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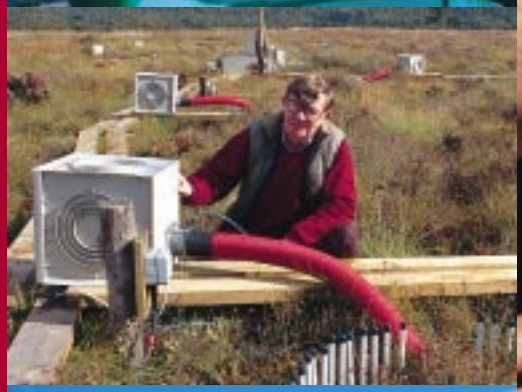
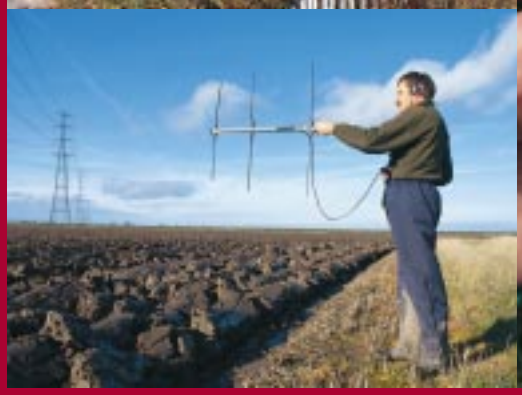
English Nature Research Reports





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Control of *Rhododendron ponticum* on Lundy in relation to the conservation of the endemic plant Lundy cabbage, *Coincya wrightii*

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This report was produced as part of an English Nature contract under the Species Recovery Programme. It is intended as a discussion document to inform thinking regarding short, medium and long term objectives for the control of *Rhododendron* in relation to the conservation of Lundy cabbage and other considerations on Lundy.

Abstract

1 Lundy cabbage and one of its specific beetle plant feeders, *Psylliodes luridipennis*, are listed on the *UK Biodiversity Action Plan*. The UK government has therefore committed itself to the conservation of these two species.

2 *Rhododendron ponticum* L. poses a threat to the survival of Lundy cabbage *Coincya wrightii,* to its associated insect fauna and to the plant communities on the eastern side of Lundy. Archaeological features are also threatened.

3 The origin and history and distribution of *Rhododendron ponticum* on Lundy is described together with an account of control measures applied to date.

4 A strategy for the control and eventual eradication of *Rhododendron ponticum* is suggested:

a The ultimate objective of *Rhododendron* control should be total elimination of the plant from Lundy. Although this may be unrealistic in the short term, *Rhododendron* on lundy will remain a constant threat and drain on resources.

b Short and medium term goals should be to remove *Rhododendron* from the areas of greatest ecological and archaeological concern, and halt the spread of the plant elsewhere. Within the constraints of labour, finance and accessibility, *Rhododendron* thickets should be removed in sequence, in accordance with their priority ratings.

c Monitoring of *Rhododendron* should be carried out at regular intervals and accurate records of control activity should be kept. A revised and costed control plan can then determine what can be achieved in the future with different levels of resources.

d Cliff-side *Rhododendron* clearance should be undertaken, initially as a pilot project, and biological control options might be considered.

Contents

1. Introduction

On Lundy, the beautiful introduced shrub *Rhododendron ponticum* L. poses a threat to the survival of one of Britain's few endemic plants, the Lundy cabbage *Coincya wrightii*, its dependent endemic insect fauna and the plant communities on the Eastern Sideland of the island (Plate 1). Other than localised overgrazing, *Rhododendron* is the only significant threat to the endemic Lundy cabbage. Although *Rhododendron* poses a problem for many plant communities in Britain, Lundy is the only location where the survival of a species is threatened.

The most frequent cause of extinction among island endemics is the introduction of alien species (eg Diamond, 1989). Under Article 8, Paragraph h of the United Nations Convention on Biological Diversity, countries have agreed "to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (JNCC, 1992) *Rhododendron* on Lundy clearly falls within this category.

In this report we briefly describe the history of *Rhododendron* on Lundy and record its current distribution. We suggest a control strategy, outlining the particular problems of *Rhododendron* control on Lundy, and the areas where control should be given initial priority. Various related recommendations are provided. In order to conserve the Lundy cabbage, we feel that the long term objective should be the complete eradication of *Rhododendron* from Lundy, as this is the only way to safeguard the Cabbage. Otherwise the need for constant, repetitive and expensive control measures will continue indefinitely.

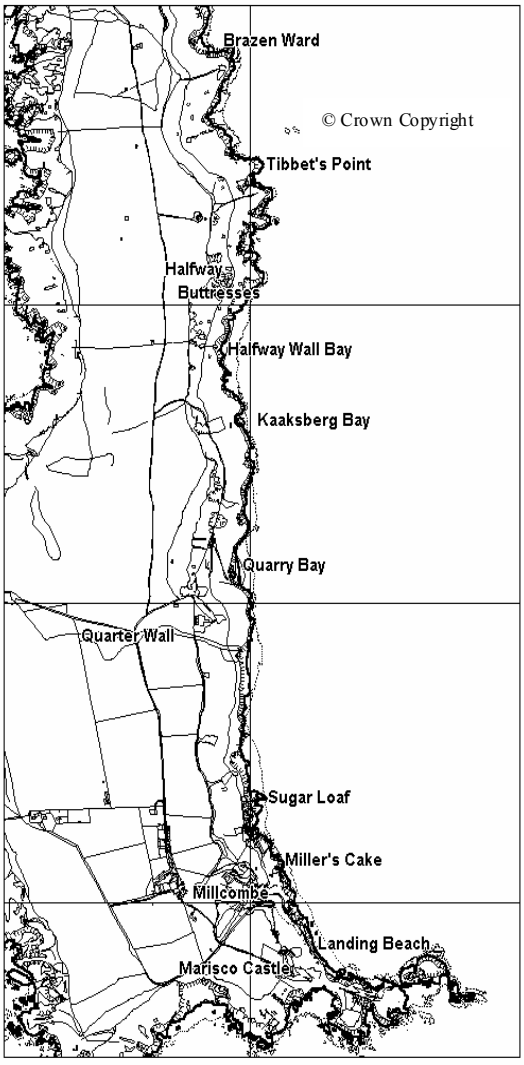

Figure 1. Lundy. Place names referred to. Scale: squares are 1km2 of National Grid

2. Background

2.1 Lundy

Lundy (Figure 1) is situated in the Bristol Channel, 18 km from the English mainland and comprises a central plateau bounded by steep cliffs. Loose, weakly metamorphosed slates and shales form the cliffs in the south east of the island, replaced by granite from Ladies' Beach northwards on the east coast. Soils are mainly acidic, except in the south east of the island, where more neutral soils occur over the slates (Dawes, 1979).

Lundy is owned by the National Trust, leased to the Landmark Trust who manage the island. Most of Lundy is designated as Site of Special

Scientific Interest, is afforded Nature Conservation Review status (Ratcliffe, 1977; Key, 1996), and is surrounded by the Lundy Marine Nature Reserve. English Nature funds the employment of a conservation warden on the island.

2.2 Lundy cabbage

Lundy cabbage (*Coincya wrightii* (O.E. Schultz) Stace) is listed as Rare in the *British Plant Red Data Book* (Perring & Farrell, 1983) and is protected under Schedule 8 of the 1981 Wildlife & Countryside Act.

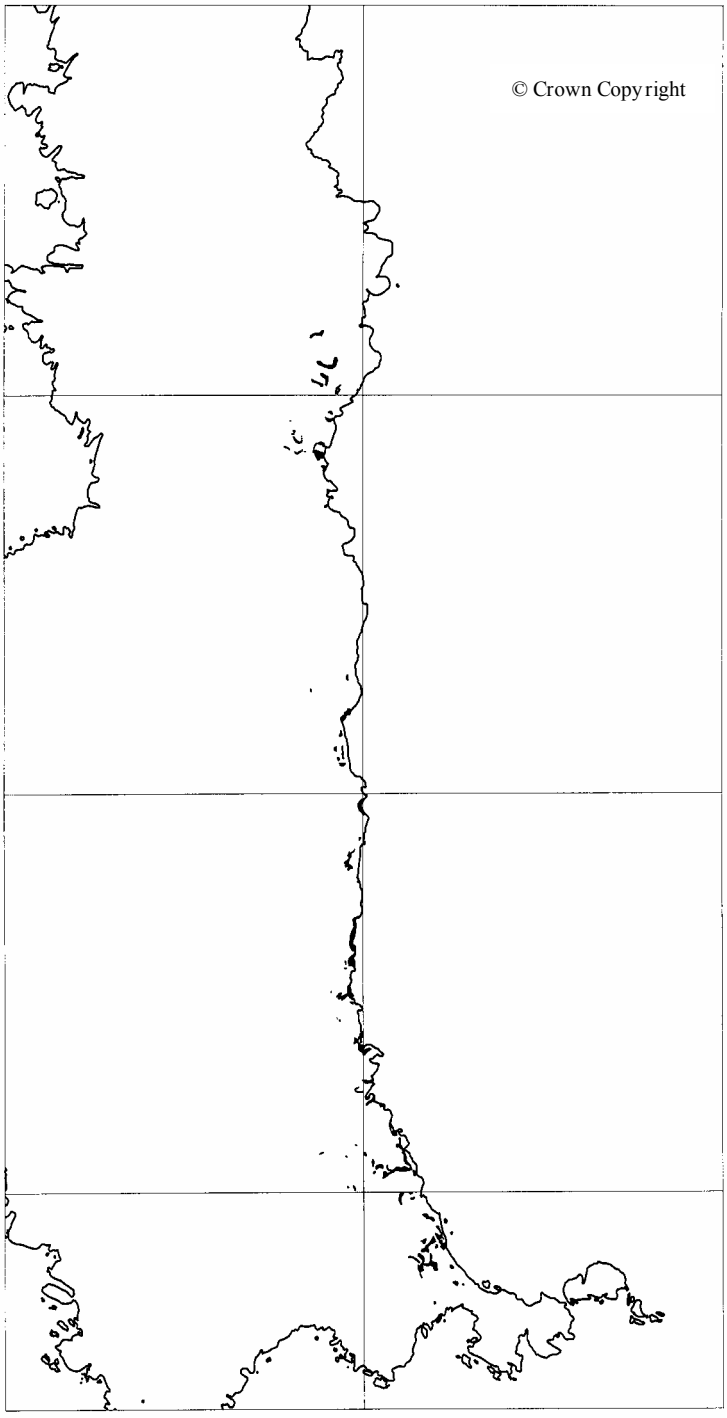

Figure 2 Distribution of Lundy cabbage (black) in 1997.

It, together with one of its specific plant feeders, the flea beetle *Psylliodes luridipennis,* is listed on the *UK Biodiversity Action Plan* (UK Steering Group, 1995).

It is unusual in being one of the few species of higher plant endemic to the United Kingdom and unique in being the only endemic plant species also to support endemic insects.

The population size of Lundy cabbage appears to vary considerably from year to year, with estimates as low as 300 plants in the 1970's (Rich, 1991), whereas there are currently in excess of ten thousand individuals (Compton and Key, in prep).

Lundy cabbage is restricted to the more sheltered south-east of the island where it is found from the cliffs just to the west of Marisco Caste Bay to just south of Tibbett's Point (Figure 2). It can be found in almost all of the plant communities within this narrow range, from the sea cliffs up to a few hundred metres inland around Millcombe (Compton and Key in prep). It is currently restricted to cliffs and very steep slopes and areas inaccessible to grazing by sheep and goats.

Exclosure experiments have confirmed that it would be much more widespread on the Eastern Sidelands in the absence of grazing pressure.

The location of the largest populations varies from year to year, but the area of slate cliffs above Landing Beach, Millcombe, the Sugar Loaf, the cliffs below the various combes on the Eastern Sidelands and sections of the granite cliffs at Quarry Bay and Halfway Wall Bay are the most important areas for the plant.

The Lundy cabbage Flea Beetle *Psylliodes luridipennis* is recognised as an endemic species and the cabbage is the main host of a second endemic beetle of uncertain taxonomic status (the Lundy cabbage Weevil, *Ceutorhynchus contractus* "var. *pallipes"*) and also supports an apparently unique flightless form of a third beetle species, *Psylliodes napi* which, on the mainland, is normally able to fly. *Psylliodes luridipennis* is listed as RDB2 - Vulnerable - in the *British Red Data Book for Insects* (Shirt, 1987).

Current work on the ecology, conservation and monitoring the Lundy cabbage and its fauna is carried out by a joint Leeds University and English Nature Lowlands Team project, partly funded under contract as part of English Nature's Species Recovery Programme.

2.3 Other conservation features

The Eastern Sideland of Lundy also supports populations of balm-leafed figwort *Scrophularia scorodonia* L., also listed as rare in the Red Data Book, some populations of which are also at risk from *Rhododendron* invasion. This side of the island is also home to a rich fauna of other scarce species of invertebrates (summary in Key, 1996).

2.4 *Rhododendron ponticum*

2.4.1 Description and origin

R. ponticum is a beautiful pink-flowered evergreen shrub, up to 5 m in height. It has been widely planted as an ornamental shrub throughout Britain, especially on acid soils in the west, and has escaped from cultivation in all areas where it has been planted. Although now an alien to Britain, the pollen record indicates that it was indigenous during previous interglacials. There are two subspecies of the plant, one native to the Iberian Peninsula, the other to the eastern Mediterranean, but the source(s) of the UK population is unclear and hybridization between subspecies and with other species in the genus may have contributed to its extreme vigour in Britain (Tabbush & Williamson, 1987: Cronk & Fuller, 1995).

2.4.2 Pest status

Although a very attractive ornamental species, *Rhododendron* is an extremely aggressive and invasive alien, posing a very significant threat to conservation and other interests on wet and acid soils. Limiting the environmental damage caused by *Rhododendron* has absorbed huge quantities of financial and manpower resources over several decades in areas such as the Lake District, Snowdonia, Western Scotland and the West Country and other smaller areas with suitable soils.

Because of its invasive nature, dense shading, acidic litter and allelopathic (toxin secreting) foliage (Cronk & Fuller, 1995) dense *Rhododendron* eliminates and excludes virtually all

other plant species beneath it, including Lundy cabbage. Bird diversity decreases in most habitats that it invades and earthworms are lost from the soil (Becker, 1988). In 1996 *Rhododendron ponticum* was put forward for inclusion on Schedule 9 of the 1981 Wildlife & Countryside Act by the Joint Nature Conservation Committee (Palmer, 1996). If this proposal is accepted by the Department of Environment, Transport & Regions, it would become an offence to introduce it to the wild.

2.4.3 Reproduction and dispersal

Rhododendron spreads vegetatively, and is a prolific producer of tiny seeds. More than 6,000 seeds can be produced by a single flower head and a large bush can produce well in excess of 1,000,000 seeds each year (Cross, 1975). Dispersal of the seeds by the wind in open situations can extend for a kilometre or more from parent plants and the seeds are also distributed on the coats of animals (Tabbush & Williamson, 1987). Dry bare soil is inimical to seedling survival and moss carpets up to 1cm deep form particularly effective germination sites (Cross, 1975).

2.4.4 Seed bank

Post-dispersal survivorship of seeds is low, with an almost 50% reduction in germinability within the first year, even under optimal storage conditions (Cross, 1975), while in an imbibed state, as might be expected in soil all seeds become non-viable after 160 days (Cross, 1981). Persistent seed banks are therefore probably not a problem.

2.4.5 Control

Shaw (1984) lists three types of *Rhododendron* control strategies:

preventative measures, designed to limit the spread of the plant by seed
holding measures, to limit the spread of existing stands
direct control measures to deal with established stands.

All three measures are being or have been carried out on various areas on Lundy.

Control of *Rhododendron* can be by pulling or cutting. However, cut stems coppice very readily, down to the very base of the stem, and regrowth rapidly undoes the work that has been carried out unless follow-up treatment with herbicide is applied or the stump is uprooted (Plate 3; Cronk & Fuller, 1995). Although stems layer easily, roots remaining underground do not form adventitious buds and will not regrow if all stem tissue is removed (Tabbush & Williamson, 1987).

Rhododendron is resistant to some herbicides, but is susceptible, especially the regrowth after cutting, to glyphosate, (Roundup® or Timbrell®), Triclopyr (Garlon®) and Ammonium sulphamate (Amcide®), herbicides widely used on UK nature reserves. With separate connections between root and shoot and poor tangential translocation, it is necessary to apply systemic herbicide to all parts of the plant to achieve death of the whole plant (Gritten, 1995).

Herbicide spraying is costly and labour-intensive with estimated costs for initial control of dense stands at between £1000 and £1500 per hectare in 1994 (Oliver, 1994). The costs of commercial clearance and after-control my now be as high as £9000 per hectare.
Areas cleared of dense *Rhododendron* may remain relatively bare of vegetation for some years after clearance and form an ideal seedbed for *Rhododendron* germination. Follow-up

treatment, usually by hand pulling of seedlings, is necessary until a full sward is established. Even after this, if mature *Rhododendron* bushes remain nearby, seedling control remains necessary in perpetuity.

