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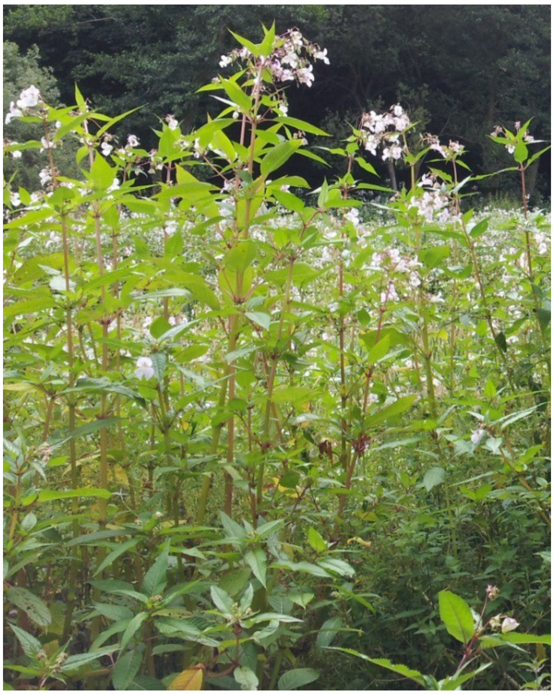
Distribution and Management of the Invasive Species Himalayan Balsam (*Impatiens glandulifera*) at Penllergare Valley Woods

A report prepared for Penllergare Trust
by WISE network, Swansea University
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1. Overview

The invasive alien plant, Himalayan Balsam (*Impatiens glandulifera*) was studied in Penllergare Valley woods during summer 2013 by Swansea University's WISE network (Dr Penny Neyland and Dr Laura Roberts) together with MSc students (Zöe Costas-Michael and Porscha Thompson). This report outlines the need for such a survey, together with a brief description of the methodology used and the results and recommendations generated by the study. Himalayan Balsam populations were classified into categories according to their distribution in relation to light regime (from full sun to shaded conditions) and analysed for their competitive ability. Results of the surveys are presented, together with the effects of Himalayan Balsam on the diversity of native communities of plant species. Management recommendations for removal and management of this invasive species are presented, with direction of where to focus management in order for it to be most effective.

Invasive plant species cause extensive implications economically and ecologically to the UK each year. Effectively managing invasive species to maintain and enhance ecosystem services and resilience is now a requirement under UK and European law. The competitive ability of invasive alien species for nutrients, light and water exceeds that of native species; subsequently causing a loss in biodiversity and ecosystem services and resilience. Economically, the damage invasive plant species cause to transportation networks and infrastructure costs billions of pounds per annum to correct where possible; furthermore, the control of such species intensifies economic issues. In addition to reduced biodiversity, annual invasive species, such as Himalayan Balsam, die back in the Autumn, increasing soil erosion. When this occurs in the vicinity of water courses it reduces water quality through increased loading of suspended sediments, as soil (and seeds) enter the river system. This has numerous additional negative consequences for the biodiversity and integrity of aquatic habitats and the Water Framework Directive, together with the detrimental effects on the functioning of the terrestrial habitat, through destabilisation and loss of bankside soil.

The terrestrial invasive plant species Himalayan Balsam (*Impatiens glandulifera*) was studied to determine its preferred habitat according to light conditions of sun, partial shade and shade. This allows management recommendations to be aimed at areas and habitats that are most at risk of invasion resulting in subsequent biodiversity loss and reduction in ecosystem stability. Leaf surface area, chlorophyll content, chlorophyll fluorescence, height and density of Himalayan Balsam were investigated as indicators of competitive ability. Shannon (community) diversity was also investigated as a measure of plant community diversity under each light condition. It was assumed that Himalayan Balsam plants that were taller, growing at higher densities and dominating the plant community were the most competitive.

This study identified that Himalayan Balsam was most competitive (present as taller plants and higher densities) under partial shade conditions. Additionally, plant community diversity in partial shade was significantly lower than other light conditions. In full shaded populations, Himalayan Balsam was present in the lowest density, however, leaf surface area was the largest in shade populations which creates a shadowing effect by preventing light from reaching the ground layer; therefore, Himalayan Balsam still outcompetes native species under shaded conditions. Where Himalayan Balsam was present in full sun, there was greater plant community diversity, in turn increasing the competition for habitat resources between native and alien species. Additionally, Himalayan Balsam height was significantly reduced when growing under conditions of full sunlight, suggesting it was growing under higher stress and is therefore least competitive in areas of full sun (verified by the lowest chlorophyll fluorescence reading of each light condition).

A suitable control for Himalayan Balsam is paramount to the restoration of biodiversity, stability and functionality, of both terrestrial and aquatic ecosystems. This study suggests this species is most competitive under the optimum condition of partial shade, where associated native plant community diversity is significantly reduced; thus, biodiversity value is lost and ecosystem services are compromised. It is recommended that management of Himalayan Balsam is undertaken wherever possible, but is focussed on populations growing in partial shade. This is vital as high competitive ability under partially shaded conditions allows the great heights and increased densities of Himalayan Balsam to suppress the growth of native species, leading to a lower associated community diversity. A long-term control programme including both mechanical and chemical removal, initiated before the July flowering season will benefit the biodiversity of the area. Furthermore, this will also increase ecosystem resilience and functioning, not least through the increase in biodiversity, but also through bankside stabilisation. Bankside populations should also be a priority target as these areas are most prone to soil erosion after autumn die-back and are often the most quickly to be newly colonised as seeds are periodically deposited along the water course. Planting of bankside areas (with suitable native plant species) after clearance may help prevent soil erosion and re-establishment of Himalayan Balsam.

Effective management will provide long term benefits both ecologically, and economically. Additionally, if conservation volunteers are utilised for mechanical removal, this will promote community involvement, education and wellbeing. Chemical removal should be carried out by licensed personnel only and should only be undertaken using suitable chemicals approved for use near waterways, such as glyphosate. This should occur twice per growing season, once before flowering and once after the first treatment has begun to reduce the density of the stands. Mechanical and chemical removal should be used in conjunction where possible, hand puling before application of the herbicide.