Genes rescue grasslands

THERE has been growing recognition of the benefits farmers can achieve from preserving areas of native biodiversity around their properties.

These areas can be habitats for pollinators of crops, a source of predators that help control crop pests and contain deep-rooted vegetation which is important for salinity control.

An example of a biodiversity region at risk is Australia's temperate grasslands.

Formerly widespread, it is believed only one per cent of their pre-European extent remains in moderate to good condition. Species in the temperate grasslands are under threat from habitat loss and fragmentation.

In most cases, the temperate grasslands have been replaced with grazing pastures, with most of the remaining fragments located on private land.

Recent research by CSIRO shows temperate grassland species are struggling to survive because plants can't make enough seed for the population to persist.

This isn't because of a lack of pollinators, poor flowering or drought, but because plants in small populations are related to each other.

CSIRO researchers have examined a perennial forb species native to the temperate grassland and native woodlands of south-eastern Australia in an effort to discover the role of genetic factors in species decline and extinction.

The species they studied, *Rutidosis leptorrhynchoides*, is now restricted to only 20 populations, and most of these have fewer than 1000 plants.

This species, like many others in the remaining temperate grasslands, has a single gene that controls mating, known as the self-incompatibility (SI) gene.

This SI gene system links genetic diversity with reproduction.

If the pollen of a plant lands on its own female parts or another plant with the same SI gene, viable seed will not be produced. This is an evolutionary mechanism to prevent inbreeding.

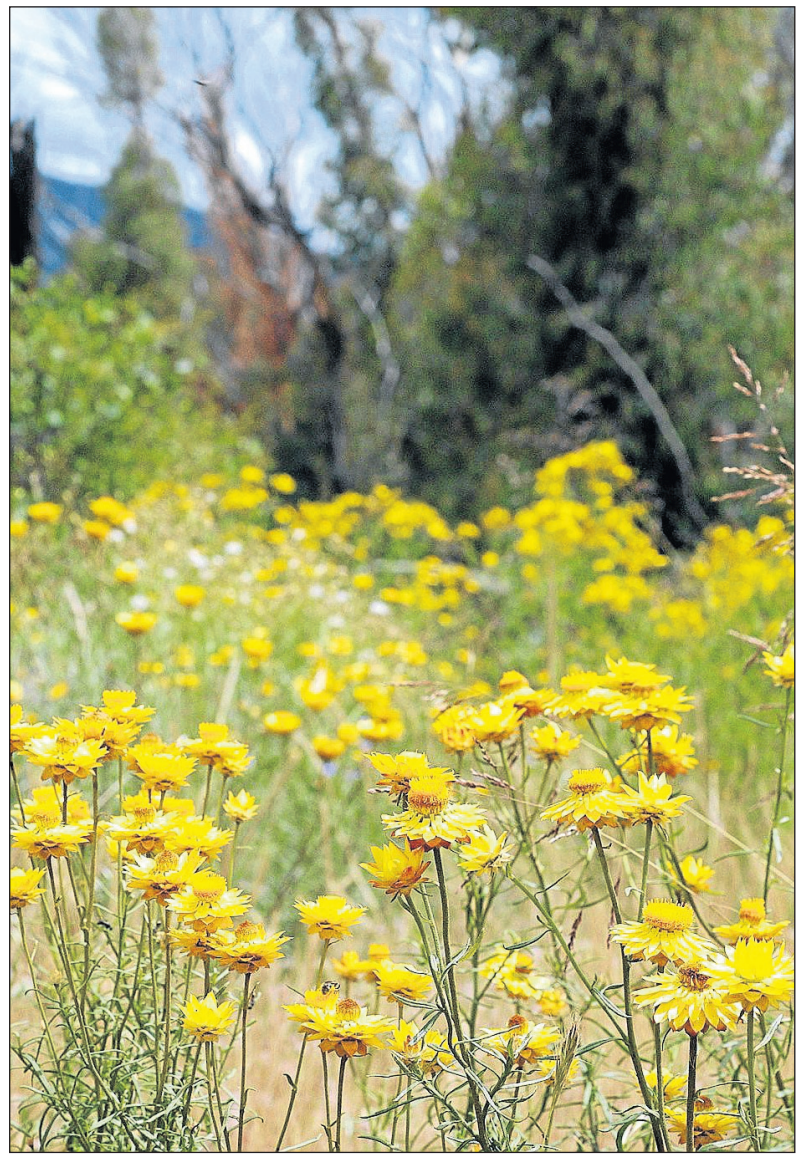
The researchers found small populations (less than 200 plants) had very low levels of genetic variation for the SI gene, meaning plants had very few genetically-compatible mates.

For this reason, these small populations only make about 20 per cent of the seed that big, genetically diverse areas do.

Population simulation models suggest these small populations are much more likely to go extinct in the next 50 years.

Scientists have used these population simulation models to show that adding new genetic material to small populations can rescue them from extinction.

Based on these results, a genetic rescue study was conducted in 2009 to pollinate plants in small populations with flowers taken from large, genetically-viable sites. Results showed a significant increase in seed set, back to healthy levels.



