prior approval as do all forestry grant aided projects.

Ireland is committed to the principles of Sustainable Forest Management (SFM), an inherent part of which is protection of the environment, including both designated and non-designated sites, habitats and species. As the national regulatory body for forestry, the Forest Service of the Department of Agriculture, Fisheries and Food implements SFM through its environmental guidelines and requirements, the *Code of Best Forest Practice – Ireland* and its inspection, referrals and monitoring procedures. Forest Service Guidelines and Schemes have provided for the protection of biodiversity in general. To date, guidelines for specific species or habitats have not been published with the exception of the Forestry and Freshwater Pearl Mussel Requirements that were published in March 2008.

Adherence to the Forest Service guidelines and requirements is a condition for all grant aided, approved and licensed forest activities. The Forest Service has provided information days on biodiversity, the Forest Biodiversity Guidelines and national and European legislation and obligations (e.g. Wildlife Act, 1976; Wildlife (Amendment) Act 2000; Habitats Directive, Birds Directive) to Registered Foresters and Forestry Companies.

Biodiversity must be the primary management objective for approximately 15% of the forest area (18 –20% under FEPS and NWS). These Areas for Biodiversity Enhancement (ABEs), which comprise open spaces and retained habitats, are aimed at encouraging the development of diverse habitats, native flora and fauna and biodiversity. If the Kerry Slug is present on site, the ABE can be targeted at protecting and enhancing habitats used by the species. All grant aided afforestation sites must have an ABE, and where appropriate this must be shown

or indicated on the Biodiversity/Operational Map which is submitted with the application.

In 2009 the Forest Service produced *Forestry and Kerry Slug Guidelines* (Forest Service 2009). The Guidelines describe the methods by which the species will be protected during forest operations and how the Forest Service will take the Kerry Slug into consideration when issuing license and approvals for forest operations.

Approval process

The approval process for afforestation outside SACs includes a number of safeguards for Annex IV species such as the Kerry Slug. These include:

- Forest referral system – all afforestation applications (approvals and licenses) in or within the referral zone of a designated area (SAC, SPA, NHA, pNHA) and all license applications in or within 3km upstream of a designated area (SAC, SPA, NHA, pNHA) are referred to NPWS for comment.
- Forest Service inspection procedures (all sites receive a desk inspection backed up by GIS data, selected sites field inspection)

Mandatory Environmental Impact Assessment is required for new forestry proposals exceeding 50 hectares under the European Communities (EIA) (Amendment) Regulations 2001. The threshold was reduced from 70 hectares to facilitate compliance with the ECJ ruling in Case C – 392/96. The Regulations also provide for the possibility of sub-threshold EIA where a project is likely to have significant effects on the environment.

In 2006 Forest Service introduced a new screening procedure, whereby all applications are now formally screened in relation to potential environmental impact. This has increased the number of sub-threshold applications (below 50 hectares) that are being referred for EIA. Despite this, an additional action is needed the ensure that the potential presence of an Annex IV species provides a trigger for the implementation of species specific guidelines.

Native Woodland Scheme

The Native Woodland Scheme (NWS) provides support for the protection and enhancement of existing native woodlands and to establish new native woodlands. Both aspects of the scheme could be beneficial to the Kerry Slug. NWS applications involve a site specific Native Woodland Plan (NWP) prepared

jointly by an ecologist and a forester in consultation with the applicant. Part 2 of the NWP requires the identification of special habitats and species.

High Conservation Value Forests

High Conservation Value Forest (HCVF) is a fundamental concept in Forest Stewardship Council (FSC) principles. Coillte has prepared (with ProForest) a draft definition of HCVF for Ireland and has already identified significant areas of its estate as HCVF. Within these areas management practices must aim to maintain and enhance the sites particular HCV. The current HCV1 classification relates to species covered by designations as well as Red list species, although there is no specific reference to Annex IV species within the classification. Inclusion of Annex IV species would be of direct benefit to the Kerry Slug by requiring management of its habitat where it is included in a HCV designation (see Future Actions).

Future Action

- By 2011 review the *Forestry and Kerry Slug guidelines* and the effectiveness of the relevant forestry schemes to ensure that they are not having a negative impact on the conservation of the Kerry Slug and that their habitat requirements are taken into account in future forestry schemes.

  ACTION: Forest Service, NPWS.

- By 2010 seek to extend the definition of High Conservation Value Forest in Ireland to include the Kerry Slug by adding Annex IV species to HCV1.

  ACTION: Forest Service

Threat 2 Invasion of woodland habitat by *Rhododendron ponticum*

Background

The introduction of *Rhododendron* into west Cork and Kerry has had a significant effect on woodland ecology, particularly on parts of the Killarney National Park and Glengarriff Nature Reserve and other sections of cSAC. The climate and soils of the area are extremely suitable for it and conducive to its spread. The distribution of *R. ponticum* in south west Ireland closely mirrors that of the Kerry Slug. Growth of *R. ponticum* within woodland has been shown to have a negative effect on slug numbers (Barron 1998).

Over 650 hectares of the National Park are now infested with *R. ponticum* and a major eradication programme has been in place for several decades. Infestation of the natural or semi-natural woodlands by *R. ponticum* has a serious effect on the habitat's ecology. Although the Kerry Slug is found in areas invaded by *R. ponticum*, it is apparently much less frequent than in areas which have not been infested. The avoidance of dense *Rhododendron* thicket has also been demonstrated by recent field work in West Cork (Anderson unpublished).

Barron (1998) suggested that areas infested by *R. ponticum* were less suitable for Kerry Slug because:

- The infested areas had less ground cover or herb layer;
- Leaf litter of *R. ponticum* is acidic and poisonous and considered to be unpalatable to Kerry Slug;
- The dense shading of the *R. ponticum* bushes inhibited bryophyte growth.

Areas cleared of *R. ponticum* can be highly disturbed and slow to recover, with reduced under-storey and herb layer. Grazing pressure in the woodlands can also inhibit regeneration which would be detrimental to Kerry Slug. While Kerry Slug has also been found in cleared areas (Barron 1998, NPWS 2005), Barron considered that numbers in cleared areas were less than in unaffected woodland. More research is needed to ascertain whether Kerry Slug numbers increase as the vegetation structure of cleared areas improves (see Section 5.2).

It is likely that the invasive Cherry Laurel *Prunus laurocerasus,* which has a similar effect on soil properties (eradication of herb layer, shading), may adversely affect the Kerry Slug in lowland broadleaf plantations. This species has a similar wide incidence within the range of the Kerry Slug to that of *Rhododendron ponticum* but is found at lower altitudes in mainly broadleaf woods (Invasivespecies Ireland 2008).