2.4.6 Potential for biological control

Although a wide range of polyphagous insects, mainly moths, feed on *Rhododendron* on Lundy island, they cause the plant little damage (Compton & Key 1996, unpublished).

Biological control of *Rhododendron* has not been attempted, and it has been claimed that there are few candidate control agents available (Cronk & Fuller, 1995) although Compton (unpublished data) has detected insects species in the Iberian peninsula which can be very damaging to young seedlings and their identities are being established. The use of non-native species for biological control would need to be subject to radial screening (Wapshere, 1989) and licensing from the Department of the Environment, Transport & Regions and cannot be expected to form part of a control programme in Britain in the immediate future.

The possibility of using *Rhododendron* bud blast disease (*Pycnostysanus azalaea*) and its vector, the homopteran bug (*Graphocephala fennahi (= G. coccinea*)) could be considered in isolated areas such as Lundy. Both pathogen and vector are present in mainland Britain, but permission from all interested parties would need to be obtained. The disease prevents flower buds from opening, but does not otherwise damage the plants and its potential value therefore lies in slowing the spread of *Rhododendron* by seeding into either newly cleared or *Rhododendron* free areas. The effectiveness of the pathogen seems highly variable, but it can destroy up to 50% of flower buds in some areas (Cross, 1975). Their introduction to the island might have an impact on *Rhododendron* vigour, but seem unlikely to offer the prospect of genuine control.

3. *Rhododendron* on Lundy

3.1 Origin and spread

Rhododendron was introduced to Lundy as an ornamental shrub in the early 19th century (Marren 1971) and was recorded as naturalised and spreading by 1877 (Charter, 1877). The plant was able to take advantage of a major fire on the east side of the island in 1926, after which it rapidly established large impenetrable thickets which still form the core population areas today (Figure 3).

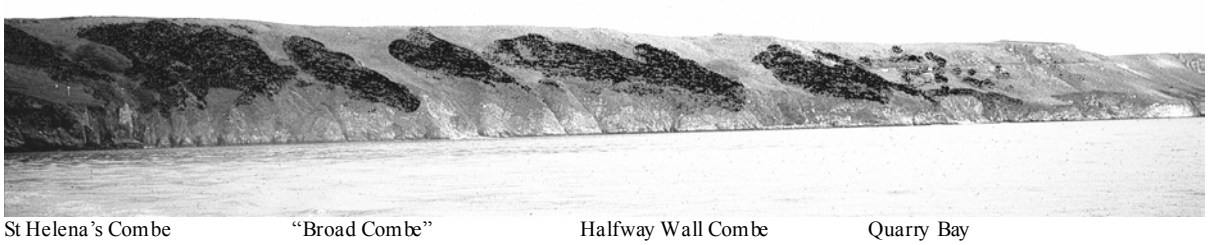

Figure 3. *Rhododendron* on the Eastern Sidelands, May 1983. Magenta of flowers changed to black.

By the time that its distribution was first mapped (Marren, 1971; National Trust 1991, English Nature 1993) *Rhododendron* formed the dominant vegetation in sections of the east

of the island, with isolated plants appearing elsewhere (Figures 4 & 5, below). Willcox (1988) reported that fixed point photography was initiated of the east side of the island in order to provide an accurate record of the distribution of Rhododendron and these photographs have only just been rediscovered and are yet to be analysed. (Liza Cole, pers comm).

A number of sequences of aerial photographs have been made of Lundy, those from 1974 and 1982 being held by English Nature. That from 1974 is currently being analysed and visible *Rhododendron* has been mapped to get an idea of changes in distribution area over this period and the speed of spread (Figures 6 & 8, below).

Despite some success with containment in some parts of the south and virtual elimination of *Rhododendron* north of Halfway Bay, an increase in *Rhododendron* cover is continuing. New plants are continuing to establish outside its previous range, presumably arising from wind-borne seed, and the established patches are expanding through vegetative growth and establishment of new bushes on their periphery.

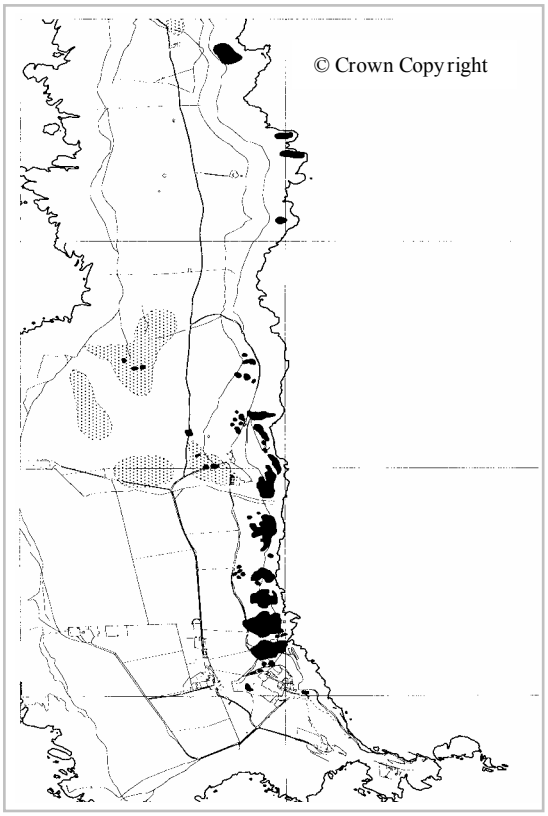

Figure 4 *Rhododendron* distribution from Marren (1971), transferred to Mapinfo® (shading = areas with seedlings).

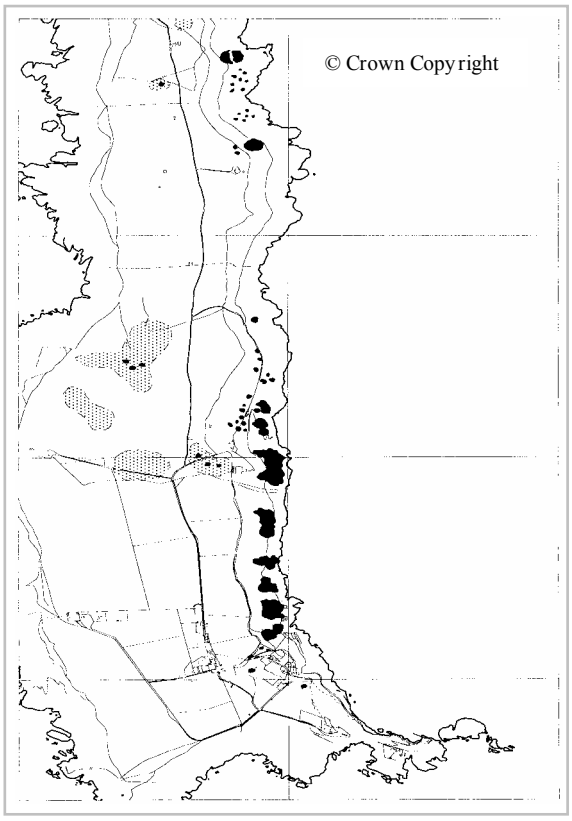

Figure 5 *Rhododendron* distribution from National Trust (1991), transferred to Mapinfo® (shading = areas with seedlings).

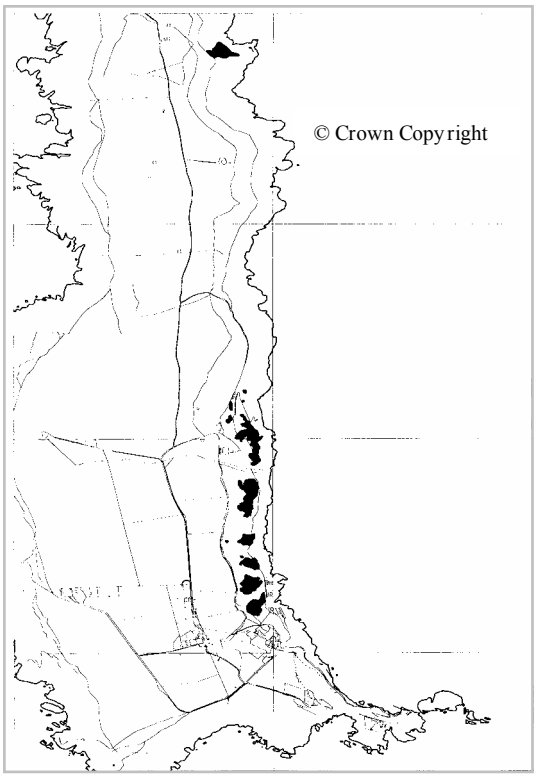

Figure 6 Visible *Rhododendron* transferred to Mapinfo ® from 1974 aerial photographs.

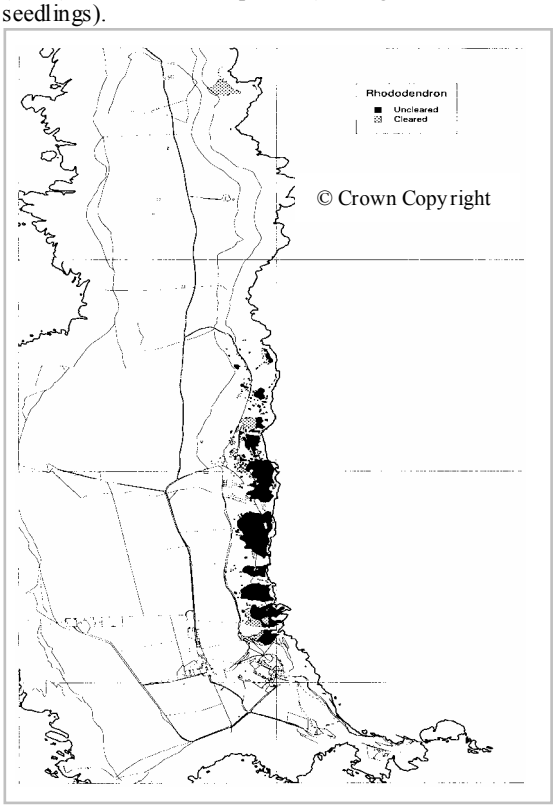

Figure 7 Current *Rhododendron* distribution: our own surveying.

3.2 Current distribution and area

The distribution of *Rhododendron* was remapped in 1996 and updated in 1997 (figures 7). Like the maps produced earlier, this was mapped by eye, but its accuracy is likely to be greater than the previous estimates as 1:10,000 digital maps were used as templates. Its distribution has been transferred to the Mapinfo® G.I.S. system at English Nature for analysis and mapping. A likely idea of the spread of *Rhododendron* over this period is given by superimposing the 1974 aerial photograph cover, the National Trust survey and the current distribution (Figure 8).

New bushes can be seen to have appeared at a variety of locations since the production of the earlier maps, mainly to the south and inland of the main *Rhododendron* thickets. The total *Rhododendron* cover on Lundy in 1997 is estimated at approximately 9 ha, of which approximately 1.5 ha has been recently cleared and is in various stages of after-treatment.

There are ten large thickets, generally separated by open valley areas ("Combes"), some with streams that drain the plateau and run approximately west to east. The expansion of the thickets in recent years has led to a narrowing of these breaks in the *Rhododendron* cover, despite the intention to maintain these open areas as fire breaks.

The other major direction of expansion of the established thickets has been towards the cliff edge and down the cliff faces. *Rhododendron* now reaches the cliff edge across much of its range, presenting a daunting and hazardous task in control. In a few places it has descended almost to sea level.

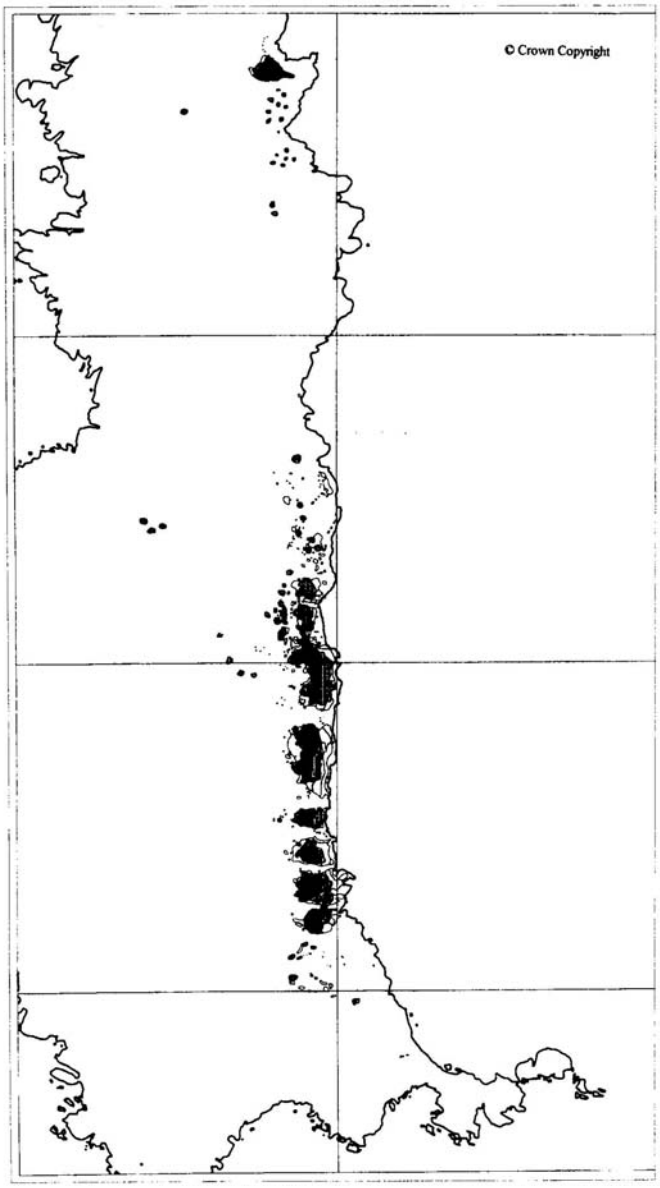

Figure 6 *Rhododendron* distribution from 1974 aerial photos (black), the National Trust survey (dotted) and our survey (outline), transferred to base map.

3.3 Threats posed to conservation features on Lundy

3.3.1 Threat to Lundy cabbage

Phytosociological analysis of the plant communities currently occupied by both *Rhododendron* and Lundy cabbage suggests that *Rhododendron* is capable of occupying the full range of habitats of the cabbage (Compton and Key, unpublished) and therefore has the potential, if unchecked, totally to supplant it.

Although it is inconceivable that *Rhododendron* would ever be allowed to occupy the full range of the cabbage, any reduction in the population size and area that the plant can achieve within a reduced range will increase the chances of it's extinction in the longer term, especially as the plant's population size seems to fluctuate so dramatically (Caughley, 1994).

3.3.2 Threat to other vegetation on the Sidelands

Although a small population of balm-leaved figwort *Scrophularia scorodonia* exists in one of the Combs, this is associated with the edges of the stream/flush in the centre of the Combe. It is not currently threatened by *Rhododendron*, but is at risk of being swamped by an increase in luxuriant growth of nettles and hogweed which presumably is resulting from nutrient runoff from fertilization of the improved grassland above (Richardson et al., in prep).

Large areas of acid/neutral grassland, largely of *Festuca rubra, Arrhenatherum elatius, Holcus lanatus, Hyacinthoides non-scriptus, Conopodium majus, & Pteridium aquilinum* have already been lost to *Rhododendron* as well as rock ledge communities of *Sedum anglicum, Jasione montanum, Umbilicus rupestris, Teucrium scorodonia, Digitalis purpurea* etc on the sea cliffs, quarries and spoil heaps.

3.3.3 Threat to other features

Archaeological features associated with quarries and old garden terraces are also threatened by the extensive root systems of the plant and the Harmon VC memorial has already had to cleared once of *Rhododendron* encroachment.

3.4 Contribution of *Rhododendron* to Lundy's attractions

Rhododendron is popular with many visitors to the island and a walkway is kept open through the various thickets for visitors to enjoy and the Landmark Trust's promotional literature on Lundy includes *Rhododendron* as one of the island's attractions. It also provides cover for Sika deer, which are also much-appreciated by visitors (Wolton, 1993). Control of *Rhododendron* and, in particular, any proposal to eliminate it therefore poses a conundrum for the management of the island:- how valuable is the *Rhododendron* as an attractive feature of the island compared with the threat that it poses to some of the unique features of the island and the endless need for financial and manpower resources to achieve its control? This is a question for a broad forum representing all interests on Lundy.

4. *Rhododendron* control on Lundy

4.1 History

4.1.1 Early attempts at control

Early reference to *Rhododendron* as a problem is by the Island's owner M C Harmon in 1949 (Harmon, 1949) when the suggestion was made that the Lundy Field Society might assist in controlling it.

