Biological collections information applied for conservation farming: "Greening the Grainbelt"

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Key messages

- Plant species lists for revegetation programs can be developed from existing biological collections.
- The floristic composition of the original native vegetation can be reconstructed using various data sources.
- Collaboration between community groups and scientific organisations is valuable and productive.

Introduction

Collaboration between the Harden Murrumburrah Landcare Group (HMLG) and the Centre for Plant Biodiversity Research (CPBR) began in 1999 when the Centre provided botanical guidance for revegetating portions of the Harden Shire with native plants. The focus was to make available information on plants known to be native to the region, providing a recommended list of species for revegetation, annotated with ecological requirements and cultivation notes.

Background

This project followed previous studies that revealed only 2.8% remnant vegetation cover. The loss of local knowledge of the original native vegetation meant that species lists for planting had to be constructed from a range of archival, historical and scientific sources, as well as expert knowledge. With so little remaining natural vegetation, ground truthing of species occurrence is not an option.

Developing a picture of the composition of the vegetation of the Harden Shire, and the establishment of scientifically defensible environmentally compatible planting lists can serve as a model for other Australian Landcare groups and encourage the community to reverse long term decline of native vegetation.

Methodology

The primary data source for the project was the collections of the Australian National Herbarium (ANH), capitalising on the up-to-date curation, accuracy of identification and geocode, and computerised information from each specimen related to the study area.

Since the late 1990's was early stages in the use of biological collections data for applications such as reconstructing the original flora of any particular region, the project developed a methodology centred around ecogeographic surveys – a process of gathering and synthesising taxonomic, geographic and ecological data.

Various definitions of the target region were delimited during the project in order to include different habitat types and broader or more limited suites of species. Supporting documentation was identified for validating taxa and providing ecological, cultivation, and weed designation information.

Throughout the project local knowledge was incorporated into the analysis and specialists such as botanists, taxonomists, horticulturalists and weed experts were also consulted widely, and enhanced annotation of the species list.

The specimen database of the ANH was interrogated for plant records from the Harden Murrumburrah Landcare area, the searches based on geographic coordinates and locality names to create the base taxon list. Other taxa were added to the list from literature sources, research projects such as the white box woodland studies with known species lists, and specimen information relating to associated species.