Current Action - Within SACs

Eradication programme

A major programme of eradication and control is undertaken within Killarney National Park which forms part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment cSAC. Control is also practiced at Glengarriff Nature Reserve, a State-owned site within the Glengarriff Harbour and Woodland cSAC. Most of the 300 hectare Nature Reserve has now been cleared of *Rhododendron,* but control of seedlings is undertaken to ensure that it does not spread.

Details of the ongoing programme are set out in the Killarney National Park Management Plan 2005-2009 (NPWS 2005). Work is undertaken by a combination of contractors and volunteer effort, co-ordinated by Groundwork. The work schedule for 2009 is set out in Figure 3 below.

Figure 3 *Rhododendron* control programme 2009. [Source NPWS.]

2009	12 ha (area to be decided)	Cut & stump treatment	Contractor
	10-15 ha (area to be decided)	Seedling removal	
	Upper & Lower Doogary, Eamonn's Wood, Cahernabane (areas of 2008 spraying) & area of initial clearance from 2008	Check effectiveness of 2008 spraying/stump treatment. Re-treat if necessary	Groundwork
	Cahernabane (area of initial clearance in 2005) & other areas of initial clearance from 2005 (Phase 2)	Follow-up: seedling removal; check for stump re-growth, treat as appropriate	
	Glaisín na Marbh (c. 40 ha)		
	Kingsboro (c. 10 ha)		
	Cahnicaun (c.21 ha)		
	Area to be decided	Initial clearance – cut; pile; stump removal/stump treatment	

Within the Management Plan, the removal of *R. ponticum* is seen as the key conservation measure for the Kerry Slug. The plan includes a specific action for the Kerry Slug: *"Continue rhododendron clearance from potential Kerry Slug habitat".*

Current Action – Outside SACs

Native Woodland Scheme

Outside the National Parks a key mechanism for woodland management and removal of invasive species is the Native Woodland Scheme implemented by Forest Service (see Threat 1). Where the presence of invasive species such as *R. ponticum* or *P. laurocerasus* is identified, the Plan developed under the scheme may specify the removal or control of the species. However in some cases where

a woodland is infested and its long-term sustainability is compromised, it may not be eligible under the scheme. To date removal of some 210 hectares of *R. ponticum* has been grant aided through the scheme in west Cork and Kerry, within the range of the Kerry Slug. A further 10 hectares each have been removed under the Woodland Improvement Scheme and NeighbourWood Scheme (source: DAFF Forest Service).

Coillte work

Some clearance of *R. ponticum* is undertaken by Coillte within their woodland estate. For example, in Forest Management District S4 work has been undertaken at Kells, while further work is planned at Castletownbere and Looscaunagh near Killarney, a known site for the Kerry Slug.

Future Action

- By 2010 devise a research project to investigate the status of the Kerry Slug in areas of woodland cleared of *R. ponticum* over differing timescales for implementation in 2011.
  ACTION: NPWS

- Continue with *R. ponticum* eradication programme at Killarney National Park and Glengarriff Nature Reserve
  ACTION: NPWS

- Undertake control of *R. ponticum and P. laurocerasus* in areas frequented by Kerry Slug in response to further research and monitoring undertaken under Actions in Section 5.3
  ACTION: Coillte

Threat 3 Agricultural reclamation

Background

Agricultural improvement and intensification has affected many species and habitats in Ireland in recent decades. The range of the Kerry Slug in west Cork and Kerry has perhaps suffered less from this due partly to the mountainous topography, soil quality and climate. The high proportion of the land designated as SAC, SPA, NHA or National Park has also restricted recent habitat losses from agricultural intensification.

There is some evidence that the Kerry Slug will frequent agriculturally improved grassland areas, especially where boulders, rock outcrop and old stone walls with trees have been retained (Anderson unpublished). There is currently no specific evidence on the effects of grazing in its moorland habitats, although grazing pressure in woodland is considered to have an adverse impact where it affects bryophyte abundance and regeneration (Barron 1998). However, land reclamation involving removal of rocks and boulders would certainly have a significantly adverse impact on the species. This was observed by Anderson (unpublished data) at Ballyvourney where boulder displacement in re-seeded areas had resulted in the apparent disappearance of the slug. Rural and site protection policies preventing the reclamation of Kerry Slug habitat is therefore of key significance for the species.

Current Actions – within SACs

Appropriate assessment

Proposals for projects involving reclamation of land within designated sites must be scrutinised rigorously. Under Regulation 32 of the European Communities (Natural Habitats) Regulations 1997, any plan or project which is likely to have a significant effect on an SAC/SPA either alone or in combination with another plan or project, must be subject to an appropriate assessment of its implications in view of the site's conservation objectives.

Notifiable operations

Within Natura 2000 sites, there are certain activities or operations that can only be undertaken by owners or occupiers with the Minister's consent. These are called Notifiable Actions and vary depending on the type of habitat or the species that is present on the site.

A number of typical Notifiable Operations for landowners within SACs prevent the loss of Kerry Slug habitat through agricultural intensification by landowners. These include:

- Reclamation, infilling, ploughing or land drainage
- Rock removal

Compliance with Notifiable Operations is assessed during Cross-compliance checks (see below).

Agri-environment Schemes

The agri-environment schemes referred to below are also available within designated sites including SACs. In addition, within designated sites, farmers who do not participate in REPS/AEOS are eligible to join the NPWS Farm Plan Scheme. This scheme pays farmers for losses and costs incurred in management of lands designated as SAC, SPA, NHA or commonage.

Current Actions – outside SACs

Cross compliance

All farmers in receipt of the Single Farm Payment are required to meet the basic Statutory Management Requirements (SMRs) and maintain land in Good Agricultural and Environmental Condition. Good Farming Practice (GFP) requires farmers to maintain wildlife habitats within designated sites.

Rural Environment Protection Scheme

The Rural Environment Protection Scheme (REPS) is a scheme designed to reward farmers for carrying out their farming activities in an environmentally friendly manner and to bring about environmental improvement on existing farms. The current scheme – REPS 4 – will run until 2013 but is closed to new applicants.

The objectives of the Scheme are to:

- Establish farming practices and production methods which reflect the increasing concern for conservation, landscape protection and wider environmental problems
- Protect wildlife habitats and endangered species of flora and fauna
- Produce quality food in an extensive and environmentally friendly manner.