Early *Rhododendron* control on Lundy was not followed up by chemical treatment and bushes that were not grubbed out rapidly regrew. As *Rhododendron* coppices well, control simply by cutting is not possible and some areas of *Rhododendron* on Lundy show evidence of such coppicing.

4.1.2 1980s/early 1990s

Control of *Rhododendron* during the 1980's concentrated mainly on the elimination of the stands of the plant at the northern edge of its distribution, around Three-quarter Wall Bay above Brazen Ward. This has been continually supplemented since by seedling removal to prevent any further spread (Willcox, 1988, National Trust 1991). By 1988 the complete elimination of *Rhododendron* plants from Three-quarter Wall Bay was reported, but with the caveat that numerous seedlings were appearing. Seedlings are still numerous in this area (Parkes, 1995 and own observations). Approximately 30 small but mature plants, which are likely to be the source of these seedlings, were found to be present in 1996, in inaccessible locations just below the cliff edge. These are an obvious priority for removal.

In the early 1990's, a chain saw, winch etc. were financed by the Lundy Field Society and English Nature's SW Region to facilitate the removal of larger branches for burning in domestic fires, thereby attempting to turn *Rhododendron* into a useful resource. Cutting was followed by treatment with Timbrel as there was less risk of damage to archaeological features than with uprooting.

Recent after-treatment measures have concentrated on chemical control of regrowth, rather than uprooting of stumps. Volunteers cut, transport and burn the branches, and contractors spray the regrowth. The policy of eradication north of Three-quarter Wall has been continued, but clearance efforts have also concentrated on areas of archaeological interest above Quarry Beach, above St. Helena's Copse and on plants in and near Millcombe (Parkes, 1996). The landward side of the most southerly two of the major *Rhododendron* thickets have also been targeted, with around half their area cleared.

4.1.3 Resources for *Rhododendron* control

Unfortunately little record has been kept until recently of the work undertaken, and the resources involved in achieving the current level of containment. It is important to keep records in future in order to determine the resources needed for subsequent control measures.

In the mid 1990s, the Landmark Trust entered into a Countryside Stewardship agreement with MAFF, part of which included financial assistance for the annual chemical treatment by contractors of 1 ha the stumps of cut *Rhododendron* under "scrub management". This is cut entirely by volunteers, largely from the Lundy Field Society and The National Trust's Acorn Volunteer Groups, the accommodation for whom is provided by the Landmark Trust. Until 1999, this clearance is all targeted towards the Quarries area and the large *Rhododendron* thickets on the Eastern Sidelands (Liza Cole, pers comm.). Individual areas targeted for clearance under Countryside Stewardship are referred to in Appendix 1.

In 1997 the Worldwide Fund for Nature offered £500 for work towards the conservation of Lundy cabbage and Mr Callum Rankine of WWF has interested the British Mountaineering Council in voluntary work helping to clear *Rhododendron* from the cliffs. Pilot work in this direction should have started in summer 1997 but was delayed by strong easterly winds and, at the time of writing, has been postponed until 1998.

English Nature has also made £2500 available in 1997/98 as part of a larger programme of work on the Lundy cabbage and its fauna funded under the Species Recovery Programme. This was for a pilot project using professional ropework operative for clearance work on the cliff faces, an area not covered by the Stewardship agreement. If successful, further resources for *Rhododendron* control on these cliffs should be available as part of the Species Recovery Control project.

Monsanto Ltd have generously provided free sufficient Roundup Pro Biactive to prevent regrowth in this area and Leeds University student volunteers will provide cliff-top assistance. Work will be carried out in winter 1997/98 by Rope Works Ltd.

4.2 Stated objectives

In the early 1990's, the policy on *Rhododendron* control was stated to be (Anon, 1992):

to remove all plants north of quarries
to remove most plants in the quarry area
to reduce present stands along east side and replace with broad-leaf trees

More recently, Wolton (1993) proposed that *Rhododendron* control should have the aims of:

eradicating the plant north of Three-quarter Wall
limiting the major thickets to discontinuous thickets, to reduce fire risks

The current management plan for Lundy (English Nature, 1994) includes the objectives of:

restricting *Rhododendron* distribution
preventing the encroachment of *Rhododendron* into *Scrophularia* stands
(a small population of *Scrophularia scorodonia* occurs in one of the gaps between the major thickets)
progressively replacing *Rhododendron* thickets with native broadleaves

The Stewardship Agreement guidelines state:

> "The aim is to maintain a balence between scrub and open land, taking into account landscape, wildlife and archaeological considerations, for example, clearing scrub completely from earthworks but leaving some elsewhere for birds.

Scrub removal may be by manual cutting followed by chemical treatment of stumps, or cutting regrowth until it stops regenerating. Pulling stumps or bulldozing scrub are not acceptable methods because of the damage this can cause to archaeology. Burning is not allowed. Cut material should be removed from the site and may be chipped or burned on areas where there will be no damage to the habitat.

Work should be carried out outside bird nesting season."

Lundy cabbage is not mentioned in any of these objectives.

4.3 Results of *Rhododendron* control measures

The areas where *Rhododendron* has recently been cut, or cut and sprayed, have been determined by the Management Plan and are indicated on the maps in Appendix 1. Elimination seems to have been effective in some areas, but problems with regrowth or seedling re-establishment are often evident. For practical reasons, none of this activity to date has been targeted to the very steep cliff-top areas, nor on the cliff-face.

4.4 Rhododendron Control and Lundy cabbage

None of the heroic efforts so far put into *Rhododendron* control have been directed towards reducing the threat to the Lundy cabbage, all work having been directed mainly at the upslope parts of the large thickets in the upper Sidelands. This is largely because of the practical difficulties of access and adherence to the Management Plan which was formulated before the threat posed by Rhododendron to the Lundy cabbage was recognised.

Nonetheless, there may have there been significant incidental benefits to the cabbage from the prevention of the spread of *Rhododendron* into the Combes as fire prevention measures, as the main populations of Lundy cabbage are on the cliffs below them. *Rhododendron* has only recently started to encroach onto these faces from the patches on either sides of the Combes.

The clearance of "St Helena's Grove", just to the north of St Helena's Combe, on the cliffs below which there is a major population of Lundy cabbage, appeared to give temporary benefit to Lundy cabbage, which was an early coloniser of this area (Gibson, 1992). It no longer occurs there, presumably having been grazed out as there is still plenty of ruderal habitat available. Recent colonization of the grove by gorse my eventually protect Cabbage seedlings and allow it to recolonise this area.

5. Constraints on *Rhododendron* control on Lundy

5.1 Accessibility and hazard

This is the most important practical consideration for achieving control on the cliffs on Lundy as the steep terrain of the Eastern Sidelands and cliffs causes particular problems.

The landward side of large thickets generally have relatively easy access and can easily be cleared by volunteers and sprayed by contractors.

Where *Rhododendron* has descended beyond the break of slope onto the cliffs, however, even to reach it requires specialist climbing skills and equipment before control can be attempted. This is especially the case on the loose slate substrate in the south of the island, although *Rhododendron* has fortunately not yet invaded that substrate to any large extent yet.

Elimination of *Rhododendron* on the cliffs will inevitably be very hazardous, slow and expensive but is critical to the conservation of the Lundy cabbage. Specialist techniques for such work are, however, available (Tillotson and Chambers, 1996).

Estimates of the hazard risk of access to different thickets are indicated in the descriptions and objectives for each area described in Appendix 1.

Stringent safety precautions, employer's and public liability insurance are necessary for cliff top and cliff-side work and English Nature's safety officer has put together an appropriate safety document (Appendix 2).

5.2 Resources - financial and manpower

Rhododendron control is both costly and labour-intensive. Accurate records of all the labour and finance that have been put into *Rhododendron* control to date do not appear to be available. Willcox (1988, 1989) noted that 250 and 500 man days were spent on *Rhododendron* control during 1987 and 1988 and 226 volunteer man-days were spent on cutting approximately 1ha of *Rhododendron* thicket in 1997 (Liza Cole, pers com). The manpower resources already invested in *Rhododendron* control on Lundy are therefore huge.

5.3 Herbicide certification

The 1984 Food & Environmental Protection Act, the 1986 Control of Pesticides Regulations 1986 and the 1988 Control of Substances Hazardous to Health (COSHH) Regulations necessitate anyone carrying out herbicide treatments to have undergone appropriate training.

5.4 Herbicide impact on non-target species

It is important that herbicides used to treat stumps and control regrowth do not come into contact with the Lundy cabbage. This risk is particularly significant on the cliffs, when the Lundy cabbage may be directly underneath the *Rhododendron* being treated.

5.5 Bird breeding season

Rhododendron control cannot be undertaken during the months of April to July when songbirds may be nesting. Care needs to be taken to avoid areas where seabirds may be nesting on the cliffs at the same time.

5.6 Fire

There is danger that fires used to dispose of cut *Rhododendron* might get out of control, spreading into the surrounding *Rhododendron* and underlying peat, and high easterly winds and prolonged dry weather sometimes prevent burning on-site. This limits the period when material can be safely disposed of to the winter months and during long periods of wet weather at other times.

5.7 Conflict of interest - the aesthetic appeal of *Rhododendron*

As described above in 3.4, *Rhododendron* in flower is valued by many visitors as a highly attractive feature of Lundy and the spring display is included in the island's publicity literature. This may conflict with any long-term policy of total eradication and it is essential that objectives of a *Rhododendron* strategy are discussed and agreed between all concerned. It is also important that the benefits resulting from *Rhododendron* control measures and the objectives of the strategy employed should be explained to visitors.

6. Prevention of re-establishment of *Rhododendron* and replacement with vegetation of conservation value after clearance

6.1 Immediate post-clearance colonization

Soil, peat and leaf litter may remain bare for some years after Rhododendron clearance and colonisation is usually by mosses, foxglove *Digitalis purpurea,* sorrel *Rumex acetosa* and *R acetosella*, Yorkshire fog *Holcus lanatus* and other ruderals. However, the ruderal vegetation and moss left after *Rhododendron* is cleared also provides an excellent seedbed for *Rhododendron* seedling re-establishment.

6.2 Grassland sward establishment

Ideally, a grassland sward should therefore be established as soon as possible after clearance. This has been quite successful in the cleared areas above Brazen Ward but has necessitated continual surveillance for *Rhododendron* seedlings (see 4.2 above). Speeding this establishment poses practical difficulties as large-scale seeding of cleared areas from a source elsewhere on the Sideland is unlikely to be practicable. It may nonetheless be worth trying to collect and spread seed in mid to late summer.

6.3 Replacement with broadleaved trees.

The stated objective of replacing the *Rhododendron* with native broadleaved trees and shrubs may also be more practicable in some areas than others. Large numbers of planted trees on Lundy have failed because of very harsh winter conditions and recent drought and planting with trees would not be appropriate where Lundy cabbage might be encouraged to return.

6.4 Replacement with shrub species

One option might be the establishment of thickets of gorse *Ulex europaeus* and *Ulex galii* and blackthorn *Prunus spinosa* to replace the *Rhododendron*. Gorse has successfully colonised St Helena's Grove and there is a long history of gorse on Lundy, including formerly on much of the plateau (Linn, 1997). Gorse and blackthorn are attractive when in flower, and gorse has a long flowering season. Both provide good cover for birds and could in time provide cover for sika deer, and both support large numbers of insects. The population of Lundy cabbage on Hangman's Hill shows that gorse and blackthorn protect it from grazing and their establishment in place of *Rhododendron* on the Eastern Sidelands could enable re-establishment of Lundy cabbage over areas where it was probably once present, as well as

having other conservation benefits. Some blackthorn and hawthorn is currently being planted by the warden.

There might be some requirement for some protection of the seedlings from grazing, possibly by a light covering with cut *Rhododendron* brushwood, just until they are established, as young plants of both species are very palatable to grazing animals.

Another option might be the establishment of bramble thickets, as in Millcombe, which has similar benefits for both birds and Lundy cabbage.

7. Potential for interpretation & publicity

7.1 Lundy cabbage

The plant is readily-visible, large and brightly coloured in Spring and early Summer and occurs in a section of the island that is passed by thousands of visitors each year. This provides an unparalleled opportunity for members of the public to view a species listed on the Biodiversity Action Plan and to be made aware of its significance. Means of taking advantage of this opportunity should be investigated.

7.2 Rhododendron control

Explanation of the need for control of *Rhododendron* is needed, both for the visiting public and for visiting volunteers who are asked to control the plant.

Suggested texts for information notes are included in Appendix 3.

8. A suggested strategy for future control of *Rhododendron* on Lundy in relation to the Lundy cabbage

8.1 Control objectives

8.1.1 Long-term objectives

The authors feel that the long-term objective for conservation of the Lundy cabbage should eventually be the total eradication of *Rhododendron* from the island, as this is the only way that the need for repetitive and expensive control and surveillance will be ended and volunteers freed for more positive and satisfying tasks. It is understood, however, that this view needs to considered in relation to other objectives on the island.

8.1.2 Short and medium term objectives & priorities

These should be to remove *Rhododendron* from the areas of greatest ecological and archaeological concern and to contain the spread of the plant elsewhere.

Clearance Priority ratings	
4	Lower Priority
3-2	Intermediate
1	High Priority
1*	Urgent – major populations of Lundy cabbage at risk.

Within the constraints of labour, finance and accessibility, *Rhododendron* should be removed in sequence, in accordance with their prioritization, (prioritization and description of requirements are given for each patch or area (or sometimes single bush!) of *Rhododendron* on Lundy in Appendix 1). Some of the priorities given here are different from those expressed in the island's Management Plan and are intended both to redirect some *Rhododendron* control towards the conservation of the Lundy cabbage and to achieve a logical sequence of clearance leaving the least threatening areas until last.

8.2 Priorities for cliff-top and cliff-face *Rhododendron* clearance, in areas requiring climbing skills

8.2.1 Isolated bushes - sources of future infestation - in areas of the island where there is little or no other *Rhododendron* and where there are populations of Lundy cabbage at risk.

i single bush on the cliff edge between Millcombe and the Miller's Cake
ii single bush just below cliff edge between Kaaksberg & Halfway Wall Bay
Priority 1*

8.2.2 Individual bushes growing on the cliff faces in the coves below the Combes - notably a small number of bushes below "Broad Combe" and Quarter Wall Combe
Priority 1*

8.2.3 Isolated bushes remaining adjacent to cleared areas, forming source of re-infestation.

i about 30 bushes on upper part of cliff just north of Brazen ward
ii single bush just south of this
iii other bushes on cliffs if discovered by survey from the sea
Priority 1

8.2.4 Advancing "creep" of dwarfed *Rhododendron* growing vegetatively down cliff faces from large thickets above.

i top of cliffs on north side of bay below St Helena's Combe
ii top of cliffs on either side of the Sugar Loaf

iii top of cliffs on either side of:
Sycamore Combe
Broad Combe
Quarter Wall Combe
iv cliffs above Quarry Bay
Priority 1

8.3 Priorities for *Rhododendron* clearance in the more accessible stands on the Sidelands

8.3.1 Isolated bushes - sources of future infestation - in areas of the island where there is little or no other *Rhododendron* and where there are populations of Lundy cabbage at risk.

i five bushes below the Marisco Castle & above the Landing Beach Road
Priority 1*

8.3.2 Individual bushes and small patches on the periphery of the large thickets, in particular where these are threatening to infill the Combes, together with the "archipelago" of small bushes and patches on the Sideland to the north of Quarry Bay and in Quarry Bay itself.
Priority 2

8.3.3 Margins of the larger thickets, containing their lateral spread.
Priority 2/3

8.3.4 Eastern portions of the large thickets between the coastal cliff path and the cliff edge, to prevent re-invasion of the cliff face once this has been cleared. Some of this clearance may be necessary in advance (and therefore effectively given priority 2) in order to gain access to *Rhododendron* on the cliff-face. *Rhododendron* should not be allowed to reach the cliff edge again after it has been cut back from these areas.
Priority 3

8.3.6 Remainder of the large thickets. Smallest first, largest last.
Priority 4

8.3.7 Struggling small bushes and occasional seedlings on the plateau. These should be monitored, but they are continually either grazed or wind-pruned and rarely (if ever?) flower. They therefore probably do not pose any significant threat and can safely be given a low priority.
Priority 4

8.4 Recommendations

8.4.1 Control of highly hazardous, less accessible *Rhododendron*

The feasibility of cliff-side *Rhododendron* clearance is to be evaluated by a pilot project using specialist contractors (eg Tillotson and Chambers, 1997), and possibly volunteers with climbing skills. The latter option will require that members of the volunteer parties obtain use of herbicide certification.

Action English Nature contract - winter 1997/98
WWF/British Mountaineering Council volunteer project 1997/98
Review after first work parties

8.4.2 Clearance in sequence of accessible patches

Within the constraints of labour, finance and accessibility, *Rhododendron* thickets should be removed in the above sequence, in accordance with their priority ratings.

