Online weed risk management database for new and emerging weeds

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Summary Weed risk management (WRM) systems have been designed to quantify the relative risks that different weed species pose. This paper reports on the development of a large database of Weed Risk Management assessments for Australia. From a survey of several sources, some 834 taxa were regarded as potential problem weeds in Australia. These taxa were prioritised using a protocol for initial weed risk assessment and the higher risk weeds were included in a reduced list of 268 taxa for more detailed assessment. Initially risk assessments are being conducted for New South Wales (NSW). Other state and territory colleagues will be able to modify these, and upload these and other species assessments onto the database. The assessments will be made available on the internet in a searchable database form after the database has been piloted using the assessments for new and emerging weeds from NSW.

Keywords WRM, weed risk assessment, potential problem weeds.

INTRODUCTION

Before a decision on management for a weed is made, an assessment of the risks and impacts of the species should be undertaken. The level of risk posed by an invading species depends on a number of factors: its potential impact, including the ultimate area of its occupation; its rate of spread and its susceptibility to control, including its detectability. While these factors may be modelled where sufficient information is available, this is rarely the case for invasive plants and less quantitative methods must be adopted. One such set of methods, weed risk management (WRM) systems generally compare species' characteristics on relative qualitative bases.

Virtue (2008) developed a system of this type that has since been modified and adopted by various authorities (e.g. see Auld 2012) and which forms the basis of the current (Anon. 2006) and revised National Post-Border WRM protocol (Auld *et al.* 2012). The NSW WRM protocol is such a system (Johnson 2009a,b). The NSW WRM system is being used to assess some 268 new and emerging weed taxa for their weed risk and the feasibility of their control.

MATERIALS AND METHODS

A list 834 species regarded as potential problem weeds in Australia was developed from Australian noxious weeds lists and invasive species lists from several sources including New Zealand, south east Asia, South Africa, the United States of America, as well as international lists of invasive species. This list was culled to 268 taxa using the Protocol for Initial Weed Risk Assessment (Johnson *et al.* 2009) judging the relative extent of impact, noting recent spread (from herbarium records) and assessing potential impacts.

RESULTS

Weed Risk Management assessments for these species are being compiled and will be completed in 2015. Initially the assessments are being conducted for NSW but can be modified as necessary for other states and territories. These assessments, together with assessments reported by Hamilton *et al.* (2014) will be made available on the internet after testing on a pilot searchable database.

DISCUSSION

Subsequent to accurate identification of a potential new weed, an assessment on the risk and impacts posed by that species is required before a decision on whether to proceed with weed management occurs. WRM systems have been designed to semi-quantitatively assess the invasiveness, impacts and potential distribution of a weed species (collectively known as weed risk assessment), as well as the control costs, duration of control and the current distribution (collectively known as feasibility of control) (e.g. Anon. 2006). By comparing the risks posed by the species with the feasibility of control, prioritisation of a set of weeds for management can occur. This is particularly important where resources are limited.

The National Post-Border WRM has helped standardise WRM approaches across Australian jurisdictions such that real possibilities exist for the sharing of both data and assessments among these jurisdictions. Similar sharing occurs with pre-border weed risk assessments (WRA) assessed using the Australian or Pheloung WRA system (Pheloung *et*

al. 1999), particularly across Pacific Ocean nations and island groups, e.g. PIER (2014). By developing a web-based searchable database for WRM assessments, this project seeks to provide a similar service, albeit initially populated with data for new and emerging weeds in NSW.

The benefits of having a post-border WRM database will be significant. It aims to be a 'one-stop-shop' for obtaining biological and ecological data for WRM assessments, with reference to relevant literature these data were sourced from. Not only will it help State/Territory and regional prioritisation of weeds by State/Territory government risk assessors and natural resource management professionals, the database will be able to be used by local government and other stakeholders as they seek to prioritise weeds of concern to them. The time needed to do a thorough risk assessment is significant: various estimates range from one to five days, depending on how well the species is known and documented. The time saved by one person completing an assessment and placing it in the database will be large when others are able to visit this assessment and use it/or modify it for their land-use/geographic area and/or circumstances. After trialling with the new and emerging weeds for NSW, we hope to place all WRM assessments for noxious weeds within NSW on the database. We are also in discussion with other State and Territory governments about the possibility of doing the same, and with researchers from the Future Farm Industries Cooperative Research Centre about hosting their risk assessments (FFI CRC 2014) once the CRC is concluded

Use of WRM systems outlined in the standard (Anon. 2006) has increased steadily across Australia since its introduction in South Australia prior to the year 2000 (e.g. Weiss *et al.* 2004, Setterfield *et al.* 2006, Johnson 2009a,b, Taylor 2012). Increasingly, WRM systems are used for newer applications such as the risk assessment of: species used for salinity remediation (e.g. Stone 2008, FFI CRC 2014); species sold in nurseries (e.g. Virtue *et al.* 2008, NGIA 2013); for genetically modified organisms (e.g. Keese *et al.* 2013, OGTR 2013; and see the reviews of Downey *et al.* 2010a and Auld 2012 for others). Training in the use of WRM systems has been rolled out across the world by the Food and Agriculture Organisation of the United Nations (e.g. FAO UN 2011), and the provision of this database on the web will help risk assessors in these countries to adopt and use the system.

There is always scope for their improvement, particularly: in the best management of widespread weeds on-ground; by incorporating better indications of uncertainty around various metrics in these systems; and in exploring assessment options to manage weed species that have some positive utility (e.g. Johnson 2012, Auld *et al.* 2012). Having said this, it is important to understand the limitations of WRM systems. One of these is that WRM systems provide an indication of the appropriate control action required for a species but do not necessarily provide guidance for on-ground action for these species (e.g. Hamilton *et al.* 2014). An administrator or weed manager still typically has a range of species and potential actions to apply in the field. While benefit/cost ratios could provide a means of prioritising species (noting Johnson 2012), the uncertainty surrounding invasion impacts makes this next stage of application difficult. Past research has proposed new ways to address these difficulties, (e.g. Downey *et al.* 2010b): also an area of active current research (e.g. Sydes and Murphy 2014, Steel and Weiss 2014). A standardised protocol drawing the best approaches from this, and other research is now what is needed.

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