Participants in REPS are required to carry out their farming activities for a five year period in accordance with an agri-environmental plan. They must comply with 11 basic measures, some of which are relevant to the conservation of the Kerry Slug, including:

- Grassland and soil management plan (avoidance of overgrazing)
- Retain wildlife habitats (including woodlands, peatland and unimproved grassland)

- Maintain farm and field boundaries
- Cease using herbicides, pesticides and fertilisers in and around hedgerows, lakes, ponds, rivers and streams, except with the consent of the Minister.

In addition land which is part of a designated site or commonage land is subject to more stringent requirements.

Supplementary conditions relating to stocking density and restricted practices such as rock removal apply to blanket bogs, heaths and upland grasslands. These conditions will be of direct benefit to the Kerry Slug.

Agri-Environment Options Scheme (AEOS)

This scheme was launched in March 2010 and will be open to applicants in the first year until May 2010. Like REPS the contracts will last 5 years. The objectives of this schemes are:

• to promote biodiversity, encourage water management/quality and combat climate change, and

• to contribute to positive environmental management of farmed Natura 2000 sites and river catchments in the implementation of the Birds Directive, Habitats Directive and Water Framework Directive

Farmers may apply for AEOS as either Category 1 or Category 2 applicants. Category 1 applies to farms that have a Natura 2000 site or non-Natura commonage. They must complete a sustainable management plan to gain entry to the scheme.

Applicants under Category 2 (farms which do not have a Natura 2000 site) must nominate one of three primary environmental objectives (halting biodiversity decline; maintaining water quality or combating climate change) and then must select either at least one mandatory and one complementary action or two mandatory actions to qualify for the scheme.

Commonage Framework Plans

In Cork and Kerry, Commonage Framework Plans (drawn up by NPWS) are an important development in managing stocking levels in uplands both within and outside SACs/SPAs to reduce grazing pressure.

Forest Environment Protection Scheme

The Forest Environment Protection Scheme (FEPS), launched in 2007, is open to farmers who are already participating in REPS. This offers encouragement for the establishment of high nature conservation value woodlands, with the

emphasis being on native and broad-leaved species. In some circumstances, this scheme might also benefit the Kerry Slug, through active measures to maintain and enhance its habitat.

Future Action

- By the end of 2010 review the relevant farming and agri-environment schemes, and make recommendations where necessary to ensure that the measures are consistent with the conservation of Kerry Slug.
  ACTION: NPWS, DAFF, Teagasc

Threat 4 Infrastructure development (e.g. roads)

Background

Major infrastructure development such as the construction of new roads has the potential to adversely affect slug populations through habitat loss, fragmentation or isolation of discrete populations. Research is needed to ascertain how disruptive such actions are on a landscape scale. Currently little is known about the viability of small populations and the potential for colonizing new territory.

While no major road schemes have been recently completed within the known range of the Kerry Slug, there is the potential for impact by future schemes. One current NRA scheme which is relevant to Kerry Slug is the proposed N22 re-alignment from Ballyvourney to Macroom, which is at Preliminary Design stage. The Kerry Slug was identified as an issue in the Constraints Study and surveys have confirmed its presence both in woodland and open bog habitat along the route (Anderson unpublished data).

Current Action – within SACs

Appropriate assessment

Proposals for development within designated sites are scrutinised rigorously. Under Regulation 32 of the European Communities (Natural Habitats) Regulations 1997, any proposed plan or project which is likely to have a significant effect on an SAC/SPA either alone or in combination with another plan or project, must be subject to an appropriate assessment of its implications in view of the site's conservation objectives. In practice therefore, all proposals either within or outside but with potential to affect an SAC/SPA should be screened for appropriate assessment.

For developments which fall within the planning system, both relevant County Development Plans contain objectives for the protection of designated sites including SACs. The relevant objectives are:

- Kerry Draft County Development Plan 2009-2015 - Objectives EN 11-21/EN11-22
- Cork County Development Plan 2009 – Objectives ENV 1-5, 1-6 and 1-7.

Eight Functional Development Plans are currently being prepared by Kerry County Council. All plans will be subjected to appropriate assessment under the Natural Habitats Regulations.

Current Actions – outside SACs

NRA Procedures

The National Roads Authority (NRA) has produced *Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2006)*. The Guidelines describe the phases required for ecological assessment of road schemes from initial Constraints Study, through to Route Selection Study and Environmental Impact Assessment of preferred route or routes.

The Guidelines specify that special consideration must be given to species protected by national or international legislation. The recent example of the N22 re-alignment from Ballyvourney to Macroom referred to above illustrates how the Constraints Study process identified the Kerry Slug as a key issue requiring consideration. Surveys of woodland and bogland habitats were undertaken as part of the Route Corridor Selection Study, and this work has influenced the final alignment of the road.

An updated version of the Guidelines has been prepared and is available on the NRA website (www.nra.ie). The updated guidelines more closely reflect the requirement for appropriate assessment under Article 6 of the Habitats Directive. A further new set of ecological guidelines has also been published. The *Ecological Surveying Techniques For Protected Flora and Fauna During Planning of National Road Schemes* provides detailed guidance on the survey of protected flora and fauna and includes specific guidance on the requirements and methodology for survey of the Kerry Slug (see Appendix 3).

Planning process

Outside designated sites, the planning process should afford protection from damaging development to species such as Kerry Slug. Objectives for the protection of species are included in many Development Plans including both the Kerry and Cork County Development Plans. For example the Cork CDP Objective ENV 1-8 specifically refers to the protection of species which receive strict protection under the Habitats Regulations 1997-2005.

Future Action

- As new information on Kerry Slug distribution and ecological requirements become available, review and update ecological guidance to ensure the conservation of the species is appropriately addressed.
  ACTION: NRA

- Ensure appropriate species protection policies for Annex IV species such as Kerry Slug are inserted into all relevant land-use plans, such as County Development Plans, Functional Area Plans and Local Plans
  ACTION: Local Authorities

9. Review

This Threat Response Plan will be reviewed annually following publication. The reviews will examine progress on the implementation of actions and recommend updates where appropriate. The review will be organised and chaired by NPWS with input from other stakeholders as required.