Action Lundy Warden/Volunteer Groups cutting together with Countryside Stewardship funded after treatment by contractors.
Consider altering planned sequence if this is possible, balancing work for ecological, aesthetic and archaeological priorities
Ongoing work

8.4.3 Herbicide follow-up

Regrowth on all cut *Rhododendron* should be after-treated with herbicide, repeated if necessary until stools are dead, to prevent thickets regenerating. Achieving complete control of regrowth should take precedence over clearing further areas, otherwise the area where regrowth is being combatted will increase considerably with time and will eventually become intractable/impossible.

Action Lundy Warden - contractors funded by Countryside Stewardship.
Ongoing work

8.4.4 Seedling control

Once or twice yearly sweeps for seedlings and small plants should continue at least until no seedlings are detected for two consecutive years.

Action Lundy Warden/volunteer parties.
Annual.

8.4.5 Sward, shrub and tree establishment.

Experimental seeding of areas cleared of *Rhododendron* with grassland mix harvested from elsewhere on the Eastern Sidelands could be tried, along with establishment of thickets of gorse and/or bramble.

Action To be discussed.

8.4.6 Recording and mapping *Rhododendron*, including clearance areas, regrowth and seedling establishment

Recording of the extent of *Rhododendron* should be carried out at regular intervals and a revised map detailing areas controlled and extent of any new spread should be produced at three year intervals. This could include fixed-point photography in selected areas. There should be regular monitoring and recording of the establishment of any new seedlings or bushes (preferably as they are removed) in the areas of the Eastern Sidelands currently free or cleared of *Rhododendron.*

Action Mapping - Leeds University/English Nature in discussion with Lundy warden.
Triennial

8.4.7 Boat Survey of cliff seed sources.

The cliffs currently almost free of *Rhododendron* should be surveyed by binoculars from a boat in calm weather to identify seed sources for targeted action, in particular looking for plants in flower in May/June and concentrating on the area from Quarry Bay to Brazen Ward.

Action Lundy Warden/Leeds University/English Nature
Annual

8.4.8 Recording conservation gains from control

Regrowth of native vegetation within areas cleared of *Rhododendron* should be monitored.

Action Leeds University/English Nature in discussion with Lundy warden.

8.4.9 Monitoring of resource-use

Use of resources should be accurately recorded in relation to the area of *Rhododendron* cleared, including costs sustained in clearance, after-treatment, etc. and the man hours employed in each aspect of *Rhododendron* clearance. Costs should be related to the accessibility of the areas where control is carried out. Suggested clearance recording and resource recording forms are included in Appendices 4 & 5.

Action Lundy Warden
Annual

8.4.10 Resource planning

Without prior records of the resources utilised on *Rhododendron* control to date, it is not possible at this time to provide an assessment of the financial and man-power resources that will be needed to achieve the control objectives.

After a suitable period of control efforts, the results of *Rhododendron* and control monitoring should be used to estimate what can be achieved in the future with different levels of resources. A revised and costed control plan should then be devised.

Action Lundy Warden & English Nature
ongoing

8.4.11 Investigation of biological control potential

Lundy would also be a good place for the experimental introduction of possible control agents, as there are no closely related plant species on the island. The potential for biological control of *Rhododendron* might therefore also be considered, with the aims of reducing the plant's vegetative vigour and reproductive output or targeting species which attack its seedlings. Objectives and methods would need to be discussed and agreed between all concerned. Initial work would comprise a survey of potential control agents.

Action Leeds University to explore practicability, desirability and permissibility with appropriate authorities (Landmark Trust, National Trust, English Nature and, subsequently, DOETR)

8.4.12 Interpretation

The possibility of producing of an agreed interpretive leaflet on Lundy cabbage and its fauna, including the need for *Rhododendron* control, should be investigated through English Nature's Species Recovery Programme. Another possibility would be a leaflet for volunteer groups. (see appendices). A poster display for St Helena's Church, the proposed Lundy interpretive facility on the beach, and the Oldenburg should also be considered.

Action English Nature Species Recovery Programme in consultation with the Landmark Trust

9. Acknowledgements

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Appendix 1 - Area-by-area descriptions of *Rhododendron* on Lundy, the threat posed to Lundy cabbage and other features of interest, priority for control and hazard rating.

Clearance Priority ratings

1*	Urgent - major populations of Lundy cabbage at risk
1	High Priority
3-2	Intermediate
4	Lower Priority

Hazard

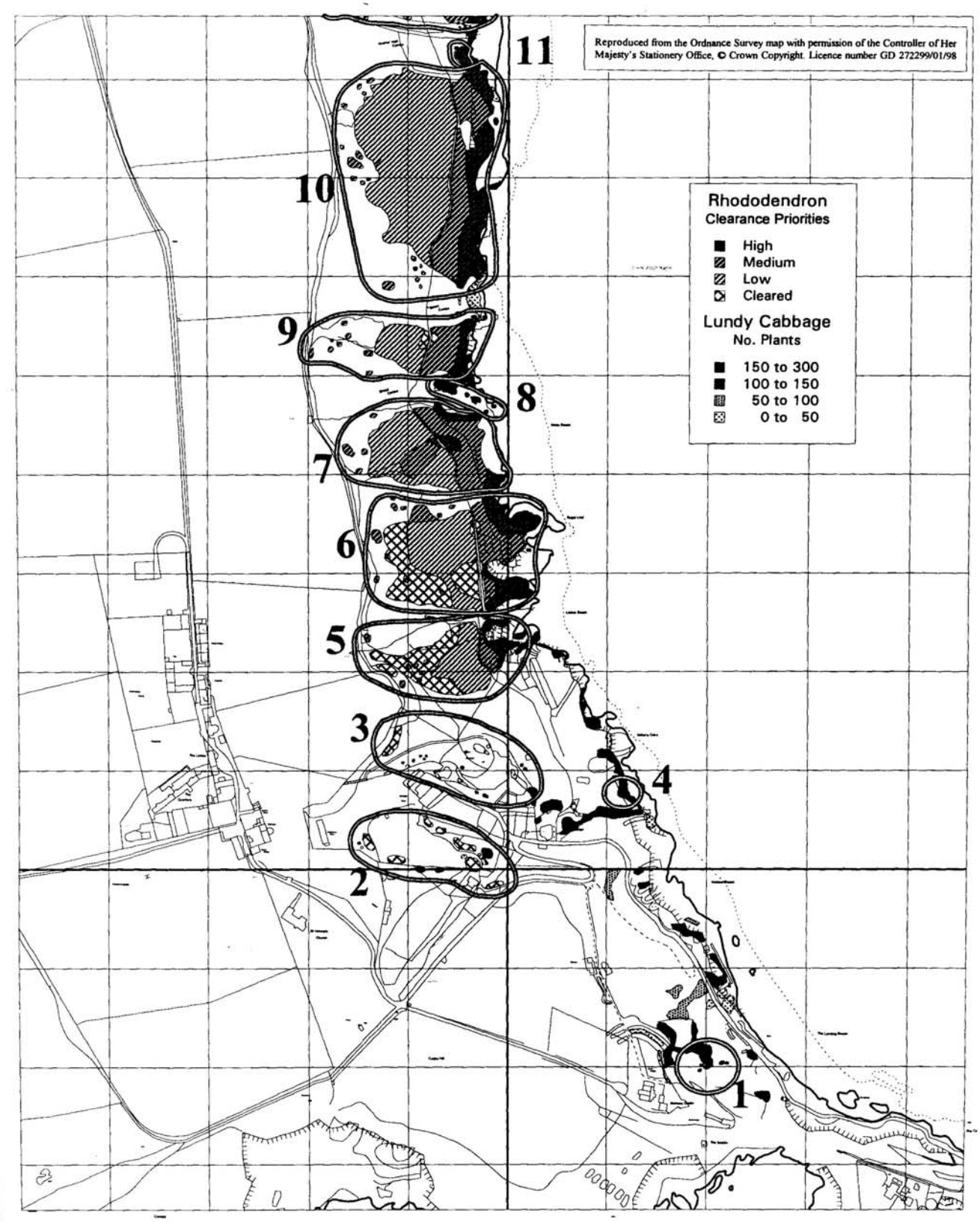
0	No problems
1	Care needed
2	Potentially hazardous, but not desperately so
3	Highly hazardous - specialist trained workers needed with ropes/hardhat experience

***Rhododendron* control areas**

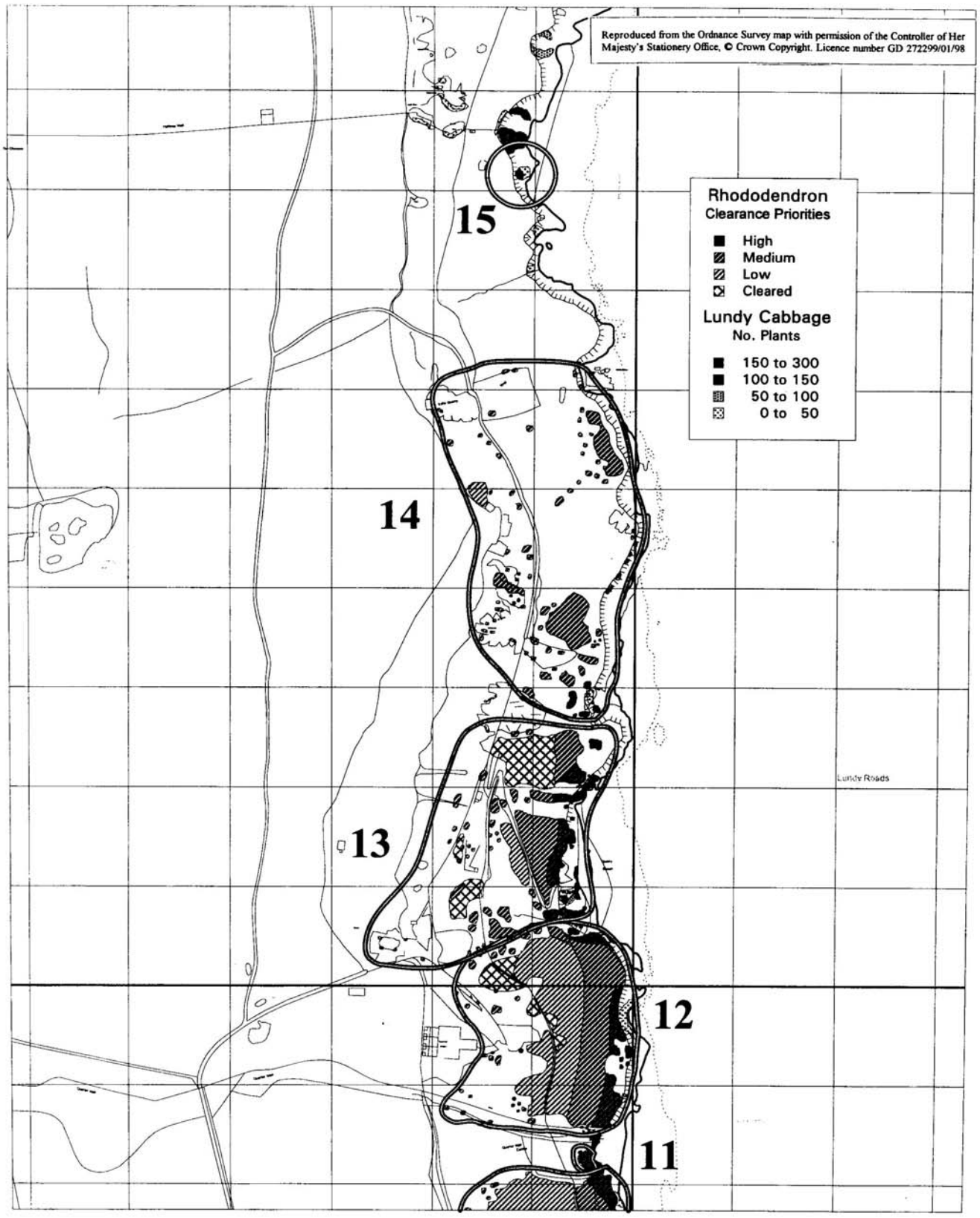
Summary Maps indicate the general locations of *Rhododendron* control areas 1-17 and their relationship to Lundy cabbage populations.

1	Landing Bay / Marisco Castle
2	Millcombe / St John's Valleys
3	Hangman's Hill
4	Cliffs between Millcombe outflow and Miller's Cake
5	Southernmost Large *Rhododendron* Thicket & outlying bushes - between old garden terraces and St Helena's Copse/Combe.
6	2nd Large *Rhododendron* Thicket from the south, between St Helena's Combe and Combe with single sycamore tree ("Sycamore Combe")
7	3rd Large *Rhododendron* Thicket from the south, between Combe with single sycamore tree ("Sycamore Combe") and combe above White Beach ("Broad Combe")
8	Small bushes on cliff/cliff edge above White Beach & below Broad Combe
9	4th large *Rhododendron* patch from south, between "Broad Combe" and Combe immediately south of Quarterwall Combe ("Figwort Combe")
10	5th large *Rhododendron* patch from south, between "Figwort Combe" and Quarterwall Combe
11	Small bushes on cliff/cliff edge above below Quarter Wall Broad Combe
12	6th large *Rhododendron* patch from south, between Quarterwall Combe and Quarry Bay.
13	Quarry Bay, including 7th and 8th *Rhododendron* patches from south
14	Northern Quarries, Cliffs and Sidelands north to Bay with the Kaaksberg. including 9th large *Rhododendron* patch from south
15	Halfway Wall Bay - Single bush on cliff face, 40m south of the cliff-top end of Halfway Wall
16	Tibbett's Point, Threequarter Wall Bay and Frenchman's Landing
17	The Plateau.

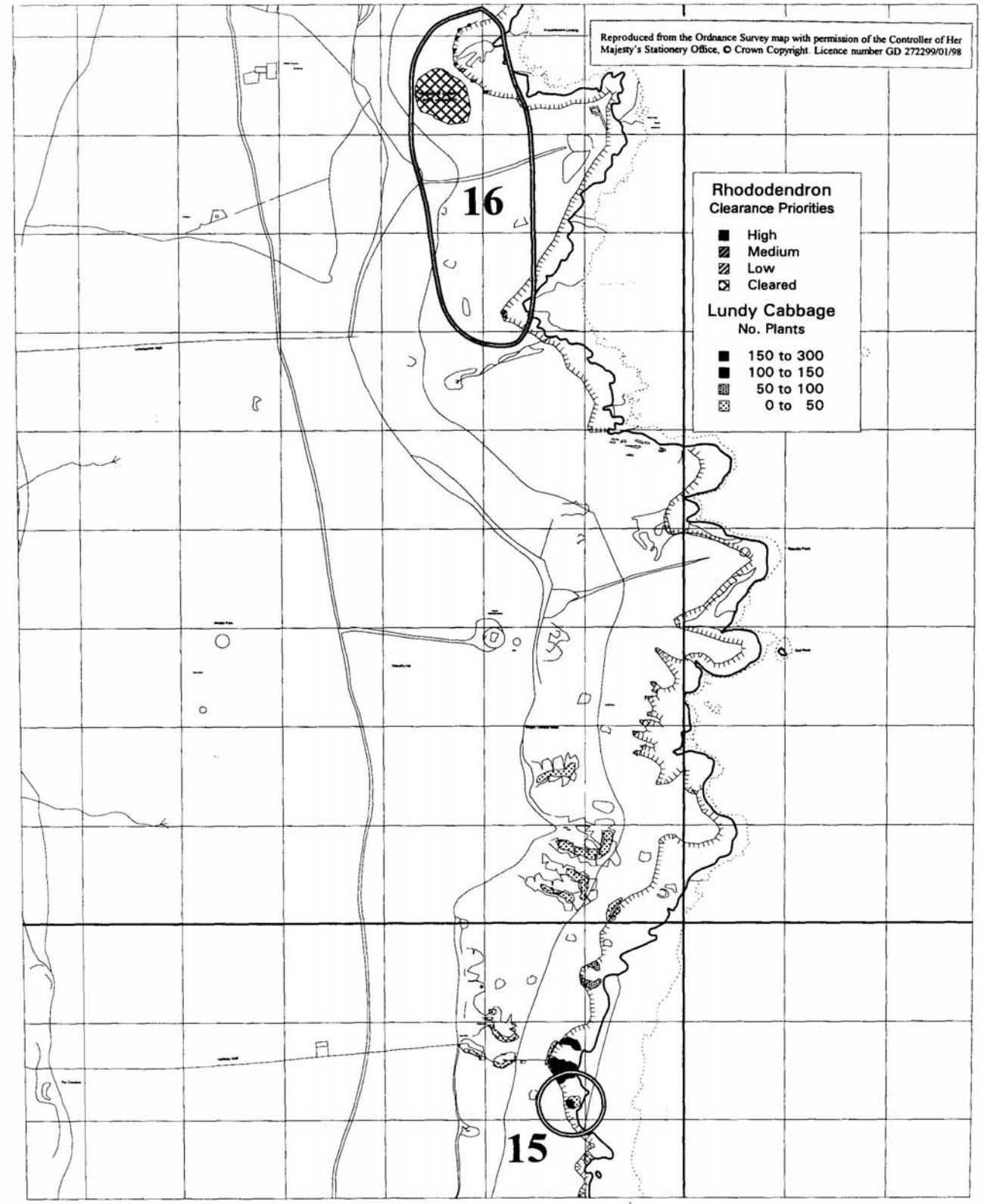
Rhododendron Patches – area numbers & priorities for clearance in relation to Lundy cabbage