CSIRO scientists aim to rescue Australia's endangered temperate grasslands.
Photo: Carl Davies, CSIRO Plant Industry

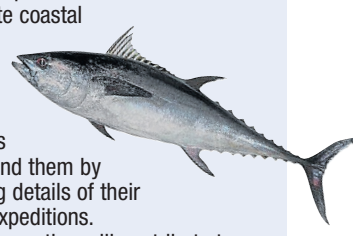
CSIRO scientists are now working with the NSW National Parks and Wildlife Service to develop a genetic management plan for the species.

By maintaining areas of functional biodiversity in combination with practices that maximise production benefits, farmers can manage landscapes into the future to achieve the twin goals of sustainable agricultural production and long-term conservation of Australia's unique biodiversity.

Clever Science

Rec fishers help scientists:

Recreational fishers who catch longtail tuna in tropical and temperate coastal waters of Australia can help scientists understand them by recording details of their fishing expeditions.



The information will contribute to scientific assessments of the condition of the longtail tuna population by the CSIRO Wealth from Oceans Flagship and help to ensure their sustainability.

■ Visit www.longtailtuna.com.au

Modelling for conservation:

Dr Simon Ferrier is developing and applying new approaches to modelling the spatial distribution of biodiversity across extensive regions.

He is doing this by linking recorded locations of large numbers of species to remotely mapped environmental attributes (climate, terrain, soils, landcover).

He then uses these models to help forecast, and plan responses to, the impacts of global change on biodiversity across these regions.

Environmental stewardship:

What are the principles that should be used when comparing opportunities to invest in biodiversity at a particular location?

CSIRO economists are providing science advice to the Australian Government's Environmental Stewardship program.

This program helps land managers care for biodiversity assets, such as box gum grassy woodlands, on private lands.

Climate and biodiversity:

Species and ecosystems will face considerable pressures under future projected climates, leading to new challenges for conserving biodiversity and ecosystem services.

Protected areas will continue to play a critical role in conservation, however greater focus will be needed on a "whole of landscape" approach.

CSIRO, building on research on the implications of climate change for Australia's National Reserve System, is carrying out detailed analyses in four priority biomes: northern savannah grasslands, south-east Australian sclerophyll forests, hummock grasslands of Central Australia and temperate lowland grassy ecosystems.

■ Visit www.csiro.au/science/Managing-Species-Ecosystems

The atlas of living Australia: biological info online

The Atlas of Living Australia will provide a single online link to Australia's biological collections.
Photo by Carl Davies, CSIRO Plant Industry.

AUSTRALIA'S unique fauna and flora have long fascinated scientists and community groups.

As a result, an immense amount of data has been collected, much of which is scattered in collections across Australia and is difficult to access.

In order to preserve our biodiversity, the information on what is here, where it is and what is happening to it needs to be easily accessible.

The Atlas of Living Australia (ALA) was set up in response to this need.

It will provide a single online link to Australia's biological collections and associated information and will include a Citizen Science portal.

The end result will be a trustworthy source of biodiversity data that will underpin management of our diverse ecosystems, help in land use planning and be a valuable tool in dealing with biosecurity issues.

The ALA will also be able to identify species at risk from climate change and so help ensure their survival.

This collaboration involving CSIRO, State museums, universities, government departments and the Council of Heads of many of Australia's biological collection groups is funded under the Australian Government's National Collaborative Research Infrastructure Strategy.

■ Find out more about the ALA at www.ala.org.au

CSIRO Key Contacts Biodiversity

Professor Iain Gordon

Theme Leader, Building Resilient Australian Biodiversity Assets

Iain leads CSIRO's biodiversity research that aims to provide the data, tools and integrated knowledge to underpin a collective national effort to halt biodiversity decline in Australia by 2020 and reverse this decline by 2035.

Donald Hobern

Director, the Atlas of Living Australia

Donald leads a large collaborative group developing the Atlas of Living Australia, an online encyclopaedia of Australian biodiversity. It will support research, education and decision making on issues such as biosecurity, global change management and conservation.

Dr John La Salle

Head, Australian National Insect Collection

John is working towards developing CSIRO's Australian National Biological Collections as dynamic online resources, which make the information held in the collections freely available to a wide user community for a variety of purposes including research and policy making.

Dr Andrew Young

Stream Leader, Biodiversity and Sustainable Agriculture research program, CSIRO Plant Industry

Andrew's research combines genetic and ecological approaches to understanding the viability of native plant populations in disturbed environments, focusing on the management of remnant native vegetation in agricultural landscapes.

Dr Stuart Whitten

Research economist, CSIRO Sustainable Ecosystems

Stuart leads a policy-oriented team that specialises in designing and implementing metrics and incentive mechanisms for biodiversity. These help improve the effectiveness of investments to conserve and manage natural resources and biodiversity.

Dr Nic Bax

Research scientist, CSIRO Wealth from Oceans Flagship

Nic applies his expertise in marine resource assessment to help understand, manage and conserve Australia's marine biodiversity. He leads research on the distribution and ecology of marine habitats, fish populations, food webs and invasive species.

■ For more information about CSIRO's biodiversity research portfolio, contact Julie Carter, CSIRO Entomology, (02) 6246 4040, julie.carter@csiro.au. For general inquires about *CSIRO Supporting Rural Industry*, contact Lisa Palu CSIRO Livestock Industries, (07) 3214 2960 lisa.palu@csiro.au