10. Future Prospects

The status of the Kerry Slug was recently evaluated under IUCN criteria and deemed not to be immediately threatened although the international significance of the Irish population was acknowledged (Byrne *et al.* 2009). While it appears to be widespread and locally common within its known range, some local declines or extinctions are likely to have occurred due to land-use change or development. However, it is equally likely that the current range of the species has been under recorded and that future survey work will confirm its presence in additional 10km squares within the Old Red Sandstone geological zone of south west Ireland. It is of paramount importance that the true status and distribution of the Kerry Slug is understood, along with further evidence of its ecological and conservation requirements.

A number of significant steps have been taken in recent years to secure the long term future of the Kerry Slug in Ireland:

- 7 SACs have been designated for the Kerry Slug. Most of these are large sites incorporating extensive blanket bog and peatland systems and significant areas of deciduous woodland. The largest site is the Killarney National Park, Macgillycuddy's Reeks and Caragh River catchment cSAC which extends to over 76,711 hectares. This site alone covers, at least partially, 14 of the 50 10km squares in which the Kerry Slug has been recorded.
- A Species Action Plan (now superseded by this Threat Response Plan) was produced in 2008.

- The National Roads Authority has produced guidance for the survey and protection of protected species including the Kerry Slug during the planning and construction of national roads.
- The Forest Service has produced guidelines which describe how the Forest Service will take the Kerry Slug into consideration when issuing license and approvals for forest operations.
- Environmental schemes in both forestry and agriculture are providing incentives to landowners to manage land in a manner which is compatible with Kerry Slug conservation.
- Research has been commissioned by NPWS into the ecology and distribution of the species in Ireland. The research will specifically produce a methodology for survey and long-term monitoring of the species.

Nevertheless, the Kerry Slug has a restricted distribution in Ireland and continues to face significant threats, not least due to the lack of knowledge about the species. Further urgent action is required to address these gaps. This plan sets out those actions, identifies who is responsible for implementing them and provides a time frame for delivery. Implementation of the prescribed survey and monitoring programme, together with implementation of the additional actions identified in this document, should ensure the long term favourable conservation status of the Kerry Slug in Ireland.

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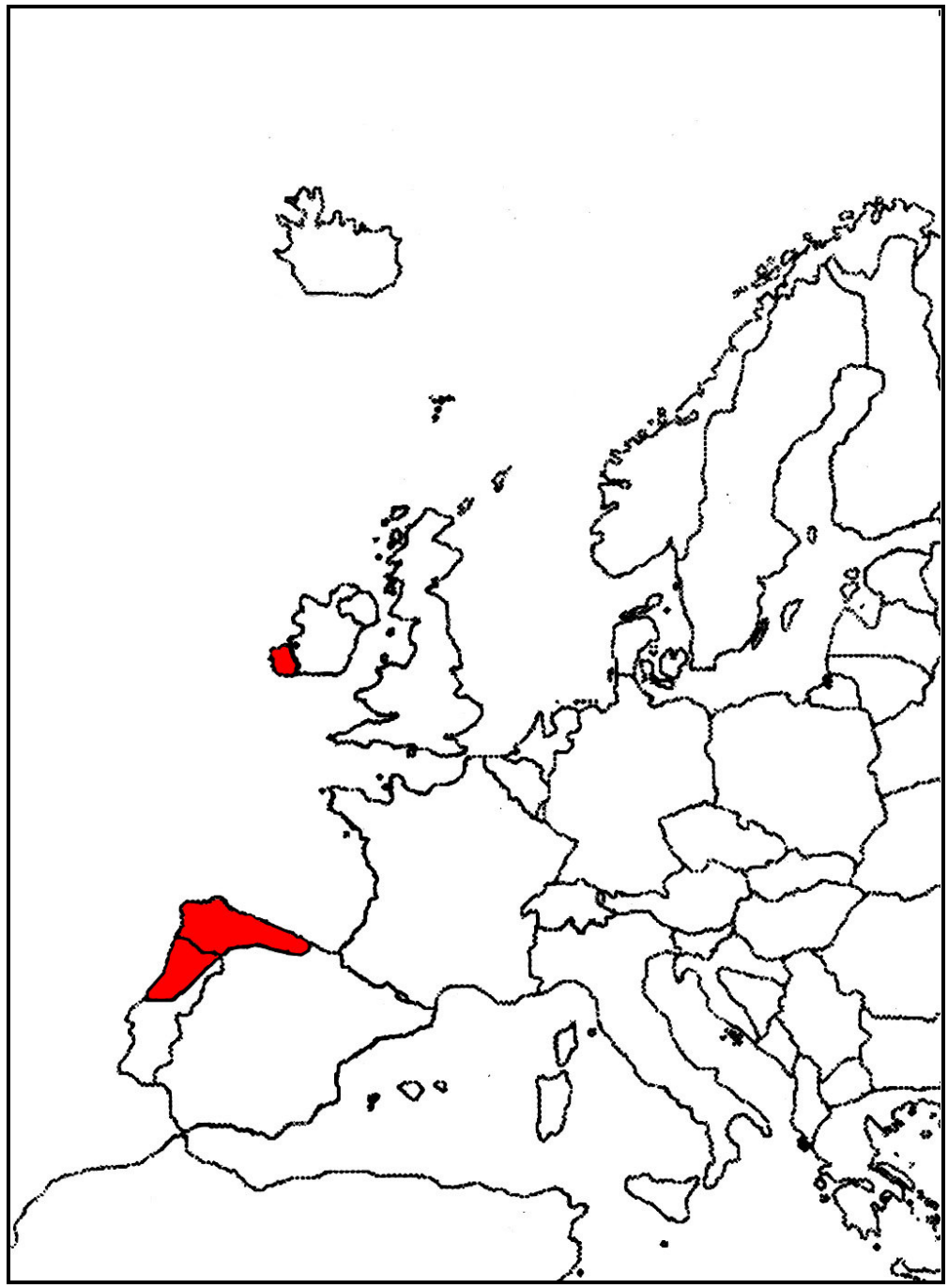
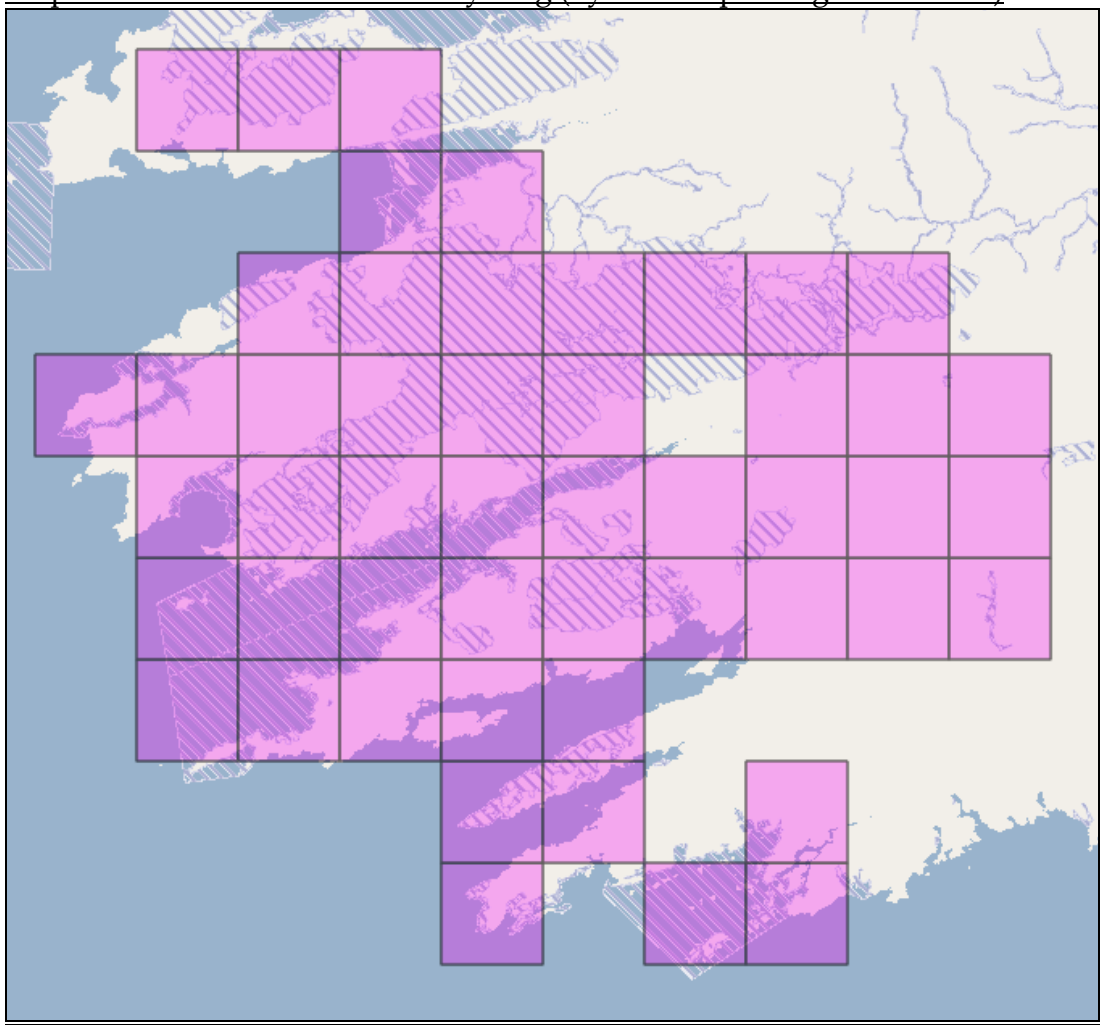
APPENDIX 1. Maps