Rhododendron Patches – area numbers & priorities for clearance in relation to Lundy cabbage



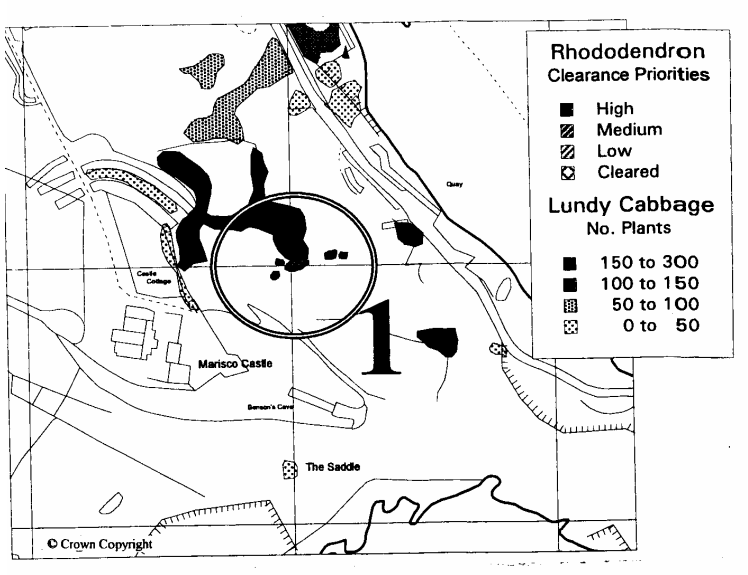
Rhododendron Patches – area numbers & priorities for clearance in relation to Lundy cabbage



1. Landing Bay / Marisco Castle SS14204380

Description & Map

About five bushes 1-4 m in size, currently coalescing into a largish patch, from approximately 30m below the cliff top below Marisco Castle and above the Landing Beach Road



Threat Posed to Lundy cabbage

A new source of infestation, threatening one of the largest populations of Lundy cabbage on the island

Other Threats

Later removal may lead to destabilizing of the slates through removal of large area of vegetation

Recommendations

Immediate removal of bushes but cutting and stump treatment and/or subsequent chemical control of regrowth. At least two years subsequent checking for regrowth and seedlings.

Priority with respect to:-

Lundy cabbage	**1***	**Urgent**
Other	**1***	

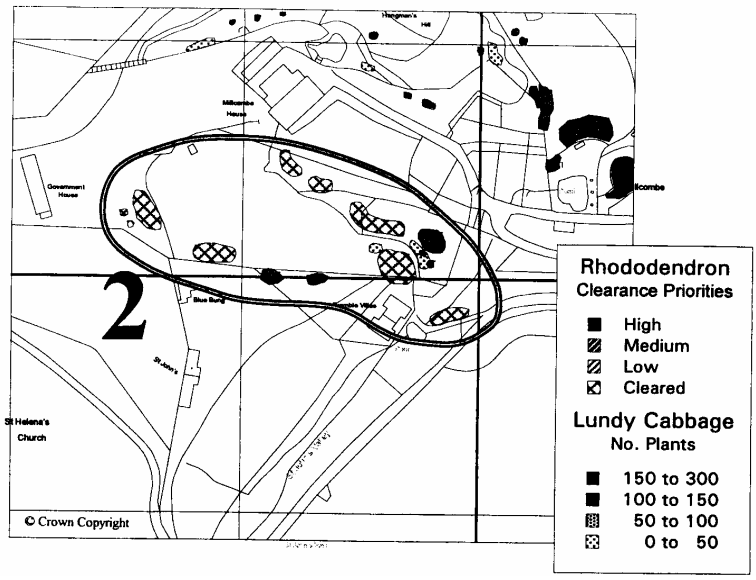
Hazard Rating

2 Care needed

2. Millcombe & St John's Valleys SS139440 & SS138440

Description & Map

Rhododendron thickets and bushes surrounding woodland on south side of Millcombe Valley, almost to Government House to the West and Bramble Villas to the south. Most has been cleared, although some is regenerating and one quite large bush northwest of Bramble Villas has been missed.



Threat Posed to Lundy cabbage

One very small population of Lundy cabbage, between Bramble Villa and the eastern edge of the woodland, at risk.

Other Threats

If allowed to regrow and or regenerate, then considerable volunteer effort has been wasted.

Recommendations

Remove remaining bushes, chemical control of regrowth and thereafter periodically check for regeneration and seedlings.

Priority with respect to:-

Lundy cabbage	2	low - relatively few plants at risk
Other	2	prior effort should not be wasted

Hazard Rating

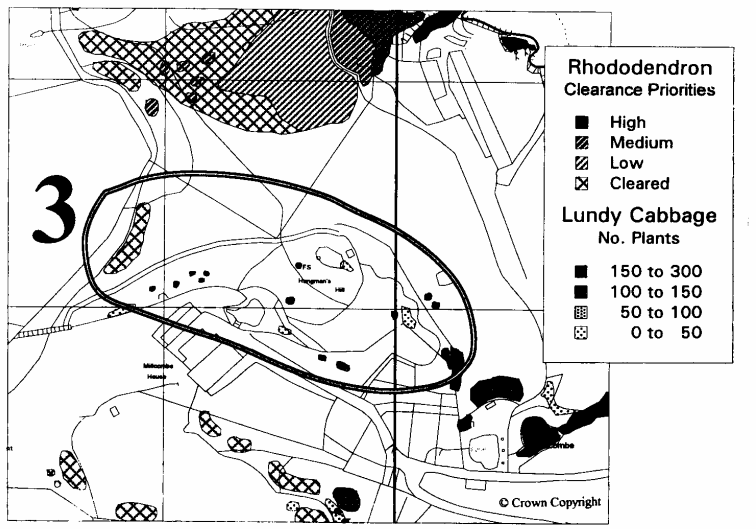
0 no hazard

This whole area is targeted for clearance in 1998/99 as part of the Countryside Stewardship agreement.

3. Hangman's Hill SS13974413

Description & Map

Scattered small bushes among gorse on and around Hangman's Hill and among pines and other trees along the north side of Millcombe Valley. Some small patches under the trees have been cut down but are regenerating.



Threat Posed to Lundy cabbage

A fairly small but highly variable (dependent on maturity of gorse and sward beneath it and intensity of grazing) population of Lundy cabbage is at risk. There are also small number of Lundy cabbage plants growing under trees and on stumps northeast of Millcombe House. These are the only Lundy cabbage populations in these vegetation types.

Other Considerations

New? colonization by *Rhododendron* - get in quick before new patches start.

Recommendations

Remove small bushes by pulling (preferably) or cutting. After treatment of stumps if necessary and periodic checking for seedling establishment. Do not destroy gorse in process as this is protecting Lundy cabbage from grazing.

Priority with respect to:-

Lundy cabbage	**1**	**High**
Other	?	

Hazard Rating

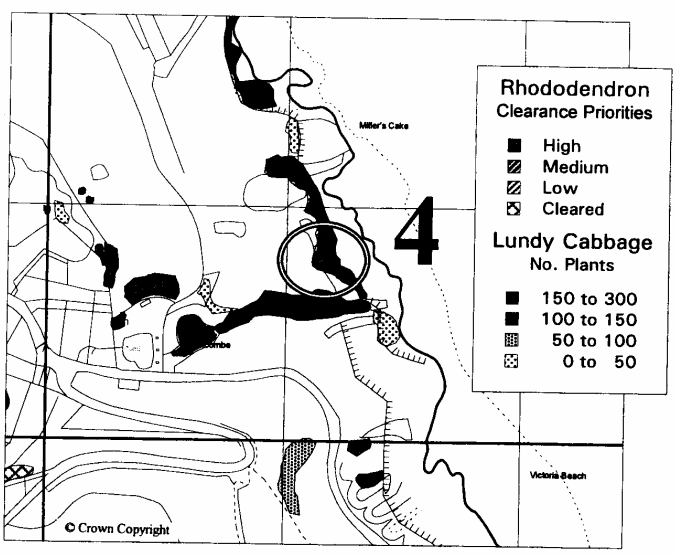
0 only hazard is from gorse prickles!

This whole area is targeted for clearance in 1998/99 as part of the Countryside Stewardship agreement.

4. Cliffs between Millcombe outflow and Miller's Cake SS14124407

Description & Map

Single, layered bush below lip of cliff to south of Miller's Cake. In flower in 1996 but not in 1997. At least 5 seedlings noted around it (and most removed) in 1997.



Threat Posed to Lundy cabbage

This bush (and its progeny) threatens one of the largest populations of Lundy cabbage to which there is no other threat apart from some marginal grazing.

Other Threats

Need to prevent a new patch taking hold.

Recommendations

This bush was dug out on 4th August 1997 and most seedlings removed. However some seedlings remain below reach without safety equipment.

Remove remaining seedlings.

Check for regrowth of bush and seedlings for at least 2 years.

Priority with respect to:-

Lundy cabbage	**1***	**Urgent**
Other	**1**	

Hazard Rating

Remaining work - 2-3 hazardous - ropework needed

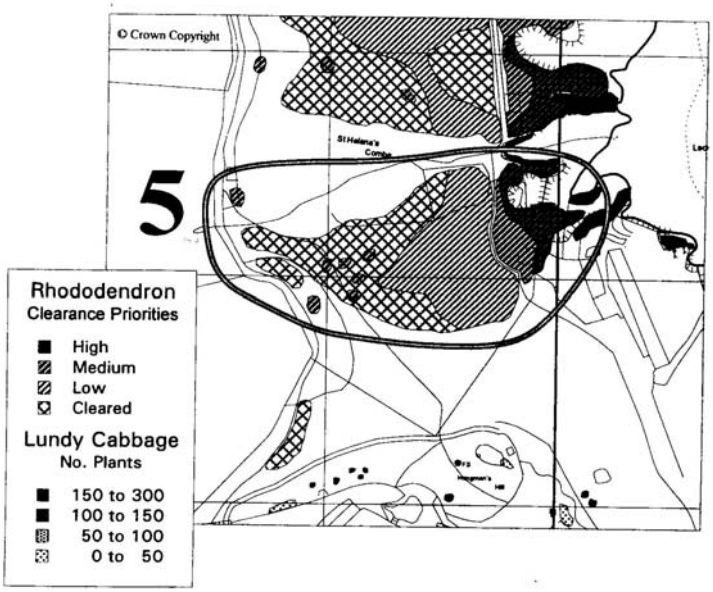
5. Southernmost Large *Rhododendron* Thicket & outlying bushes - between old garden terraces and St Helena's Copse/Combe

Description & Map

Approx ¾ ha thicket of *Rhododendron* on fairly gently sloping Sideland.

The eastern edge of this patch continues right to the cliff top and has begun to creep down the cliff in the complicated pattern of bays/inlets at the "outflow" of St Helena's Combe.

Approx 50% of the upslope part of the thicket has been cleared although some outlying bushes missed and some regrowth is occurring.



Threat Posed to Lundy cabbage

Upslope part of thicket	none
Cliff-face population	A large cliff population of the cabbage is threatened by continuing creep down the cliff.

Other Considerations

Archaeological. There are shown on the map to be old garden terraces under part of this thicket.
Aesthetic appeal and sika deer cover.

Recommendations

Cliffside part.	-	Clear all *Rhododendron* growth downslope of coastal footpath, treat stumps and maintain free of seedlings.
	-	Remove all *Rhododendron* creep from whole of cliff face and maintain *Rhododendron* free.
Upslope part.	-	Consolidate eradication of area already cleared by stump treatment, seedling removal and checking.
	-	Remove outlying bushes and contain outwards spread of remaining thicket by periodic cutting back.
	-	Only consider further large scale clearance when other priorities have been addressed.

Priority with respect to:-

Lundy cabbage	**cliffside & cliff-top only**	**1**	**High**
Other	archaeology	?2	

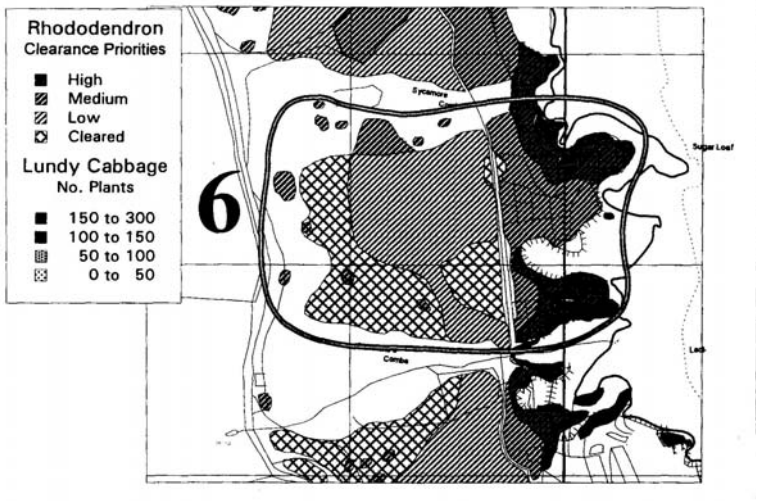
Hazard Rating

upper thicket	0	no hazard
between path and cliff top	1-2	care needed
cliff top/cliff face	3	very dangerous - ropework needed

Rhododendron encroachment from this patch into St Helena's Coombe & Copse is targeted for clearance in 1997/98 as part of the Countryside Stewardship agreement.

6. 2nd Large *Rhododendron* Thicket from the south, between St Helena's Combe and Combe with single sycamore tree ("Sycamore Combe") SS139443 etc

Description & Map



Approx 1½ ha of *Rhododendron* on fairly steep sloping Sideland.

Approx 35% of the upslope part of the thicket has been cleared, including around a grove of turkey oaks in the middle of the thicket adjacent to the footpath ("St Helena's Grove"). Some outlying bushes have been missed and some regrowth occurring, including seedlings into the Grove.

The northern margin of the thicket is encroaching into Sycamore Combe and there are some established bushes within the combe separate from the main thicket.

Along its eastern edge, this patch continues right to the cliff top and is creeping down the cliff into both the inlet below St Helena's Combe, onto the promontory attaching the Sugarloaf to the mainland and into the bay below Sycamore Combe.

Threat Posed to Lundy cabbage

Part of the thicket west of the path	Probably none. Lundy cabbage was an early coloniser of St Helena's Grove after clearance, but it has not been seen there since at least 1992.
Below the path and cliff face.	Large populations of Lundy cabbage on the cliffs below St Helen's Combe and Sycamore Combe are at risk from continued expansion of the *Rhododendron* down the cliffs.

Other Considerations

Archaeological.	There are shown on the map to be old garden terraces under part of this thicket.

Aesthetic appeal and sika deer cover.

St Helena's Grove is one of the few areas of trees on the island and a great deal of effort has already been put into clearing it.

Recommendations

Cliffside part.

- Clear all growth downslope of coastal footpath, treat stumps and maintain free of seedlings.
- Remove all *Rhododendron* creep from whole of cliff face and maintain *Rhododendron* free.

Upslope part.

- Consolidate eradicated area by stump treatment, seedling removal and checking.
- Cut back expansion of thicket into Sycamore Combe and remove outlying bushes.
- Contain outwards spread of remaining thicket by periodic cutting back.
- Maintain open area in St Helena's Grove and consider clearing between this area and St Helena's copse to unite them into a single patch of woodland.
- Only consider further large scale clearance when all other priorities have been addressed (nb this area has already been targeted for clearance in under the Stewardship Agreement.

Priority with respect to:-

Lundy cabbage	**cliffside & cliff-top only**	**1**	**High**
Other	archaeology & Gibson's Grove	?2	
	threat to firebreak/infill of Sycamore Combe	2	

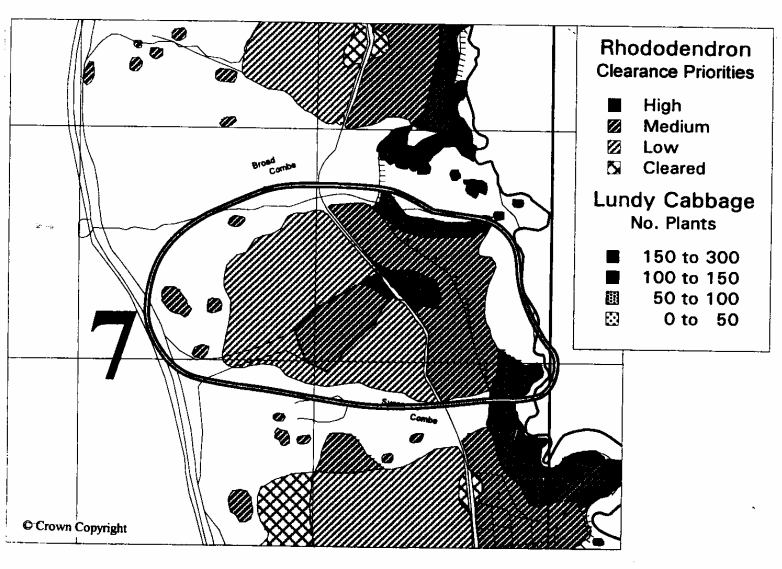
Hazard Rating

upper thicket	0	no hazard
between path and cliff top	1-2	care needed
cliff top/cliff face	3	very dangerous

Rhododendron between St Helena's Copse and St Helena's Grove, peripheral bushes on the margin of the main patch and *Rhododendron* encroachment from the patch into Sycamore Combe is targeted for clearance in 1997/98 as part of the Countryside Stewardship agreement.

