A survey and strategic appraisal of rhododendron invasion and control in woodland areas in Argyll and Bute.

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Rhododendron ponticum (L) is an invasive non-native shrub species that has colonised a range of natural habitats since its introduction into Britain around 240 years ago. Once it invades an area it shades out indigenous vegetation, reduces the habitat's biodiversity value and eventually dominates the habitat. Where this occurs in woodlands the process of natural regeneration is prevented and the woodland habitat is then under threat of irreparable deterioration. This project aimed to collate mapped information and local knowledge on the current extent of rhododendron in woodlands in Argyll and Bute, predict future rhododendron expansion of mapped source populations over time periods of 20 and 50 years resulting from the combination of vegetative layering and seed dispersal, and develop a strategic management plan to eradicate rhododendron from the land base.

Mapped rhododendron currently occupy an area of 4,654 ha in Argyll and Bute, of which 85% is located within woodland. However, this figure is likely to significantly underestimate the true level of occupation in Argyll and Bute, as the information available in current datasets was limited, particularly for the southern areas of Argyll and Bute. Additionally, there has not been an attempt to systematically record the presence or map the location of all rhododendron populations in the region. Except for the recent Loch Lomond and Trossachs National Park (LLTNP) invasive plant audit (Chapman, 2007), and commercial woodland maps from West Argyll, Lorne, and Cowal and Trossachs Forest Districts. If we accept the level of rhododendron occupation recorded in the LLTNP audit is a more accurate of the level of occupation in similar habitats in Argyll and Bute, then our survey has under-recorded the potential area of rhododendron colonisation.

Some form of rhododendron control management (i.e., chemical herbicide, removal of material, etc) is being undertaken on 15% of this area (704 ha). Assuming current control is 100% successful and an absence of future control, rhododendron invasion will increase the extent of unmanaged rhododendron from 3,950 ha up to an area of 4,851 ha in 20 years, and 6,249 ha in 50 years. The cost of eradicating current rhododendron source populations from the entire Argyll and Bute landscape is estimated at > £9.3 million (in 2008). Restricting eradication to the 1,252 ha of dense or sporadic rhododendron cover types that currently occupy or threaten to invade designated sites (SAC, SPA, SSSI, and National Park) lowers the control management costs to £3.2 million (in 2008).

Delaying control management would increase the cost of eradication by allowing expansion of the current populations by 23% after 20 years and by 58% after 50 years. Therefore, allowing current populations to spread over the next 50 year period will potentially increase the cost of eradication to > £19 million in 2028 and > £65.4 million in 2058. Assuming a worse case scenario, where disturbance within 150 m of existing rhododendron populations enables the colonisation of new habitats, 15,308 ha of Argyll and Bute are currently under threat of invasion. Changes to the management of these threatened habitats should be carefully considered and rhododendron control undertaken prior to implementation of management that will create conditions for rhododendron expansion.

Development of a GIS-based control management decision support system would enable different management options to be assessed, such as the cost of controlling only part of the land base. This information can then be used as a tool by managers to produce strategic management plans to eradicate rhododendron in areas with an established population, and protect potential sites suitable for invasion.

This report makes 12 key recommendations to prioritise bushes for eradication and enhance control operations. These recommendations should be adopted in Argyll and Bute, and in the wider environmental community, when invasive *Rhododendron ponticum* eradication is the primary management objective:

1. Ideally the focus for any eradication programme should be based on preventing the initial invasion of a habitat not currently occupied by rhododendron.

2. Where a major rhododendron population exists in a habitat external to the woodland, and the woodland habitat is currently in the early stages of rhododendron invasion, the priority for control lies in removing the seed source before tackling the invasion front.

3. As a general principle any expenditure on rhododendron control, which is aiming to eradicate the problem in a geographic area, should be invested principally in the tallest or oldest bushes first.

4. Changing the order in which bushes are controlled can affect the probability of reinvasion of seedlings from seed bearing bushes and hence the number of times herbicide applications have to be made.

5. Attention must be given initially to any ***recently cut bushes*** with no regrowth or stump regrowth that is, or will be when treated, < 1.3 m tall, as these can be most effectively killed using a foliar herbicide application

6. Eradication should then concentrate on any ***designated native woodland habitats*** (i.e., SSSI's, SPA's, and SAC's) that have mature flowering bushes within them.

7. We recommend that where possible in sensitive sites/ habitats only, seedlings approaching 10 years (or 60 cm height) should be eradicated before they can cause damage to the native vegetation sward.

8. Sensitive species, such as herbaceous plants and some bryophytes, are adversely affected by the herbicides recommended for rhododendron control, and may in some circumstances cause greater damage than the targeted rhododendron bush or seedling. Alternative control techniques may have to be considered in these conditions, or the time of application changed to seasons when sensitive species are dormant.

9. Ground surveys potentially underestimate the extent of rhododendron in open habitat, gardens and designed landscapes, and in woodland areas where the level of occupation prevents surveyor access.

10. This survey has highlighted the potential role of transport routes and linear features as dispersal corridors, which should receive special consideration when planning rhododendron eradication programmes.

11. The removal of all flowering rhododendron within 150 m in open habitats, and 50 m in woodlands, of area to be clear felled or to be managed under Low Impact Silvicultural Systems (LISS) is recommended to prevent expansion of the bushes into disturbed sites.

12. Working groups or forums should be encouraged in regional areas where an eradication programme is intended, to allow neighbours with invasive rhododendron to collaborate on programmes and co-ordinate the order or priority of control operations.