New weed identification key online

Murray Dawson[1] and Julia Wilson-Davey

Fig. 1 *Ulex europaeus* (gorse). This iconic weed is the image used on the home page of the new key. Image: Trevor James.

A new interactive key has been developed that will be a big help for people who need to identify weeds in New Zealand. The computer-based online key draws on the National Pest Plant Accord (NPPA) Key, which was completed in July 2009 (Dawson and Ford, 2007), and the Department of Conservation's consolidated list of environmental weeds in New Zealand (Howell, 2008).

The new key covers more than 500 plant taxa (species, subspecies, varieties, hybrids and cultivars), including about 150 NPPA plants, more than 300 environmental weeds, and many similar species and close relatives. The key is available for use, free of charge, on the Landcare Research website (www.landcareresearch.co.nz/research/biosystematics/plants/weedskey/index.asp or use the shortcut http://tinyurl.com/weedkey; Fig. 1).

As with the original NPPA Key, which it replaces, the New Zealand Weeds Key was very much a team effort. Murray Dawson, the lead developer, and Peter Heenan (both of Landcare Research) collaborated with Paul Champion (NIWA), who provided expertise on aquatic species, and Trevor James (AgResearch). Sheldon Navie (University of Queensland) provided data from similar keys he

has developed in Australia. All five authors provided images for the key with the majority provided by Trevor James. Further illustrations were contributed by the Department of Conservation, Weedbusters, regional authorities, and other New Zealand and overseas contributors. The key is well illustrated with about 9000 images showing a range of features for each plant, e.g., plant form, leaf, floral, fruit and seed characteristics. Only 11 taxa currently lack images and these will be added when they become available.

The plant names follow the Landcare Research Ngā Tipu o Aotearoa – New Zealand Plants databases (http://nzflora.landcareresearch.co.nz). There are several cases where the taxonomic names used in the new key are more recent than those listed in the NPPA Manual (2008) and the Department of Conservation list of environmental weeds (Howell, 2008). These recent names are recorded within the key with synonyms (older names) in brackets and in comparison tables linking from the home page.

The names in the Weeds Key are linked to related websites such as the New Zealand Plants databases, MAF Biosecurity New Zealand (www.biosecurity.govt.nz), and Weedbusters New Zealand (www.weedbusters.co.nz), all of which provide further information on the plants.

A new feature also allows the user to retrieve lists of NPPA species and environmental weeds, and the suffixes 'NPPA' and 'EW', respectively, have been added to the names of these plants within the key.

The new interactive key to the weed species of New Zealand is a unique and extensive resource. It is a powerful tool that makes it easy to identify weedy plants without having to learn all of the complex botanical terminology.

How to use Lucid keys

Lucid™ keys have an intuitive interface divided into four panes (Fig. 2). The left-hand panes are features (characters and character states used in the key) and the right-hand panes are the entities (all taxa included in the key such as species and subspecies).

On start-up, the top left-hand pane displays a complete list of 'Features Available' and the top right-hand pane shows all the entities in the key. Features in particular are organised in a file directory structure that you can open and close individually (or all at once).

As you start using the key, the character states that you choose appear in the 'Features Chosen' (bottom left) pane and the taxa that lack these features appear in the 'Entities Discarded' (bottom right) pane.

Say for example that you had a sample of gorse (*Ulex europaeus*) that you wanted to identify using the Weeds Key (most New Zealanders would immediately recognise gorse anyway but the principle of using the key is the same). Based on the features you can see on the sample in front of you, you can select from 216 character states (grouped into 48 characters) scored for the more than 500 entities in this key. For gorse, the character state for 'Plant Form' is 'Shrub' and the character state for 'Stem Prickles' is 'Present'. Scoring these two character states takes you down to 28 'Entities Remaining'. If your sample was in flower, you could choose 'Flower Colour' as 'Yellow' (with 11 entities