7. 3rd Large *Rhododendron* Thicket from the south, between Combe with single sycamore tree ("Sycamore Combe") and combe above White Beach ("Broad Combe") SS139444 SS138444

Description & Map



Approximately 1 ha thicket of *Rhododendron* on fairly steep-sloping former Sideland grassland.

Outlying bushes to the west and northwest. The northern margin of the thicket is encroaching into Broad Combe. Along parts of its eastern edge, this patch continues right to the cliff top and is creeping down the cliff into the inlet below Sycamore Combe.

A rock outcrop runs roughly southwest-northeast through the centre of the thicket but is covered in *Rhododendron* except where the path cuts through.

None of this thicket has been cleared recently.

Threat Posed to Lundy cabbage

There was probably a significant population of Lundy cabbage on the rock outcrop which has been eliminated by the Rhododendron, as a few plants of Lundy cabbage still exist where the path cuts through.

"Creep" down the cliff face into the inlet below Sycamore Combe, together with that from the *Rhododendron* patch to the south, threatens a significant cliff population. It is likely that the same will happen to the north, onto cliffs below Broad Combe where there is again a significant population of Lundy cabbage, if the spread is not contained.

Other Considerations Aesthetic appeal and sika deer cover.

Recommendations

Cliffside

- Remove all *Rhododendron* creep from whole of cliff face below Sycamore Combe and maintain *Rhododendron* free.

Upslope part.

- Consider clearing experimental area around existing tiny population of Lundy cabbage on outcrop where path cuts, avoiding damage to bramble which is protecting plants from grazing/browsing. If colonised by Lundy cabbage, consider wider clearance on outcrop. This would be difficult to keep free of *Rhododendron* seedlings. Otherwise, maintain this small rock island *Rhododendron*-free by periodic cutting back.
- Cut back expansion of thicket into Broad Combe.
- Remove outlying bushes. Contain outwards spread of remaining thicket by periodic cutting back.
- At southeastern part of the thicket, clear all *Rhododendron* growth downslope of coastal footpath, treat stumps and maintain free of seedlings. Eventually remove all *Rhododendron* East of path.
- Only consider further large scale clearance when other priorities have been addressed.

Priority with respect to:-

Lundy cabbage	Outcrop in main thicket	2	
	Cliffs below Sycamore Combe	**1**	**High**
Other	Outlying bushes to W & NW	1	
	Encroachment into Broad Combe	1	
	Remainder of thicket	4	

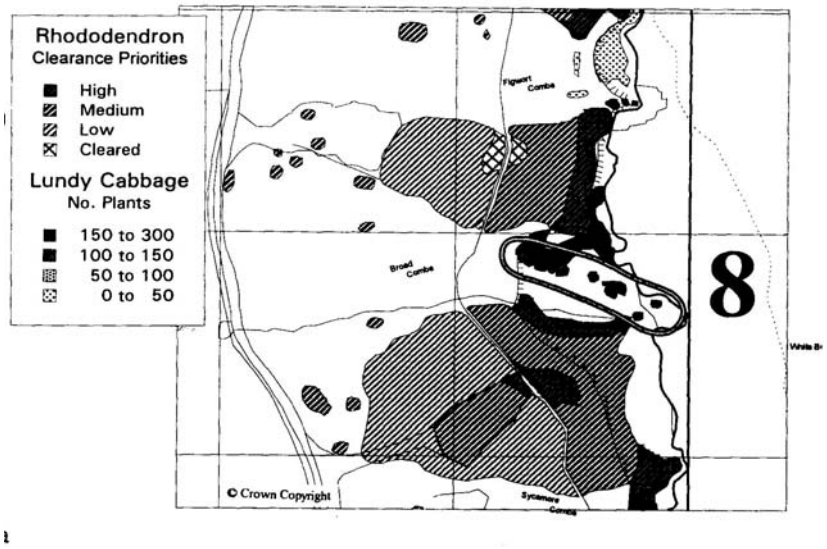
Hazard Rating

upper thicket	0	no hazard
outcrop	1	care needed
between path and cliff top	1-2	care needed
cliff top/cliff face	3	very dangerous

8. Small bushes on cliff/cliff edge above White Beach & below Broad Combe. SS139444

Description & Map

A series of small (approx ?1m diameter) bushes growing on sloping cliff face and extending downwards from large thicket to the south (region 7) and onto small promontory at southeastern edge of Broad Combe.



Threat Posed to Lundy cabbage

Very high, as there is a large population on these cliffs and *Rhododendron* colonization is just beginning. Some of the bushes are already encroaching onto the population of cabbage

Other Considerations

If untreated, ultimately these bushes will close together between the large thickets to the north and south, eliminating the firebreak and filling the combe.

Recommendations

Total removal, either by cutting or pulling (they might be small enough), chemical stump treatment and subsequent checking for regrowth and seedling establishment.

Priority with respect to:-

Lundy cabbage	**1***	**Urgent**
Other	**1***	

Hazard Rating

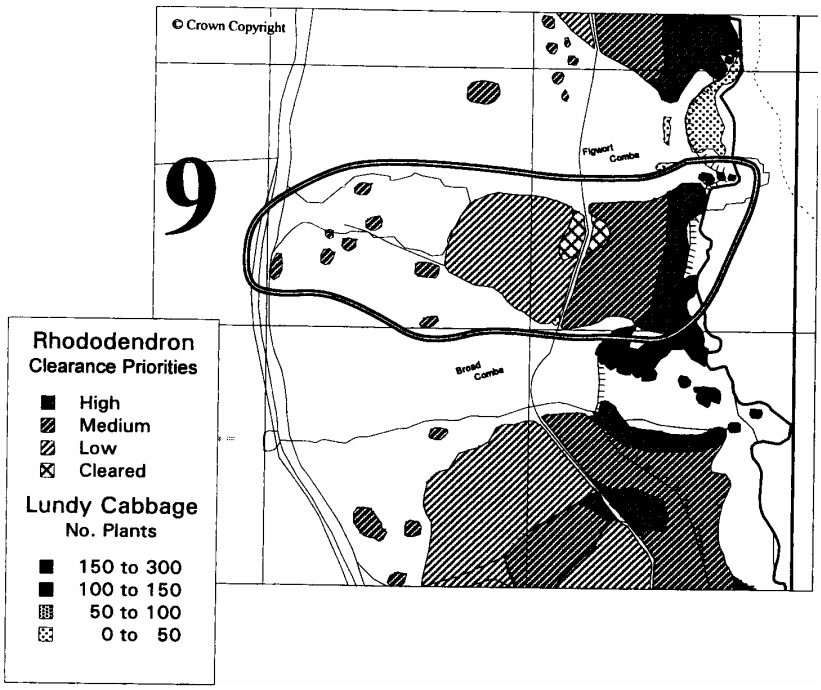
3 very dangerous

9. 4th large *Rhododendron* patch from south, between "Broad Combe" and Combe immediately south of Quarterwall Combe ("Figwort Combe", named after northernmost population of balm-leaved figwort in flush) SS139445 & SS138445

Description & Map

Approximately ½ ha thicket of *Rhododendron* on fairly steep-sloping former Sideland below large rock outcrop.

Isolated bushes have colonised parts of the outcrop. Little of this thicket has currently been cleared except an area where the cliff path exits the thicket to the north.



Threat Posed to Lundy cabbage

Below the path and cliff face. The south-eastern portion of this thicket creeping down the cliff is threatening a large population of Lundy cabbage on cliffs below Broad Combe, which is also threatened by a series of bushes growing on the upper cliff face (see 8 - above). A series of small bushes "budded" off the large thicket down the cliffs to the north east onto the cliffs below "Figwort Combe" will eventually threaten a variable population (small in 1997 but has been larger) on the cliffs.

Part of the thicket west of the path	None. Seedlings of Lundy cabbage have been found on the margins of the path through this thicket, but there is no potential for establishment here, or on the rock outcrop, given the accessibility to grazing animals.

Other Considerations Aesthetic appeal and sika deer cover.

Recommendations

Cliffside

- Remove all *Rhododendron* creep from whole of cliff face below Broad Combe and cliff to north. Maintain *Rhododendron* free.

Upper Thicket & Outcrop

- Remove outlying bushes on rock outcrop. Contain outwards spread of remaining thicket by periodic cutting back.
- At southeastern part of the thicket, clear all *Rhododendron* growth downslope of coastal footpath, treat stumps and maintain free of seedlings. Eventually remove all *Rhododendron* along cliff top and maintain *Rhododendron* free.
- Only consider further large scale clearance when other priorities have been addressed.

Priority with respect to:-

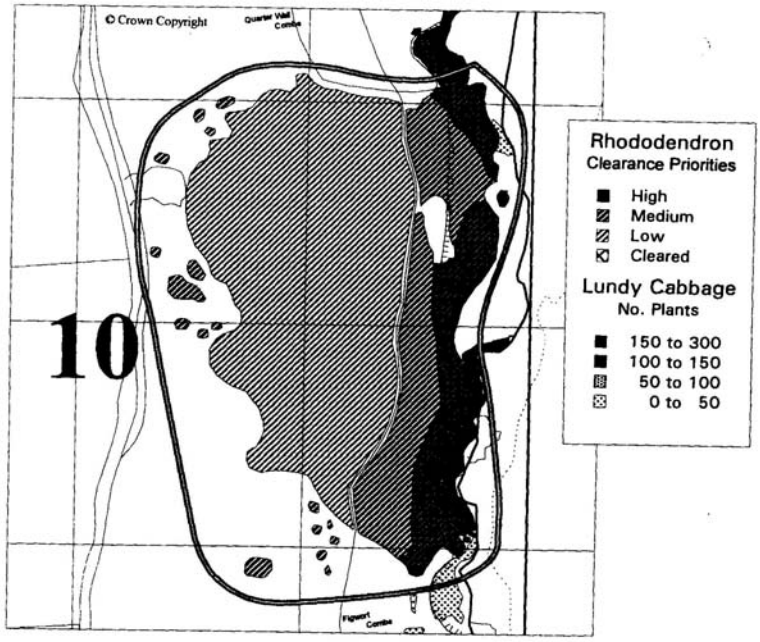
Lundy cabbage	**Cliffs below Broad Combe**	**1**	**High**
	Remainder of thicket	4	
Other	**Outlying bushes on outcrop**	**2**	

Hazard Rating

main thicket	0	no hazard
outcrop	1-2	care needed
between path and cliff top	1-2	care needed
cliff top/cliff face	3	very dangerous

10. 5th large *Rhododendron* patch from south, between Combe immediately south of Quarterwall Combe ("Figwort Combe", named after northernmost population of balm-leaved figwort in flush) and Quarterwall Combe SS138446, SS139446, SS138447 & SS139447

Description & Map



The largest thicket of *Rhododendron,* approximately 2½ ha, on fairly gently sloping Sideland.

Extensively creeping down the cliffs below "Figwort Combe" and Quarter Wall Combe and onto the cliffs to the north of Figwort Combe at the south eastern part of the thicket.

There is a small clearing within the thicket where *Rhododendron* colonisation appears not to be complete. Numerous peripheral bushes, some quite large, extend into the centre of Figwort Combe and onto the Sideland upslope of the main thicket.

Threat Posed to Lundy cabbage

Below the path and cliff face.	The south-eastern portion creeping down the cliff is threatening a variable population (small in 1997 but has been larger) on cliffs below Figwort Combe. A large population growing on an approximately 90m stretch of cliffs below the thicket is threatened. Cliffside "creep" from the North-eastern corner of the thicket is threatening a very large population on the cliffs below Quarter Wall Combe and a small population on the cliffs just to the south of this.
Remainder of thicket	None
Other Considerations	Aesthetic appeal and sika deer cover.

Recommendations

Cliffside

- Remove all *Rhododendron* creep from whole of cliff face below southernmost half of thicket and Broad Combe and cliffs for 40m south of Quarter Wall Combe. Maintain free of *Rhododendron.* Eventually remove all *Rhododendron* from cliff.

Upslope part of thicket

- Remove outlying bushes upslope of main thicket and within Figwort and Quarter Wall Combes. Contain outwards spread of remaining thicket by periodic cutting back.
- At southeastern and northeastern corners of the thicket, clear all *Rhododendron* growth downslope of coastal footpath, treat stumps and maintain free of seedlings. Eventually remove all *Rhododendron* east of path along cliff top and maintain *Rhododendron* free.
- Only consider further large-scale clearance when other priorities have been addressed.

Priority with respect to:-

Lundy cabbage	**Cliffs at South end of thicket**	**1**
	Creep into Quarter Wall Combe	**1**
Other	Outlying bushes	2
	Remainder of thicket	4

Hazard Rating

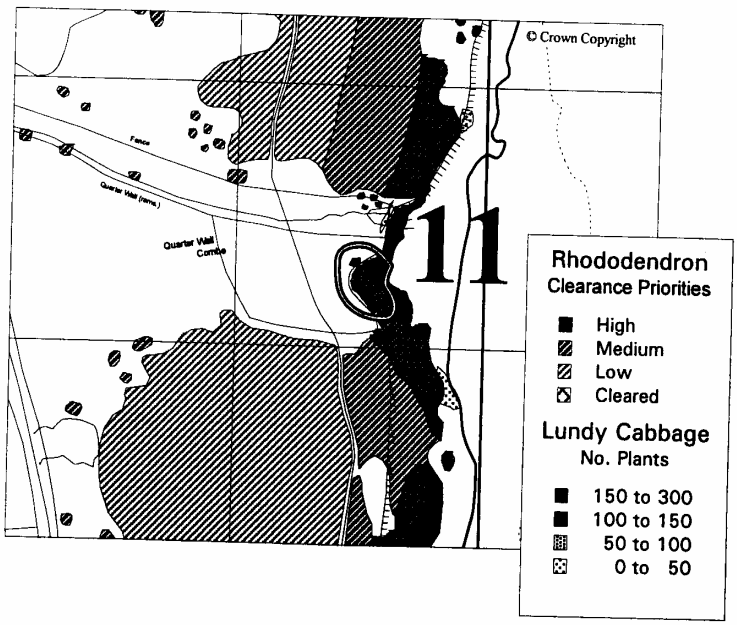
main thicket	0	no hazard
between path and cliff top	1-2	care needed
cliff top/cliff face	3	very dangerous

Rhododendron encroachment from this patch into Broad Combe is targeted for clearance in 1997/98 as part of the Countryside Stewardship agreement.

11 . Small bushes on cliff/cliff edge below Quarter Wall Combe. SS 139448.

Description & Map

A series of small bushes growing on steep cliff face and extending downwards from large thicket to the south (region 10).



Threat Posed to Lundy cabbage

Very high as there is a large population on these cliffs and the *Rhododendron* colonization onto them is just beginning. Some of the bushes are already encroaching onto the population of cabbage

Other Considerations

If untreated, ultimately these bushes will close together between the large thickets to the north and south, eliminating the firebreak and filling the combe. There are a number of ancient alders in the combe which might eventually be at risk.

Recommendations

Total removal, either by cutting or pulling (they might be small enough), chemical stump treatment and subsequent checking for regrowth and seedling establishment.