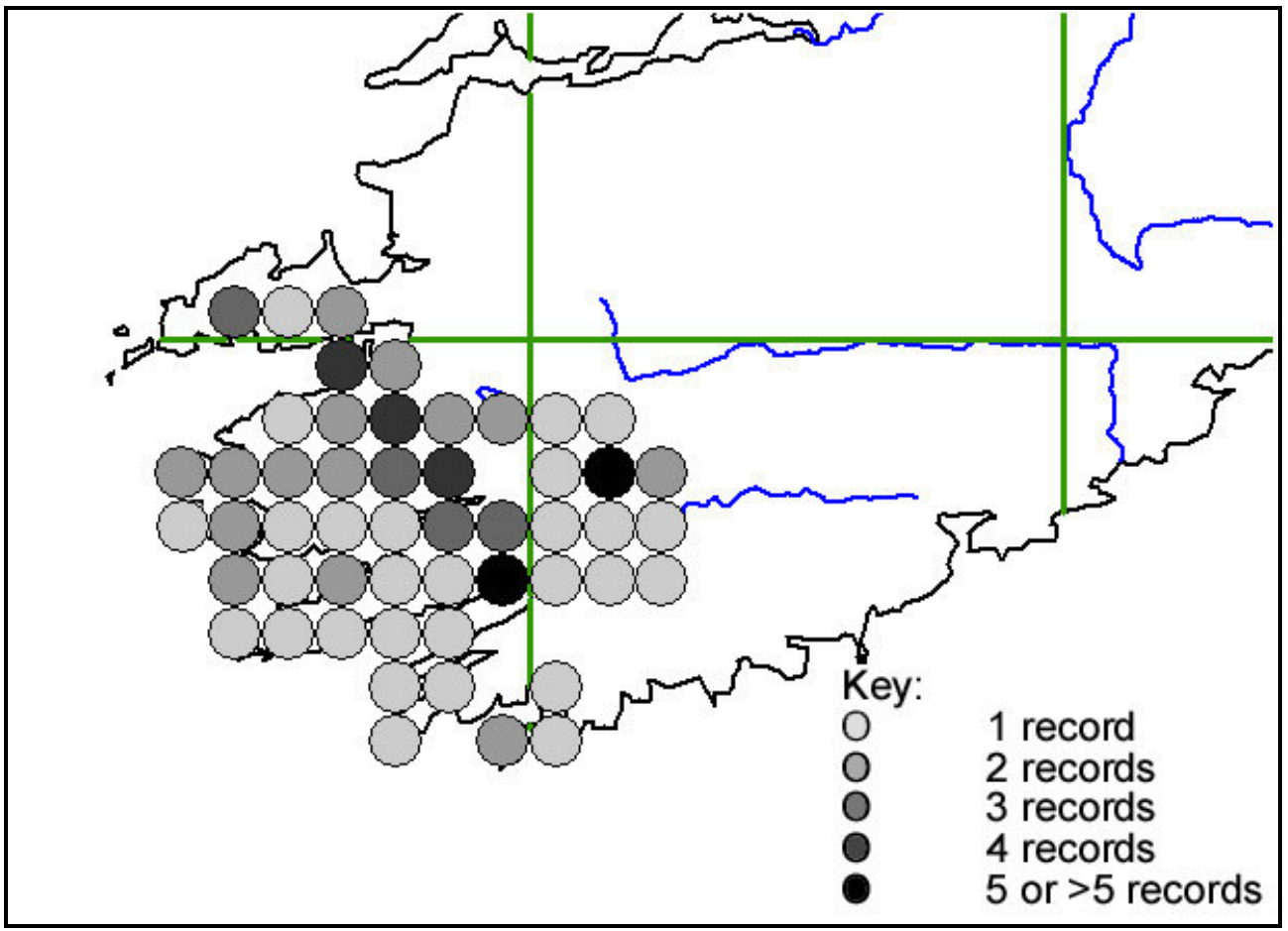
Map 1 Global range of the Kerry Slug *G. maculosus*