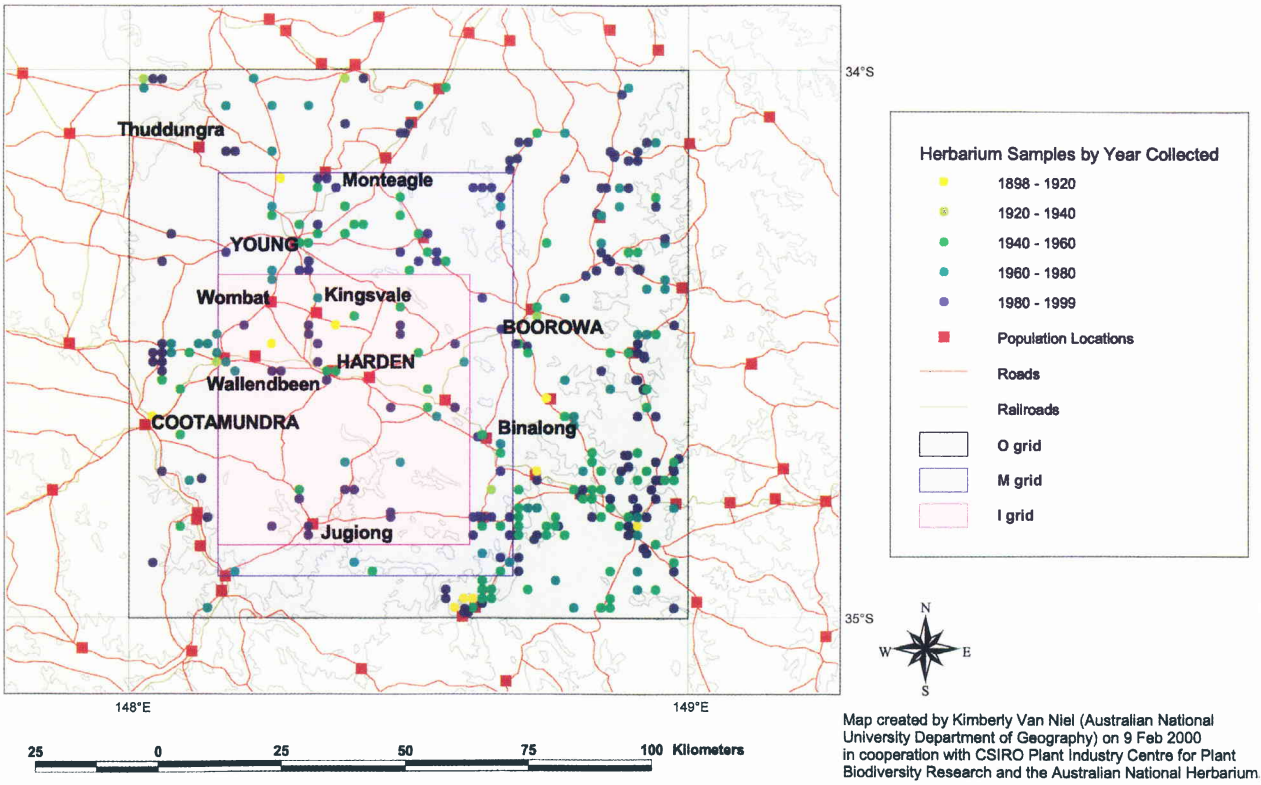
Herbarium Data

A search of herbarium data in a one-degree grid square around Harden produced an initial taxon list. Two smaller grids captured areas that were most representative of Harden's biophysical and edaphic characteristics. We further narrowed the search, based on landholders' advice, by removing specimens collected in hilly areas not representative of the immediate Harden region. The final inner grid was designed to capture only the Harden Shire.

Herbarium records from the three grids provided the majority of the species listed, which numbered approx. 500 taxa. Following removal of any species considered to be a weed, 400 taxa formed the "Plant Species List".

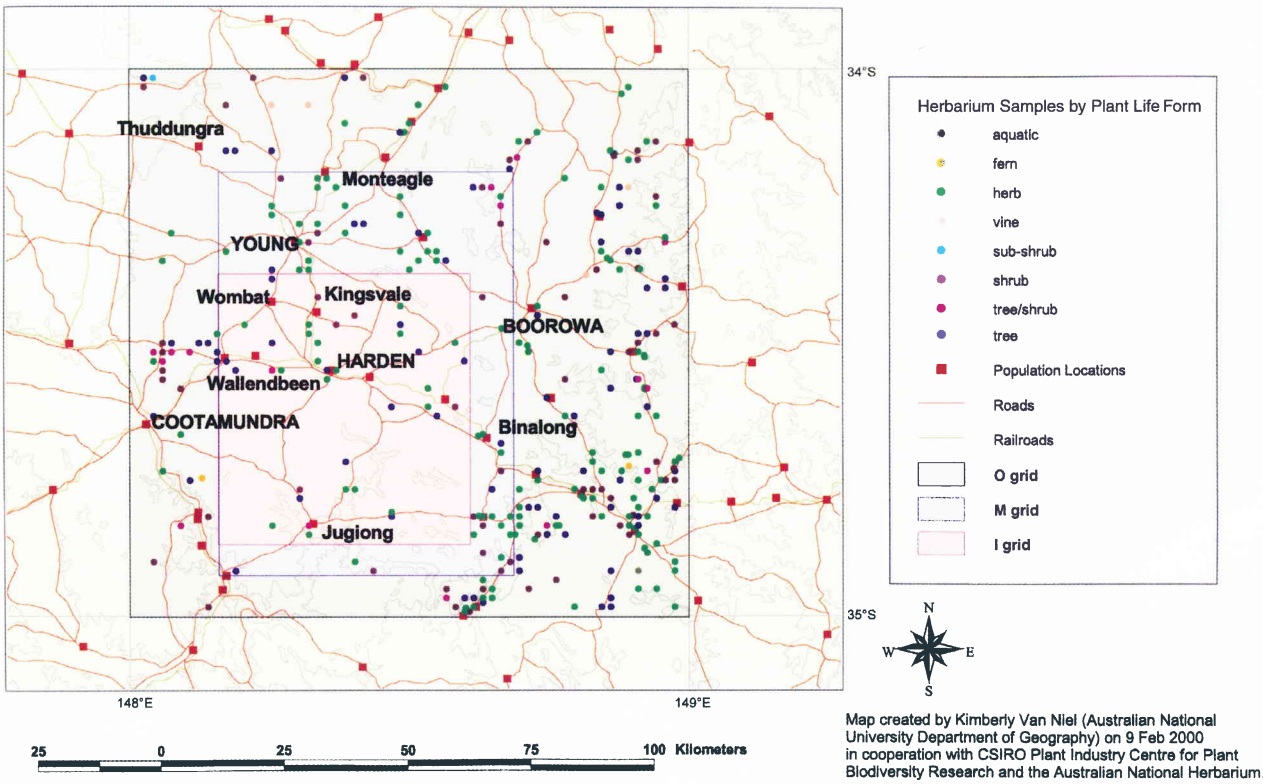
The maps show the grids and herbarium specimen locations. These maps indicate the distribution of ANH specimen locations by time of collection and by plant life form. In each case the outer grid (O grid) represents the collections in the broader region sampled; the middle-sized grid (M grid) defines an area most representative of the biophysical features; the innermost grid represents the boundaries of the Harden Shire (I grid).