Priority with respect to:-

Lundy cabbage	**1***	**Urgent**
Other	1	

Hazard Rating

3 very dangerous

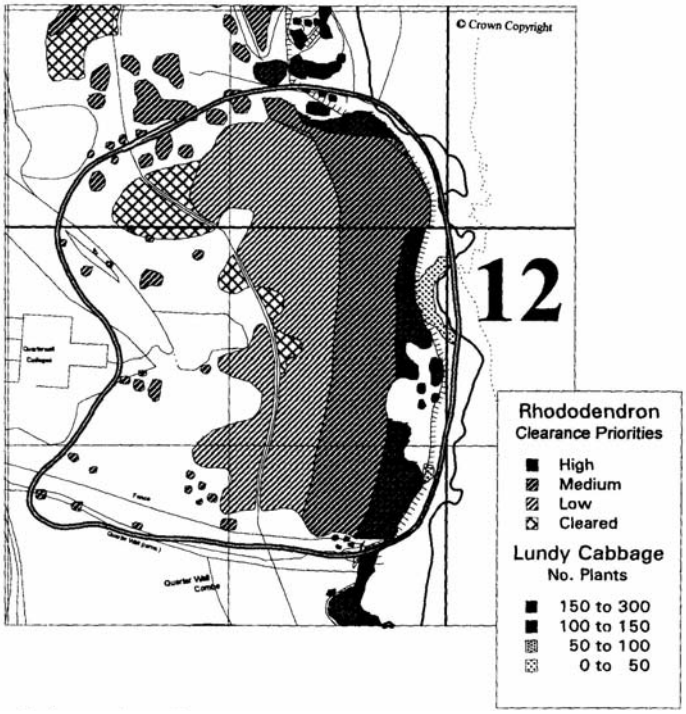
12. 6th large *Rhododendron* patch from south, between Quarterwall Combe and Quarry Bay. SS139448, SS139449 & SS139450 etc.

Description & Map

Approximately 2 ha thicket, on gently to very steeply sloping Sideland.

Creeping down the cliffs in Quarter Wall Combe and onto the cliffs along parts of the thicket's seaward edge and into the southern edge of Quarry Bay.

Just south of the middle of the thicket the *Rhododendron* has not reached the cliff edge. This isolated area of cliff grassland is encircled with *Rhododendron*, and there are small bushes established within it.



Numerous peripheral bushes, mostly small, extending well into the centre of Quarter Wall Combe and onto the Sideland upslope of the main thicket, including onto the edges of quarry spoil below the ruins of Quarterwall Cottages.

Two areas of this thicket have been cleared recently - a large "lobe" extending west of the coast path at the north of the thicket, and small areas around the path immediately below the cottages.

Threat Posed to Lundy cabbage

Below the path and cliff face.

Creep down the cliff above Quarter Wall Bay is threatening a large population. Two other small populations on the cliffs either side of the area where *Rhododendron* does not reach the cliff edge are also threatened.

Other Considerations

Aesthetic appeal and sika deer cover.

Recommendations

Cliffside part.

- Remove all *Rhododendron* creep from cliff face on northern margin of Quarter Wall Combe and maintain *Rhododendron* free.
- Eventually remove *Rhododendron* along cliff-top and cliff face all along this stretch.

Upslope part.

- Consolidate eradicated area by continued stump treatment, seedling removal and checking.
- Cut back expansion of thicket into Quarter Wall Combe and remove outlying bushes.
- Contain outwards and upslope spread of remaining thicket by periodic cutting back.
- Only consider further large scale clearance when all other priorities have been addressed.
- Consider clearance of access to uncolonised area at cliff edge and maintain and expand this area clear of *Rhododendron* and clear to cliff edge.

Priority with respect to:-

Lundy cabbage	cliffs below Quarter Wall	**1**	**High**
	cliffs along main thicket	2	
Other	remainder of thicket	4	

Hazard Rating

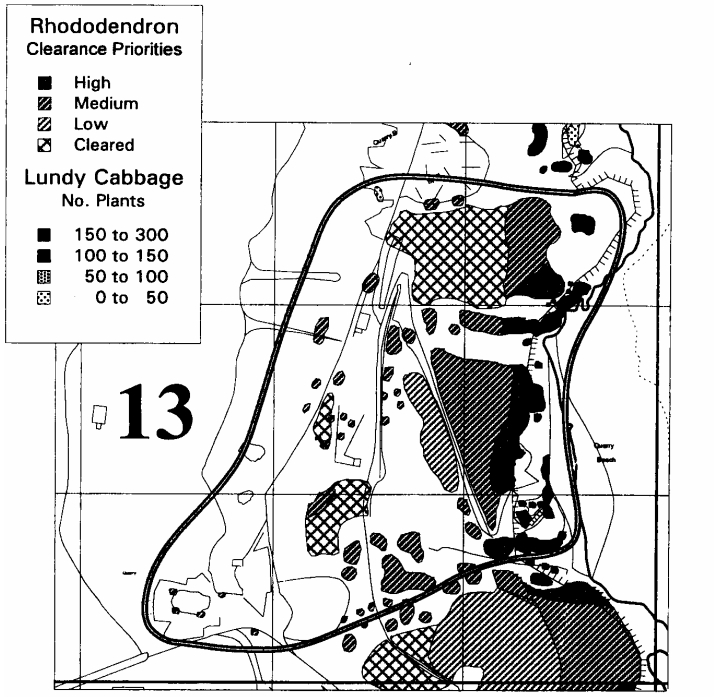
upper thicket	0-2	variable, dependent on slope
cliff top/cliff face	3	very dangerous

All *Rhododendron* west of the coast path is targeted for clearance in 1998/99 as part of the Countryside Stewardship agreement.

13. Quarry Bay, including 7th and 8th *Rhododendron* patches from south, SS138450, SS139450, SS138451, SS139451, SS138452 & SS139452. North to "Quarry B".

Description & Map

Extensive "archipelago" of large/medium sized thickets and numerous individual bushes of *Rhododendron* across steep and gently sloping Sideland, Quarry Terraces, quarries, rock outcrops, cliff faces and undercliffs to the west of Quarry Beach. The two larger thickets are approximately ½ ha each in extent.



The largest thicket reaches and extends down the cliff edge and onto the undercliff above the northern part of Quarry Bay and there are numerous other small thickets and bushes colonising the southern part of these cliffs. Small bushes extend almost to high water mark.

There has been extensive clearance of *Rhododendron* in Quarry Bay, including $^2/_3$ of the northernmost large thicket and areas on the Quarry Terraces.

Threat Posed to Lundy cabbage

South cliffs & undercliff	There is a large, fluctuating population of cabbage on the cliffs and undercliff which is being pushed out by *Rhododendron* colonization from the seaward margin of the southern big thicket and numerous smaller patches on the cliffs.
Northern sea cliffs	A "lobe" of the northern large thicket, part of a smaller thicket and colonising new bushes potentially threaten the population on these cliffs and on a small landslip immediately south.
Remaining areas	Almost none. There are sometimes a few plants of Lundy cabbage in "Quarry B" which would be at risk from further colonisation.

Other Threats

Extensive industrial archaeological remains in the quarry have been covered by *Rhododendron* in the past and re-exposed by clearance. *Rhododendron* roots may damage these.

Rhododendron is colonising among the sallow in the old Heligoland trap on the terrace, and the quarry faces above quarry pool.

Other Considerations

Aesthetic appeal and sika deer cover.

Bird ringers value scrub around the Heligoland Trap as cover for birds. If *Rhododendron* is eradicated here it should be replaced with other shrub species.

Recommendations

Cliffside part.

- Clear *Rhododendron* from cliff top, cliff face and undercliff all along margin of Quarry Bay and maintain *Rhododendron* free.

Upslope part.

- Consolidate eradicated area by continued stump treatment, seedling removal and checking.
- Concentrate clearance efforts on removal of archipelago effect of small patches and bushes throughout area, which will eventually consolidate into new large patches.
- Only consider further large-scale clearance when all other priorities have been addressed.

Priority with respect to:-

Lundy cabbage	cliffs and undercliffs	**1**	**High**
Others	archaeologically important areas	2	
	"archipelago" of bushes/thickets	2	
	remainder of 2 large thickets	4	

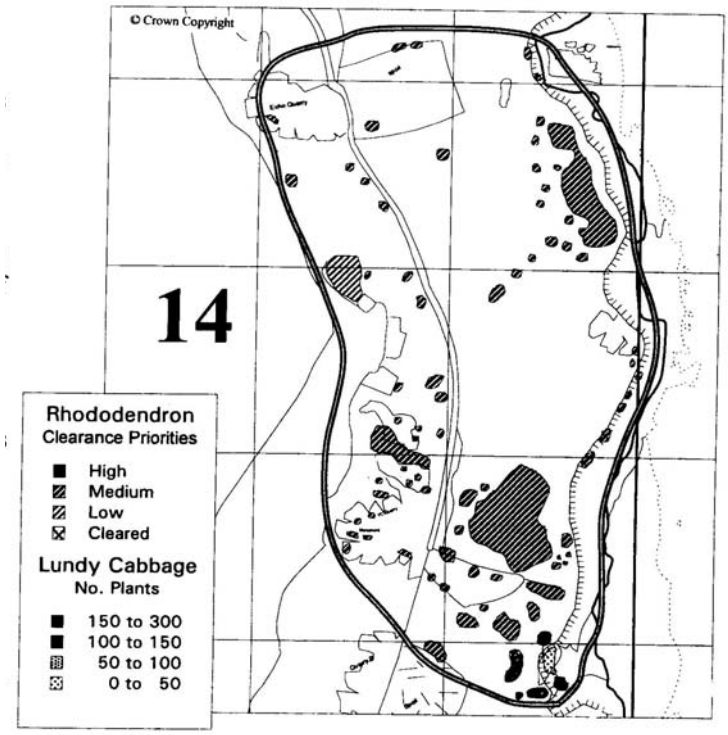
Hazard Rating

"archipelago"	0-2	variable, dependent on slope - some bits on quarry faces and outcrops potentially highly hazardous
cliff top/cliff face/undercliff	1-3	care needed - to - very dangerous

Rhododendron upslope of the track down to Quarry Beach is targeted for clearance in 1998/99 as part of the Countryside Stewardship agreement.

14. Northern Quarries, Cliffs and Sidelands north to Bay with the Kaaksberg including 9th large *Rhododendron* patch from south, SS139452, SS138453, SS139453, SS138454, SS139454, SS138455, SS139455, SS138456, SS139456, SS138457 & SS139457.

Description & Map



Another extensive "archipelago" of large and medium sized thickets and numerous individual bushes of *Rhododendron* across gentle sloping Sideland, the Quarry Terraces, quarries, quarry waste heaps, rock outcrops, and only in one or two places reaching the cliff edge.

There are small bushes on the cliff edge or face at scattered intervals along this section, including the cove above the Kaaksburg.

The largest thicket is approximately ¼ ha in extent and there is a thicket just to the south of the Kaaksberg of approximately $^{1}/_{8}$ ha.

There appears to have been no recent clearance of *Rhododendron* in this area.

Threat Posed to Lundy cabbage

There is a small population of Lundy cabbage on the shallow cliffs above the small bay immediately north of Quarry Bay and east below the spoil of "Quarry B". Small patches of *Rhododendron* are encroaching onto the cliffs all around this population.

Other Considerations

There is industrial archaeological interest in the quarries and on the terrace. The VC memorial was formerly obscured by *Rhododendron* before clearance.

Rhododendron appears only recently to have colonised much of this area and further spread could be relatively easily prevented at this stage.

There is little colonisation onto the cliff face or edge and again, what little there is could be relatively easily dealt with at this stage, circumventing much more costly clearance later.

Recommendations

- remove bushes above small population of Lundy cabbage in inlet
- remove all small "archipelago" bushes on Sideland, outcrops, quarries, spoil etc.
- remove all small bushes along cliff edge and cliff face to prevent further spread
- prevent large thicket just south of Kaaksberg from reaching cliff edge and eventually eliminate it

While there will be difficulties in finding cut stumps for after-treatment clearance should be prioritised here in order to circumvent a much larger task at a later date.

Priority with respect to:-

Lundy cabbage	bay 90m north of Quarry Bay	**2**
Others	archaeologically important areas	2
	"archipelago" of bushes/thickets	2
	cliff top/face plants and northern big thicket	2

Hazard Rating

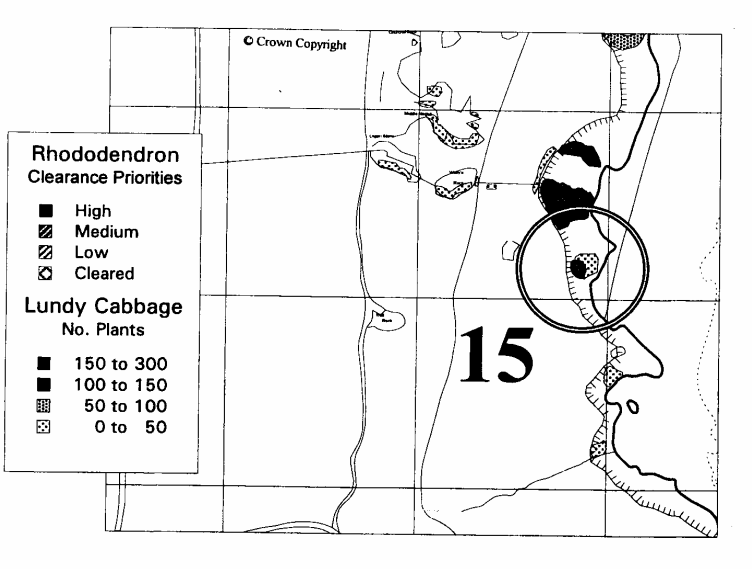
"archipelago"	0-2	variable, dependent on slope - some bits on quarry faces and outcrops potentially highly hazardous
cliff top/cliff face	1-3	care needed to <u>very</u> dangerous

15. Halfway Wall Bay - Single bush on cliff face, 40m south of the clifftop end of Halfway Wall SS138459

Description & Map

A single flowering bush about 1.5m across on the cliff face about ?10m from the cliff top 40 m south of the end of the Halfway Wall.

There may be additional bushes but much of the cliff-face here is invisible from the cliff top. These would need to be identified by boat from close to the cliff bottom.



Threat Posed to Lundy cabbage

There is a very large and increasing population of Lundy cabbage on the cliffs below the Halfway Buttresses, including a subpopulation immediately below the bush. This population is not threatened in any other way and there appear to be no other source of infestation by *Rhododendron* other than this single bush.

Other Considerations

A potential source of infestation of the Sidelands below the Logan Stone etc., an area otherwise completely clean of Rhododendron.

Recommendations

- remove the bush, preferably by pulling. Check for other seedlings. Chemical treatment of the stump and subsequent checking for regrowth and seedlings for 3 years afterwards.
- check remainder of cliffs in Halfway Wall Bay in May/June with binoculars from boat close to cliff bottom.

Priority with respect to:-

Lundy cabbage **1* Urgent**

Others **1**

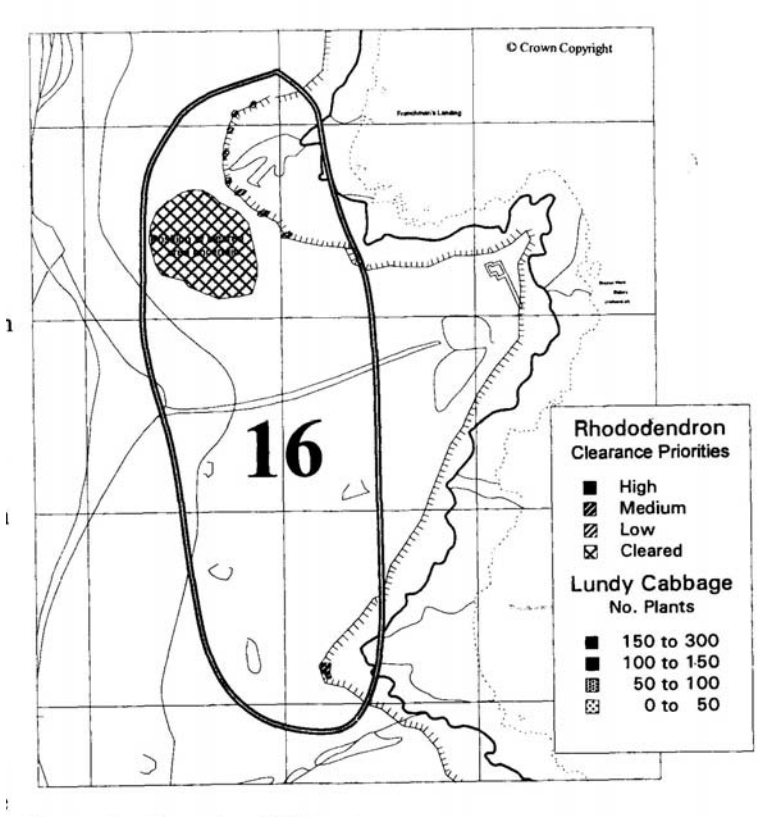
Hazard Rating

3 very dangerous

16. Tibbett's Point, Three-quarter Wall Bay and Frenchman's Landing - SS139463, SS138466 & SS137468

Description & Map

A very large patch of *Rhododendron* was successfully cleared above Brazen Ward in the late 1980s but there has been constant seedling establishment in the sward all around the peninsula with Brazen Ward since then. There are also seedlings regularly found on the Sidelands above Gull Rock.



A single non-flowering bush was observed above Three-quarter Wall Bay in 1996 but was not adequately mapped and could not be refound in 1997.

At the same time, approximately 30 flowering bushes up to 1m across were found at the very cliff edge and up to 5m down the cliff face in the bay above Frenchman's Landing.

It is very likely that the seedlings are derived from these bushes rather than from a latent seed bank and their removal would obviate the need for further work here.