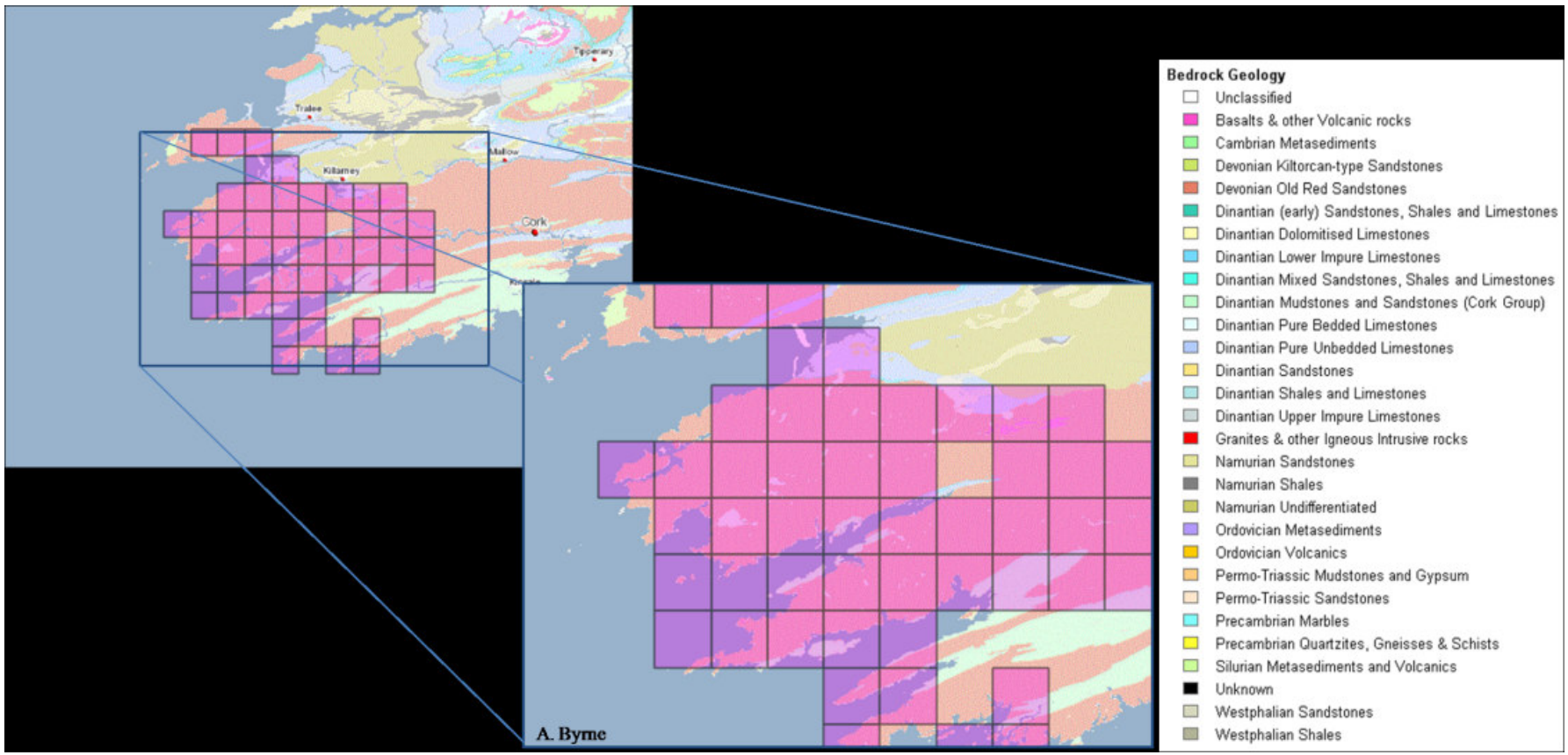
Map 2. Distribution of Kerry Slug (by 10km square against cSACs)



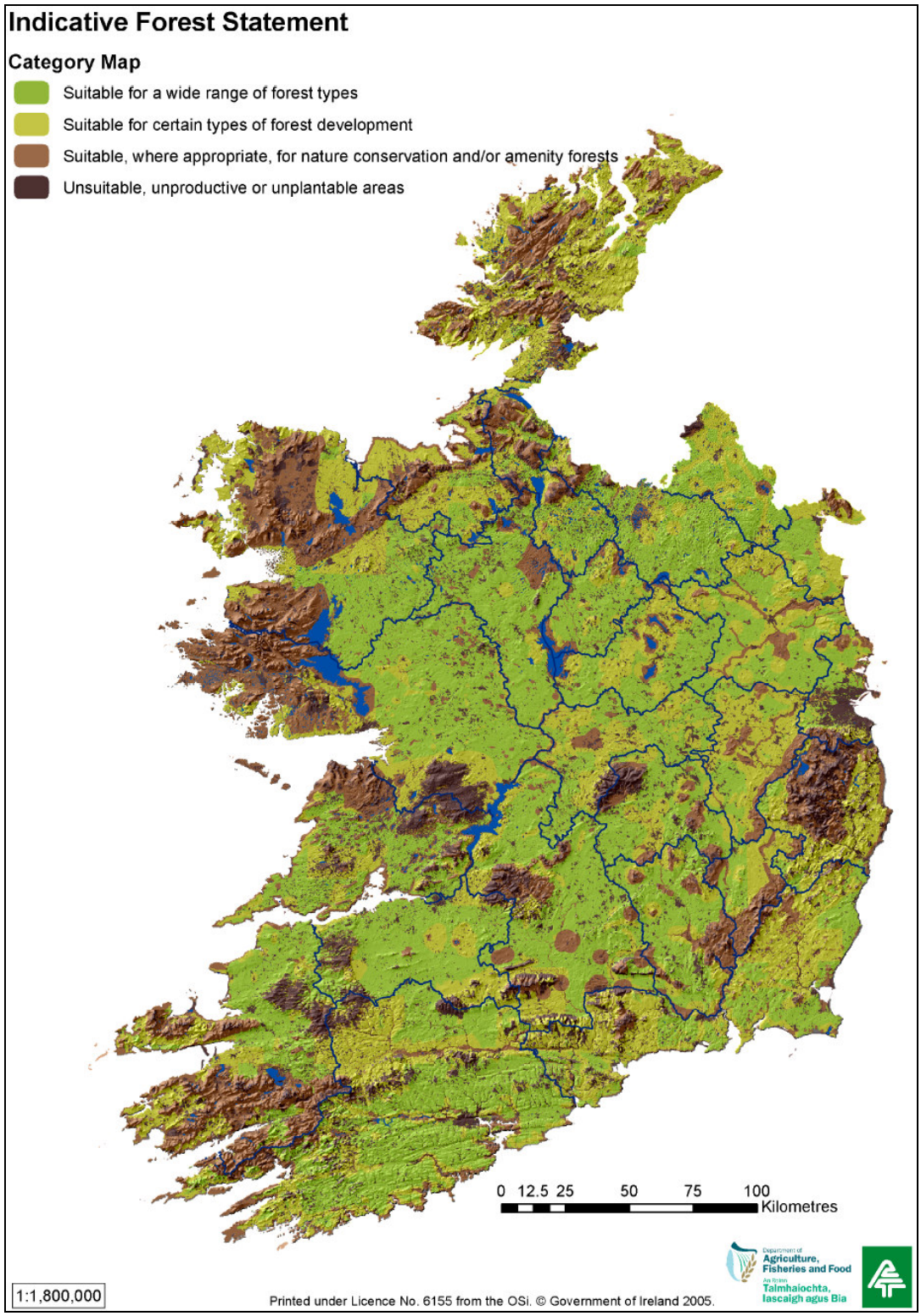
Map 3. Number of sites recorded in each 10 km square