Collection Dates of Samples in the Australian National Herbarium



Map created by Kimberly Van Niel (Australian National University Department of Geography) on 9 Feb 2000 in cooperation with CSIRO Plant Industry Centre for Plant Biodiversity Research and the Australian National Herbarium.

Plant Growth Life Form of Samples in the Australian National Herbarium



Map created by Kimberly Van Niel (Australian National University Department of Geography) on 9 Feb 2000 in cooperation with CSIRO Plant Industry Centre for Plant Biodiversity Research and the Australian National Herbarium.

Expert Knowledge

The species list was supplemented with common name, form, habitat, soil type, associated species, available cultivation information, and any special notes of interest, such as toxicity, from a variety of literature sources and ANH specimen data.

The development of the species lists underwent many iterations and incorporation of data from many sources including local knowledge and cooperation and input from landowners and experts familiar with the region. Members of the HMLG were especially helpful in annotating the species list, providing locally relevant common names, and building on previous landcare experience.

Supporting Literature

To supplement and verify the species list, local research, published literature and local reports were used. Prober's published studies of remnant areas on the western slopes (Prober 1996), Hudson's (pers.comm.) surveys of roadside vegetation in Young Shire, the Olympic Highway Roadside Vegetation Assessment and Management Guidelines (Stelling 1996), and the Binalong Landcare Report (Brown et al. 1997) were all compared against the taxon list derived from ANH's database for verification and addition of any other taxa.

Species List Collation

The resultant list of approx. 400 species is available as a searchable on-line database, as well as a spreadsheet. This scientifically defensible list is the major output of the project. It is available for HMLG and others to use for vegetation regeneration. Landcare groups in the region continue to use the list. The list is annotated to indicate:

- the part of the landscape from which the species was originally found, including:
  - the vegetation community and habitat;
  - the soils in which it grows; and
  - other species associated with it.
- information relating to cultivation and ecological requirements of the listed species, including:
  - notes about propagation and transplanting;
  - landform type recommended for planting;
  - the layer of the vegetation community in which the species will grow; and
  - recommended stage of planting.

The source of the information by which the species is included in the list is provided. These are primarily the three grids defined to interrogate the ANHSIR database of the Australian National Herbarium – O grid, M grid and I grid – or literature or expertise consulted during the project.