There may be other bushes, especially somewhere near Gull Rock. Much of the cliff-face here is invisible from the cliff top. These would need to be identified by boat from close to the cliff bottom.

Threat Posed to Lundy cabbage

None - this is well north of the northern limit of the species.

Other Considerations

A continual source of re-infestation of these Sidelands in an area otherwise now completely clean of *Rhododendron.*

Recommendations

- remove all bushes, preferably by pulling. Check for other seedlings on cliff. Chemical treatment of the stump subsequent checking for regrowth and seedlings for 3 years afterwards.
- continue removal of seedlings on Sideland above Brazen Ward and (hopefully) monitor the success of removal of the seed source.
- check remainder of cliffs in this area in May/June with binoculars from boat close to cliff bottom. Try to identify the source bush near to Gull Rock

Priority with respect to:-

Lundy cabbage		**None**
Others	**1**	**High**

Hazard Rating

3 very dangerous

17. The Plateau. SS1345, SS1346

Description

Numerous areas of seedlings and very stunted "bonsai" bushes a few centimetres tall in areas from Pondsbury to just north of Threequarter Wall. These have currently not been mapped but are included on the maps produced by Marren (1971) and the National Trust (1991).

Threat Posed to Lundy cabbage

None

Other Considerations

Rhododendron seems unable successfully to colonise the plateau, either as a result of exposure or susceptibility to the greater levels of grazing/trampling by stock.

Recommendations

- a watching brief to be kept to ensure that no plants reach flowering size
- consider putting effort into clearance only after successful eradication elsewhere on Lundy.

Priority with respect to:-

Lundy cabbage	0	None
Others	**4**	**Low**

Hazard Rating

0 safe

Appendix 2 - Lundy SSSI - Cliffside *Rhododendron* Control Health & Safety Plan

1. Nature of the project: Clearance of short *Rhododendron* threatening Lundy cabbage.

1.1 Client: English Nature (Species Recovery Programme).

1.2 Location: Lundy Site of Special Scientific Interest
Cliffs on Eastern Sidelands (Grid reference SS139460 to SS141438)

1.3 Nature of Work to be undertaken: *Rhododendron*, largely dwarfed by wind exposure is progressing vegetatively and establishing from seed down the cliffs into the core habitat of the endemic plant Lundy cabbage.

This *Rhododendron* is to be removed from the cliffs, by cutting or uprooting as appropriate and transferred to the sidelands where it will be disposed of by volunteers.

This is a pilot project to examine the practicability and cost effectiveness of this method of removal and the area to be removed cannot be stipulated.

1.4 Timescale: The works will be carried out in the autumn or winter of 1997/98 at a time to be agreed with English Nature's representative on Lundy, the warden Liza Cole. Work will be completed by 28th February 1998. In the event of slippage in the work due to extremes of weather or technical difficulties, English Nature's project officer must be informed immediately.

1.5 Risk Assessment: a risk assessment and method of work statement giving a safe system of work for these operations must accompany the tender documents.

2. The Existing Environment

2.1 The cliffs on this part of Lundy are up to 70m in height, sheer into the sea and onto rocks.

2.2 Most are of granite, although some are of friable slate. There may be wet seepages down part of the cliffs rendering them slippery or icy.

2.3 In easterly winds they can be very windy and very exposed.

2.4 Access to the top of the cliff may be made difficult by the presence of mature *Rhododendron,* while in other places there is a steep grass slope culminating in a vertical, unfenced cliff edge.

2.5 All work at high level will require the use of bosun's chair, safety harness, belts and suitable anchorage points.

2.6 Care must be taken in the hauling of cut material up or down the cliff that lifelines are not interfered with or abraded.

Site Wide Elements

3.1 Access and egress will be agreed with the Lundy Warden Liza Cole, telephone 01237 431831, once agreed there will be no variation of the routes without consultation.

3.2 Delivery and storage of all equipment & materials will be agreed with the Lundy Warden.

3.3 Emergency RV point, identified by name, if possible, and grid reference will be agreed by the contractor and Lundy Warden before work commences.

4. Site Rules

4.1 The works outlined in this contract are judged to be of too high a risk for any contractor or contractor's staff to undertake working alone. No lone working will be permitted when that work involves accessing the cliff faces or edges.

4.2 All persons working on site must be appropriately trained and competent in climbing and use of suspended equipment (bosun's chair, climbing harness, etc) and supervised by an experienced operator.

4.3 An emergency plan must be prepared for all foreseeable incidents eg equipment failure when on steep face, inversion when operating in harness etc.

4.4 A record of all accidents and near-misses will be kept and reported to English Nature. Any incident covered by RIDDOR will be reported to the appropriate authority ASAP.

4.5 All necessary personal protective equipment will be provided by the principal and/or subcontractor for their employees and the contractor will ensure that the appropriate clothing and equipment is used.

4.6 The minimum PPE requirements, excluding specialists equipment on this site is:

- Body coverall or boiler suit
- Safety footwear
- Safety helmet and chin strap
- Eye protection

4.7 All work will comply with statutory legislative requirements, where no standards are set by law, industry ‘best practice' must be used.

4.8 Provision for first aid treatment should be made, at least one member of the work crew must have CPR skills.

4.9 English Nature will dismiss from the site any contractor or employee of a contractor who contravenes these rules.

4.10 The contractor will make known the risk assessment and safe systems of work required on this site to all individuals involved in this project.

4.11 This is an isolated site where good communications between suspended face workers and cliff top base is essential. A fully operational radio system is required.

4.12 A fully charged mobile telephone must be available at all times when work is under way.

5. Indemnity

5.1 The contractor will indemnify English Nature against all actions, costs, claims, damages, direct or indirect or consequential expenses, liabilities or losses howsoever caused by the contractor, his employees and agents in association with this work, save where the contractor can establish that the circumstances were the fault of English Nature.

5.2 The contractor is required to sign an undertaking to certify these rules and conditions have been received and understood and passed on to all relevant employees.

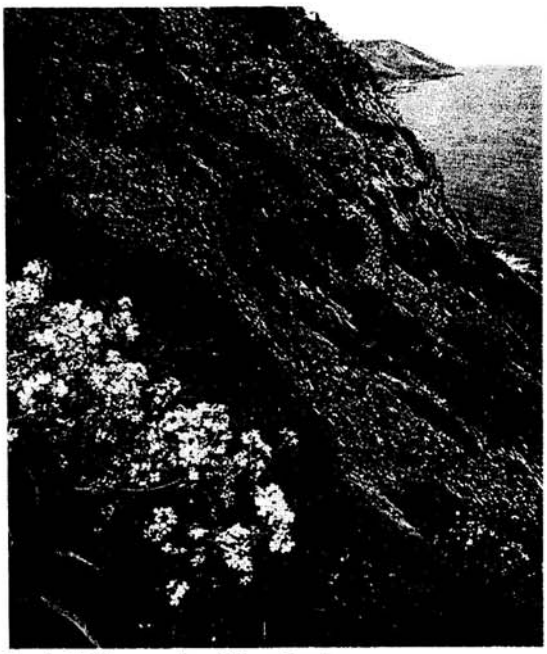
6. If there are any queries regarding this Health and Safety Plan, or any other queries regarding health & safety, please refer to English Nature's Safety Officer, Mr David O'Connor at English Nature, Northminster House, Northminster, Peterborough PE1 1UA. Tel 01733 455062.

Appendix 3 - Possible information sheets for visitors and for volunteers tackling *Rhododendron*

Rare Plants on Lundy

LUNDY CABBAGE

The Lundy Cabbage *Coincya wrightii* is one of those very few plants that are endemic to Britain - that is,



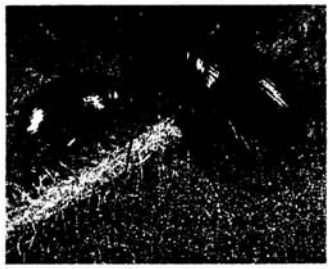
Lundy Cabbage on the cliffs on Lundy photo R S Key

they grow nowhere else in the world. The Cabbage grows only on a short section of cliffs, outcrops and coastal grassland on the South East side of the island of Lundy in the Bristol Channel. It is probably a relic species, once more widespread in Europe and isolated on Lundy after the last ice age and has subsequently died out elsewhere.

It is a handsome plant, a member of the cabbage family and superficially similar to charlock or wild mustard. Its nearest relative in Britain is Isle of Man Cabbage, which grows on dunes on the west coast of Britain but its nearest relatives live in Spain and North Africa. Lundy Cabbage grows to about four feet tall and forms a splendid sight when the cliffs are covered with yellow flowers in May to August.

Lundy Cabbage thrives best in soil that is bare of vegetation, such as on the granite cliffs, or that has recently been disturbed, for example on the numerous landslips that occur on the soft slates of the southernmost part of Lundy.

Lundy Cabbage is unique in being our only endemic plant that also supports some endemic insects, the Lundy Cabbage Flea Beetle and the Lundy Cabbage Weevil. There is a third insect that is a Lundy race of the common Cabbage Stem Flea Beetle. All of these are closely related to, but significantly different from, beetles on the mainland. These insects have probably evolved on Lundy since the ice-age and this little community of insects presents a unique opportunity in Britain to study evolution in action - our own equivalent of the Galapagos Islands.



Lundy Cabbage Flea Beetle photo R S Key

▶

species RECOVERY

Action for Biodiversity

The Species Recovery Programme, which was launched in 1991. aims to achieve long-term self sustained survival in the wild of the species of plants and animals currently under threat of extinction.

Working in partnership with a wide range of organizations and individuals, the Programme involves a combination of detailed survey work and ecological studies leading to an understanding of habitat requirements so that site management can be carefully targeted. In some cases the re-establishment of species to former sites or suitable alternatives will take place to ensure populations are viable in the long-term.

While Lundy Cabbage has been on Lundy for 9000 years, its existence may now be threatened by an invading alien - the beautiful shrub Rhododendron from Turkey, which was introduced as an ornamental plant onto the island in the nineteenth century and is still spreading. It now covers much of the cliff tops where the cabbage probably used to grow. Lundy Cabbage's strongly cabbagy flavoured leaves are also attractive to the islands sheep, goats and rabbits and most of the plants now grow in inaccessible places or are protected by thorny brambles and sloes.

The Island of Lundy is owned by the National Trust and managed by the Landmark Trust. Work on the control of Rhododendron has been under way since 19xx. Since 1993 Leeds University and English Nature have been studying the ecology and conservation needs of the cabbage and its insects. In 1995 Lundy Cabbage was recognised as a species of international conservation importance and its conservation action plan championed by the National Trust in 1996.

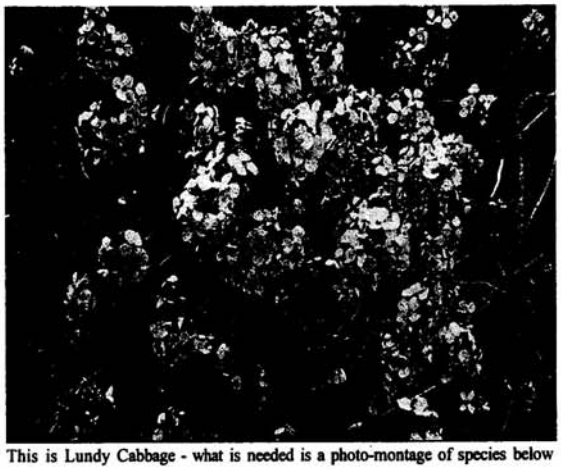
The objectives of the plan are to:

- Maintain the existing range and abundance of Lundy Cabbage on the Island.
- Control the Rhododendron and grazing animals that prevent it extending its range into areas it probably once inhabited.
- Help the cabbage to recolonise these areas.
- Assess the success in conserving the cabbage and its insects and other scarce species that are likely to benefit from management of its habitat.

These will be achieved by:

- Setting up and implementing a rhododendron control and eradication strategy
- Examining ways of reducing the impact of grazing on the cabbage.
- Re-establishing the cabbage in the areas where it once occurred.
- Monitoring the cabbage, its dependent insects and the other species with which they co-exist.

OTHER RARE PLANTS ON LUNDY



This is Lundy Cabbage - what is needed is a photo-montage of species below

photo R S Key

Golden Hair Lichen *Teloschistes flavicans*
Another protected species, this lichen is only found in places with exceptionally pollution-free air. It occurs mainly on rocks along the west side of Lundy and looks like a small ball of golden wool. It too has a Species Recovery Programme on the mainland where it is more threatened.

Balm-leaved Figwort *Scrophularia scorodonia*
A Red Data Book plant that grows, often along with Lundy Cabbage, on the rock slippages on the south-east of the island. Otherwise in afew sites in the west country and on the Scilly Isles.

Least Adders' Tongue Fern *Ophioglossum azoricum* A tiny, nationally scarce fern that grows in short-grazed grassland on the west side of the island in huge numbers.

Northminster House, Peterborough, PE1 1UA. Telephone 01733 340345 Fax 01733 68834
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Battle notes for Rhodi-bashers

The war against *Rhododendron* on Lundy

The story so far

While *Rhododendron* is an elegant and beautiful shrub when it clothes the eastern side of Lundy with its pink flowers in May and June, unfortunately it is also an aggressive alien invader. It is the major threat to the plant life of the Eastern Sidelands of Lundy, and to the survival of Lundy's own unique plant, the Lundy cabbage. *Rhododendron* naturally grows in Portugal, Spain and Turkey. It was originally planted in ornamental gardens around Millcombe in the nineteenth century and soon escaped into the wild. A big fire in 1926 cleared a huge seedbed for it on the Sidelands and it has been spreading ever since.

Because Lundy is an island, it is just possible that we can eventually eradicate this beautiful but dangerous invader, despite the large area it now covers and its liking for some of the most difficult and dangerous parts of the island. Huge efforts have already been made, with some victories. After gargantuan efforts by volunteers, *Rhododendron* is close to being eradicated in the north around Gannets Combe and in the south around Millcombe. Some of the really big thickets have been trimmed back, the dense cover around Quarry Bay has been fragmented. In these areas, we've got it on the run.

Some of the *Rhododendron* has infiltrated the sea cliffs, where it is both very hard to get to and at its most destructive to the Lundy cabbage. Special forces are needed in such circumstances, and a Worldwide Fund for Nature-led team of expert climbers are testing the viability of work on these dizzying heights.

Elements of the campaign

In the war against Rhododendron, the big, long-established thickets are equivalent to the massed foot soldiers of the enemy - easy to find and slow moving, but they take a lot of effort to eliminate. They are also resilient - unlikely to be all destroyed on the first sweep through their territory and follow-up, cleansing activity, usually employing chemical warfare, is vital if the earlier campaigning effort is not to be wasted.

Areas where mature *Rhododendron* has been cleared often continue to sprout seedlings for years- especially if there are still nearby mature plants continuing to produce seeds. Seedlings are the enemy's fifth column, easy to control once you get hold of them, but small, very hard to find but waiting to cause trouble if they are ignored.

Uncontrolled seedlings eventually flower, turning into a guerilla force behind the lines of control. If allowed to set seed they can undo very rapidly the hard work of earlier volunteers. The results of clearance of seedling and regrowth do not look as spectacular as clearings in the main thickets, but they are just as vital.

A *Rhododendron* Campaign Plan

Planning and coordination are required if any campaign is to succeed. English Nature and Leeds University have put together a plan of action with maps of *Rhododendron* distribution, its accessibility and targets for the plants that are most important to attack. It is also very important to check the time, effort put in and success of all the control measures, including that your own team, because this is the only way that we can predict when the *Rhododendron* menace might finally be eradicated, and how much it will cost in man-hours, blisters and money.

Appendix 4 - Annual check list of *Rhododendron* control measures.

199_

1. Primary clearance

Priority	**1***	**1**	**2**	**3**	**4**
No. of tasks					
Man hours					
Area cleared					

2. Regrowth control

Priority	**1***	**1**	**2**	**3**	**4**
No. of tasks					
Man hours					
Area cleared					

3. Seedling Eradication

AREA	Seedling sweep 1	Seedling sweep 2
S of Millers Cake		
Gannets Combe		
Frenchman's Landing		
Above Gull Rock		

4. *Rhododendron* distribution re-mapped this year? *Yes/No*

Appendix 5 – Suggested record sheet for individual *Rododendron* control operations

***Rhododendron* Patch Worked on (patch number, grid reference)**

Date(s)

Team/Organisation

Team members

***Rhododendron* Clearance Priority**

1*	Urgent	☐
1	High	☐
2/3	Intermediate	☐
4	Low	☐

Accessibility

3	Very hazardous	☐
2	Potentially hazardous	☐
1	Care needed	☐
0	No problems	☐

***Rhododendron* Growth Type**
area (square metres) or number of seedlings

Primary clearance of bushes

Regrowth

Seedlings

Methods Used

Task Length – Man hours

Weather Conditions

Other Notes

ENGLISH NATURE

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Front cover photographs:
Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888