Map 4. Kerry Slug records against locality and geology



Map 5. Indicative Forest Statement category map



APPENDIX 2 Department Circular of May 2007

AN ROINN COMHSHAOIL, OIDHREACHTA AGUS RIALTAIS ÁITIÚIL
DEPARTMENT OF THE ENVIRONMENT, HERITAGE AND LOCAL GOVERNMENT

AN ROINN COMHSHAOIL,
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Circular Letter NPWS 2/07

16 May, 2007

Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/ applications for derogation licences.

A chara,

I am directed by the Minister for the Environment, Heritage and Local Government to refer to the EU Habitats Directive, to the Habitats Regulations 1997-2005 which transpose that directive into Irish law,[1] and to Ireland's obligations under that Directive.

The Directive, and the implementing Regulations, require that certain species listed in Annex IV of the Habitats Directive are strictly protected. A list of these species is appended.

These species are not necessarily associated with areas subject to a specific nature designation: in the case of bat species and otters they may be found anywhere throughout the country.

Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive-

"(a) deliberately captures or kills any specimen of these species in the wild,
(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,
(c) deliberately takes or destroys the eggs from the wild, or
(d) damages or destroys a breeding site or resting place of such an animal,

shall be guilty of an offence."

[1] Council Directive 92/43/EEC of 21 May 1992, on the conservation of natural habitats and of wild flora and fauna, the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998, (S.I. No. 233 of 1998), and the European Communities (Natural Habitats) (Amendment) Regulations, 2005, (S.I. No. 378 of 2005),

Regulation 21 provides corresponding protection for Annex IV plant species.

The carrying out of any work that has the potential to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 21 or 23 of the Habitats Regulations.

It should be noted that in the case of Regulation 23 (d), it is not necessary that the action should be deliberate for an offence to occur. This places an onus of due diligence on anyone proposing to carry out an action or project that might result in such damage or destruction.

A particular concern arises regarding works carried out by or on behalf of local authorities themselves, including works of maintenance or repair.

Examples of cases that are likely to require assessment are the removal of trees and other habitat during the construction of roads or other infrastructure, the modification of the courses of rivers, drainage and discharge of water, and even the re-pointing or replacement of masonry in bridges, walls and other structures where bats are likely to roost, etc.

Procedure to be followed

Local authorities must ensure that they, their staff and their agents comply fully with the requirements of the Directive and the Regulations as follows:

1. In advance of any works, an appropriate initial assessment should be carried out by a person competent to identify where a risk of damage or disturbance to an Annex IV species may exist (e.g. by an appropriately qualified ecologist). The fact that such an assessment has been carried out should be recorded and kept with the papers associated with the project.

2. Projects where a risk is identified should be subject to an appropriate scientific assessment. It will be necessary to identify alternatives or modifications that will avoid that risk.

3. Where it is not possible to identify a means of avoiding the risk completely, the question of seeking a derogation licence from the Minister under Regulation 23 of the Habitats Regulations should be considered if it is desired, notwithstanding, to proceed with the action or project.

4. The Minister is empowered, within strict parameters, to grant a license for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations. The scope of the Minister's powers to grant derogation licences is set out in Regulation 23, as follows:

Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a

derogation from complying with the requirements of the provisions of section 21 of the Principal Act and Regulations 23 and 24 where it is—

(a) in the interests of protecting wild fauna and flora and conserving natural habitats, or

(b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property, or

(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment, or

(d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants,

(e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent (if any) specified therein, which are set out in the First Schedule.

6. Any application for a derogation licence (to be submitted to Mr Jamie Mulleady of this Department at: Species and Regulations Unit, National Parks and Wildlife Service, 7 Ely Place, Dublin 2 email: Jamie.mulleady@environ.ie) should address the criteria referred to in the above paragraph as well as proposed scientifically-based mitigation measures to address any potential impact on the identified Annex IV species. A decision on an application will be made on the basis of the information and proposals submitted and best scientific knowledge.

7. An application for such a derogation licence should be made in advance of seeking approval under Part 8 or 10 of the Planning and Development Regulations, 2001, as amended, or seeking planning permission for works. This will ensure that full consideration can be given to the impacts of the proposed project on the species and to avoid the possibility of delay to the proposed project or of a refusal of a derogation licence which would prevent the works being carried out as planned.

8. The obligation to obtain a derogation licence is additional to the requirement to notify the Minister of a proposed development which may have an impact on nature conservation to the Minister under article 82(3)(n) and others of the Planning and Development Regulations, 2001 (as amended). Local authorities should notify the Minister (Development Applications Unit) in any case where it appears that a proposed development may pose a risk to Annex IV species.