Outcomes

This collaboration between the HMLG and the CPBR generated benefits well beyond those originally anticipated. The following summarises the main outcomes of the project:

***Greening the Grainbelt* Website** containing the species database in an interactive spreadsheet form. http://www.cpbr.gov.au/greening-grainbelt/index.html

Greater diversity of plantings is encouraged through provision of a broad selection of species for any given land type. A wide selection of species may also avoid plants becoming vulnerable to disease or insect attack.

Provides the reference point for selection of species for majority of plantings undertaken by the HMLG and extending to other regions in the Southwest Slopes.

Enhanced awareness of the community as to the vegetation of the Harden Murrumburrah region prior to European settlement

Enhanced community awareness of current biodiversity, conservation and revegetation issues

Empowerment of the Landcare group to research information needed to develop revegetation programs.

Increased understanding of scientists of needs and knowledgebase of community groups

Clear demonstration of the utility of herbarium specimen data in environmental planning and biodiversity conservation

A practical and transferable methodology for the use of herbarium resources and associated data in land-use planning and land-use management.

The success of this small project stimulated the Federal and State/Territory Governments to support the databasing of the collections in the main Australian herbaria. Ten years on, the herbarium specimens collected in Australia from each herbarium are now available electronically via *Australia's Virtual Herbarium* (AVH), so that any user has access to information for c. 6.5 million specimens on-line. http://www.chah.gov.au/avh/.

Conclusions

This project was an outstanding example of collaboration between a community group and a scientific institution. Both partners benefited by working together, particularly in sharing data in a form appropriate for developing revegetation and restoration programs.

This was one of the very first projects world-wide demonstrating the use of herbarium data to develop a view of past vegetation communities, and particularly the vegetation that once occupied the Harden region. Admittedly with only 2.8% of the natural vegetation remaining in the area, it is not possible to accurately verify the results on the ground, but compatibility with the surrounding region and past historical data corroborate the findings.

> River Bottlebrush (*Callistemon sieberi*) from the Myrtaceae family, one of the species recommended for revegetation programs.

Future potential

In the past three years other studies have used biological collections data to select appropriate species for revegetation. With Australia's herbarium records available on-line, data are accessible for large scale analyses applied to issues such as conservation planning in changing environments.

With further advances in analytical packages and modelling it is now possible to improve revegetation outcomes by providing innovative tools for the selection of key species used for revegetation, stewardship and restoration programs, and could be applied in communities such as box gum woodlands of the Lachlan and Murrumbidgee catchments.

Interactive web-based tools can assist landholders selecting plant species for revegetation using environmental and climate change modelling, identifying the best conditions for each species, under current and predicted future climates. This would enhance biodiversity values of future landscapes and develop strategies to ensure survival and sustainability of revegetated areas. On-line communication will enable practitioners to provide feedback to an ever increasing information resource based on real local knowledge, enabling participants to learn from others.

Acknowledgements

The CPBR Botanical Interns of 2000 produced much of the species list from ANHSIR and herbarium specimens. CPBR staff assisted with the project, especially Pennie Hohnen, Anthony Whalen, Murray Fagg, Jim Croft and Bob Makinson.

Special thanks are due to our HMLG partners, particularly to the Coordinator Louise Hufton for her drive and for facilitating interactions with other Landcare activists and farmers. Dick Littlejohn (Harden Murrumburrah Historical Society), Bindi Vanzella (Greening Australia, Wagga) and Ben Stocks (nurseryman) provided local knowledge and input to the species list. Finally, we thank the farmers who spent their time with us and whose knowledge and commitment to Landcare was helpful and impressive.

Futher reading

Brown, N. et al. (1997) Binalong Landcare Report, Department of Land and Water Conservation.

Hudson, K. (2000) Roadside plant species lists, part of Superb Parrot project, Young Shire Council. (unpublished report).

Prober, S.M. (1996) Conservation of the Grassy White Box Woodlands: range wide floristic variation and implications for reserve design. *Australian Journal of Botany* 43: 349-366.

Stelling, F. (1996) Olympic Highway Roadside Vegetation Assessment and Management Guidelines, Olympic Highway Committee.