[1] Landcare Research, PO Box 40, Lincoln 7640, New Zealand; dawsonm@landcareresearch.co.nz
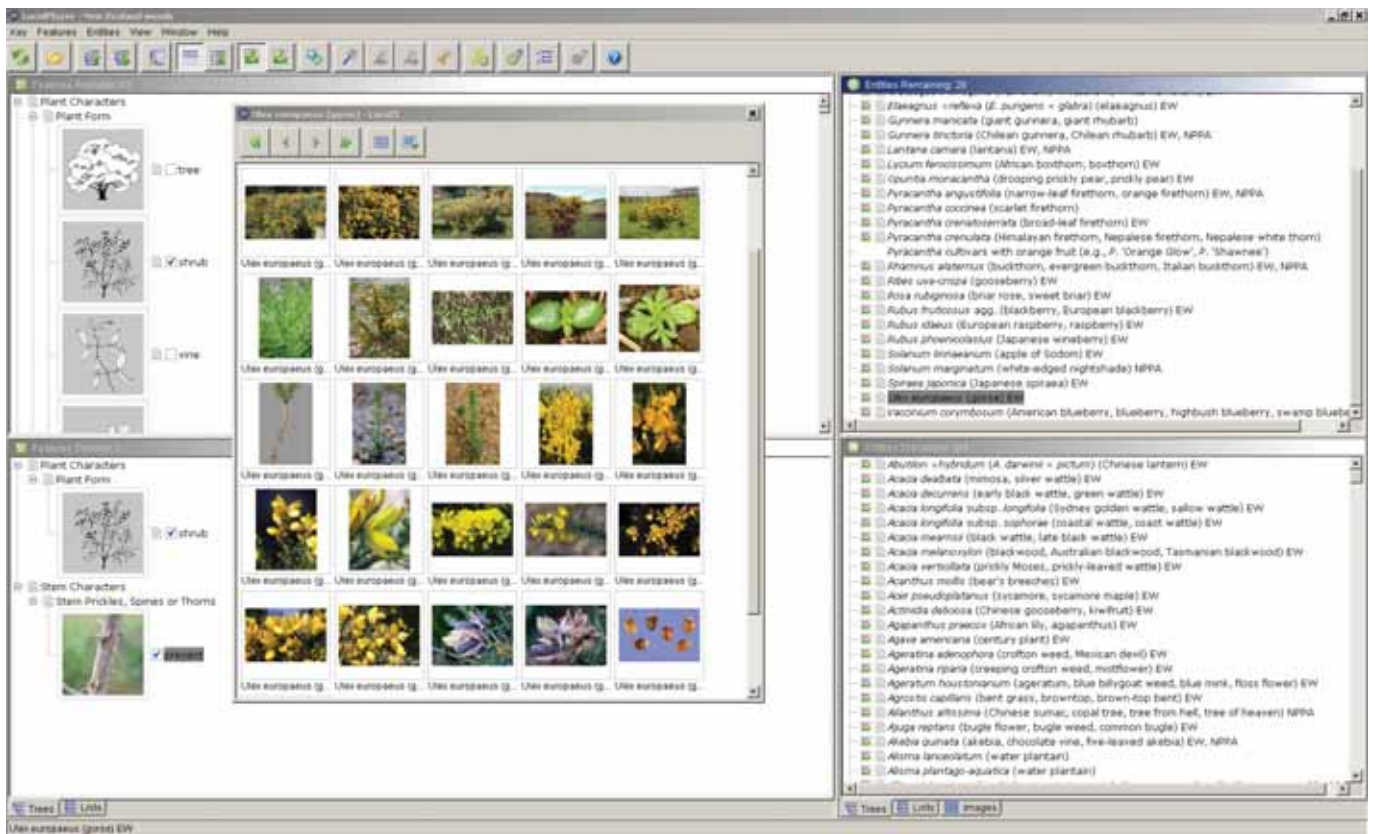
Fig. 2 Screen shot of the new weeds key. Image: Murray Dawson.

remaining) or 'Flower Type' as 'Pea-shaped' which would give you the correct identification.

You are not limited to these features or this order of entering them. Lucid™ keys are multi-access so you can select whatever features you like anywhere within the key. These keys are also fault tolerant – misinterpreted features (characters that are easily mistaken) can be accommodated.

At any stage of the identification process, you can view images for each entity in a separate (pop-up) window (Fig. 2, inset). There are several other features to these keys, such as a 'Best' button (which takes you to the most discriminating characters) and manual discard (to drag-and-drop taxa from the 'Entities Remaining' to the 'Entities Discarded' panes where it is obvious that they are not the plant that you are identifying).

Once these basics are understood, the keys are very easy and fun to use.

Other interactive keys

Other online interactive keys to plants of New Zealand have been developed at Landcare Research – all are free to use and are based on Lucid™ software (developed by the Centre for Biological Information Technology (CBIT) at the University of Queensland in Australia). Most were funded by the Terrestrial and Freshwater Biodiversity Information System (TFBIS) Programme.

Fig. 3 *Hierochloe novae-zelandiae* (alpine holy grass) – icon used for the grass key. Image: Kerry Ford.

A key to more than 400 New Zealand native and naturalised grass species and hybrids (Fig. 3) was completed in July 2008 (Dawson and Ford, 2007). This key (http://tinyurl.com/grasskey) was developed by Kerry Ford and

David Glenny (of Landcare Research) and Trevor James (AgResearch). Because grasses are difficult to identify and have specialised terminology and characters to distinguish and describe them, this is probably the most technical key developed at Landcare Research. This key draws upon the information published in the grass flora (Edgar and Connor, 2000).

Fig. 4 *Metrosideros umbellata* (southern rata) – icon used for the native plants of schools and marae key. Image: Ellex Stewart.

A key to 61 native plants of schools and marae in New Zealand (http://tinyurl.com/schoolkey) was made available in April 2010. This key (Fig. 4) was developed by Ellex

Stewart while she was based at Landcare Research and funded by a New Zealand Science, Mathematics and Technology Teacher Fellowship. Plants in this key include trees, shrubs, ferns, grasses and flaxes common to schools and marae throughout New Zealand. Because it was developed as a teaching resource, this key is particularly easy to use and probably the best one to provide an introduction to the other keys.

A key to 65 native *Coprosma* (http://tinyurl.com/coprosmakey) was completed in June 2010 by David Glenny and Jane Cruickshank (of Landcare Research) and Jeremy Rolfe (Department of Conservation). This key (Fig. 5) includes a glossary and fact-sheets to a genus that can be difficult to identify using traditional printed floras and guidebooks.

Fig. 5 *Coprosma acerosa* (sand coprosma) – icon used for the *Coprosma* key. Image: David Glenny.

Two further keys are currently under development.

Murray Dawson, Jeremy Rolfe, and the New Zealand Native Orchid Group have started work on a key to the New Zealand native orchids – a family of more than 120 difficult-to-identify plants with high conservation values. This key is scheduled for completion in May 2013.

A team led by David Glenny is working on a genus-level key to native and naturalised flowering plants in New Zealand. Covering more than 1100 genera, this is the largest key being developed so far for New Zealand. Completion is scheduled for June 2013.

In addition to these Landcare Research initiated keys, Chris Ecroyd (recently retired curator of the National Forestry Herbarium, Scion, Rotorua) has produced a key to cultivated pines. His latest version was uploaded in March 2011 and includes 91 *Pinus* species (www.scionresearch.com/latest_pine_key).

This is an impressive collection of plant identification resources considering that there were no widely available interactive keys for New Zealand plants prior to three years ago. We are also fortunate that they are all free to use – give them a go!

References

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