9. Should a problem be identified regarding Annex IV species in the course of works, this should be reported immediately to the National Parks and Wildlife Service. No further work that might impact on such species should take place unless a derogation licence has been obtained.

Applications for planning permission
Issues concerning damage or disturbance to Annex IV species also arise in the context of applications for planning permission for proposed development, e.g. proposals to renovate older houses. The responsibility of avoiding disturbance or damage to Annex IV species, or of obtaining an appropriate derogation licence, rests with the developer.

However, planning authorities should note that in any case where it appears that a proposal may pose a risk to Annex IV species, the planning application should be referred to the Minister under article 27(1)(n) of the Planning and Development Regulations 2001 (as amended). This referral should be done in the appropriate manner for applications having impacts on nature conservation sites. Planning authorities could also take the opportunity afforded by any pre-application discussions to alert prospective applicants to the requirements in relation to Annex IV species.

Further information
Species Action Plans, which set out specific measures for the monitoring and protection of these species, have been or are being prepared. They are published on www.npsw.ie or can be obtained from Species Unit (Tel: 01 888 3212). Guidelines in regard to bats are available at www.npsw.ie.

General questions in relation to the protection of Annex IV species or require any further information on an application for a derogation licence should be referred to Species Unit (01 8883214). Specific queries regarding a proposed project, location or species should be referred to the appropriate National Parks and Wildlife Service Divisional Ecologist or to the Regional Manager (contact details http://www.npws.ie/media/Media,4976,en.pdf).

If you have any questions in relation to the referral of a planning application, please contact Development Applications Unit (Tel: 01 8883181)

Is mise le meas,

Peter Carvill,
Assistant Principal Officer.

To: all County and City Managers, Directors of Services for Planning, Town Clerks

Appendix

Species listed in Annex IV found in Ireland:

- All bat species
- The Otter
- All Cetaceans
- The Leatherback Turtle
- The Natterjack Toad
- The Kerry Slug
- The Killarney Fern
- The Slender Naiad
- The Yellow Marsh Saxifrage

APPENDIX 3.
National Roads Authority
Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA 2009) – Kerry Slug extract

Key Card:

Kerry Slug

(*Geomalacus maculosus*)

Kerry Slug (*Geomalacus maculosus*)
Photos: Paul Scott, Scott Cawley

Description

The Kerry slug is a member of the Arionidae family. It is marked with white or yellow spots, and two colour forms exist: a blue/grey slug with white spots; and a ginger or brown form with yellow spots. Both varieties co-exist in Ireland. Adults can appear up to 70 to 80mm long, but may contract into a ball shape when disturbed, unlike any other Irish slug. They are also able to elongate and flatten themselves to take refuge in crevices.

The Kerry slug has a very restricted global range, occurring only in Ireland, Spain and Portugal (where it is possibly now extinct). In Ireland it is a member of the distinct faunal and floral element known as 'Lusitanian' species.

Life-Cycle and Behaviour

Kerry slugs feed on lichens, liverworts and mosses growing on rocky outcrops and on mature trees and timber. They are active at night throughout most of the year if it is not too cold or dry, and also commonly during the day, emerging to feed in very damp and humid conditions on cloudy, warm, damp days, either during or after rain. At other times they hide in crevices, under dead bark and stones.

Kerry slugs are capable of self-fertilisation and produce eggs in batches of 18 to 30 between July and October. The eggs are large, approximately 6 to 8.5mm by 3 to 4.25mm, and take between six and eight weeks to hatch. The animals can live for up to seven years, becoming sexually mature in their second year.

Habitat Preferences

In Ireland, the Kerry slug is restricted to the sandstone geology of west Cork and Kerry, where it has been recorded from fifty 10km squares since 1965. Within this range, it occurs within two broad habitat types.

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The first habitat type is oak-dominated or mixed deciduous woodland with a mixture of oak and birch. Woodland on slopes which incorporate rocky outcrops or scattered boulders is of particular value. Other favoured conditions include: areas where trees and rock are situated close to water in undisturbed, humid conditions; areas with clean air; and areas with a good lichen, or lichen, liverwort and moss floras. In this habitat, the slugs can graze the organic film of the lichen and associated flora.

The second broad habitat type includes areas of unimproved oligotrophic open moor or blanket bog, with sandstone outcrops and boulders. These areas may be largely devoid of vegetation except for lichens and mosses, which are present in a sufficiently large quantity to provide enough suitable grazing material.

Survey Techniques

It will obviously only be necessary to consider the need to undertake specific surveys for Kerry slug within its geographical range. Should the multi-disciplinary walkover survey and desk study identify habitats suitable for use by this species that could be affected by the proposals, then targeted surveys would be necessary.

It is recommended that fixed-route transects should be walked at 20m intervals throughout oak woodland or bog habitat at night using torchlight, and a visual count made of the number of individuals observed within five metres of the transect. This will involve a careful search of features on which the animals are likely to be feeding, especially tree trunks, moss-covered timber close to water, and lichen covered boulders and outcrops. Transects should be covered over a fixed time period to provide indices of relative abundance and allow comparison between sites in those situations where such data would be useful.

Optimum Survey Period

Surveys for the Kerry slug can be carried out all year round. Assuming there are no significant health and safety implications, they should be conducted at night, particularly during damp and humid conditions. Periods of excessive cold or drought should be avoided as survey efficiency during these periods is considerably reduced. Whilst surveys can be carried out on cloudy, damp days, the efficiency of these searches will be lower than for nocturnal surveys.

Mitigation, compensation and enhancement

Given that mitigation is likely to be site-specific in nature, detailed mitigation strategies should be developed in consultation with the NPWS and other relevant consultees. In the first instance, areas with known populations of the Kerry slug in the sandstone geology of west Cork and Kerry should be avoided through route selection. Where loss of suitable habitat cannot be avoided through alterations to route alignment, measures should be taken to protect populations. Appropriate measures are likely to involve erecting protective fencing around areas in which the Kerry slug is known to occur to protect the animal and its habitat from harm during road construction and maintenance activities. Translocation and habitat enhancement schemes should be avoided wherever possible, since the Kerry slug is particularly vulnerable to changes in its habitat.

In all cases, impact assessment should consider the likely effects of atmospheric pollution, to which lichens (the main food source of the Kerry slug) are particularly sensitive. In addition, care should be taken to ensure there is no increase in the spread of exotic species such as rhododendron, since this invasive species changes the humidity regime of woodland and open habitats that it invades, making them less suitable for the Kerry slug.

Key reference

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National Roads Authority
***Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA 2009)**