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Profile - Project

Fire, fragmentation and conservation in the western wheat belt

Researchers with CSIRO and Western Australia's Department of Environment and Conservation (DEC) are studying the impact of fire and fragmentation on regional plant diversity.

Patterns of fire
Fire frequency
Studying fire for conservation

Native vegetation across parts of Western Australia has been cleared for agriculture. Photo by Mr Glen Ryan.

A three-year CSIRO-DEC project is focusing on the impact of fire and fragmentation on native plant communities, with a view to finding ways to better manage fire for biodiversity conservation.

The Western Australian (WA) wheat belt, in the south-west of the state is part of a globally recognised biodiversity 'hotspot' for its unique and diverse plant communities.

However, native vegetation across large parts of the region has been cleared for agriculture.

The subsequent fragmentation of vegetation poses significant threats to plant diversity in the region.

These interacting threats include:

- weed invasion
- changing environment
- altered species interactions (such as pollination and seed predation)
- changes in fire regimes.

PATTERNS OF FIRE

The WA wheat belt has experienced a long history of fires, such that many regional plant species possess traits that enable them to persist and prosper in a fire-prone environment.

However, patterns of fire ignition, spread and suppression may be different in different patches of remnant vegetation, compared with uncleared land.

These different fire regimes are likely to have a substantial impact on plant communities.

FIRE FREQUENCY

Remnant patches often have long intervals between fires. This current fire regime is likely to be very different from the one experienced prior to land clearance, and also to the regimes experienced by the uncleared portions of the landscape.

Having long intervals between fires risks the decline (by a reduction in local population size or local extinction) of plant species that germinate and grow predominantly in a post-fire environment. This occurs if the interval between fires is longer than the life of the plant or seed. Another potential outcome is an ecologically detrimental abundance of fire-susceptible plant species.

Alternatively, fires that are too frequent can cause the decline of plant species, either directly (if fire frequency is less than the juvenile period for species killed by fire), or indirectly, through encouraging weed invasion.

Having long intervals between fires risks the decline (by a reduction in local population size or local extinction) of plant species that germinate and grow predominantly in a post-fire environment... Alternatively, fires that are too frequent can cause the decline of plant species.

STUDYING FIRE FOR CONSERVATION

The CSIRO-DEC study looks at which fire regimes may be beneficial for biodiversity conservation in the WA wheat belt.

Specifically, researchers are:

- mapping recent fire histories across the study area in the southern wheat belt to determine if differences in fire regime, such as fire frequency, season, intensity and extent, are related to remnant size
- determining the upper and lower limits of fire frequency needed to maintain plant community diversity.

This research is jointly supported by CSIRO Sustainable Ecosystems and by the Science Division and the Great Southern District of the WA Department of Environment and Conservation.

Read more about CSIRO's research on Biodiversity & Ecology.

FAST FACTS

The native vegetation in the Western Australian wheat belt has been extensively cleared and fragmented

Vegetation fragments are likely to be experiencing different fire regimes to unfragmented areas, due to different patterns of fire ignition, spread and suppression

Altered fire regimes may affect the diversity and survival of native plant communities by reducing opportunities for germination and growth, causing local population declines or extinctions

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RELATED AREAS

Grains

Bushfires

CSIRO Sustainable Ecosystems

WA Department of Environment and Conservation's Science Division *[external link]*

WA Department of Environment and Conservation's Plant Conservation Research *[external link]*

RELATED TOPICS

Plant conservation and biodiversity

Dr Patrick Smith: integrating conservation and agricultural production

Floreat: Centre for Environment and Life Sciences (CELS) (WA)

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Fire, fragmentation, weeds and the conservation of plant diversity in Wheatbelt Nature Reserves

Summary
The clearance and fragmentation of native vegetation poses significant threats to plant biodiversity. Vegetation remnants can experience different fire regimes from uncleared landscapes, and changes in fire regimes are likely to have substantial impacts on plant communities. Extremes of fire frequency and scale may cause local population declines or even extinctions. Long intervals between fires risk the decline of species that recruit predominately in the post-fire environment if the interval between fires exceeds plant and seed longevity, and/or risk an ecologically dysfunctional abundance of certain fire-susceptible species. Alternatively, fires that are too frequent can also cause species decline, either directly (if fire frequency is less than the juvenile period for species killed by fire), or indirectly, through facilitating weed invasion.

South-western Western Australia (WA) is a globally significant hotspot for plant diversity and endemism. However, the native vegetation of large parts of this region has been extensively cleared for agriculture. Plants in remnants are threatened by a number of interacting processes, such as weed invasion, changing environment, altered species interactions and changes in fire regimes. The WA wheatbelt has historically experienced fires, and many plants possess traits that enable them to persist and prosper in a fire-prone environment. However, many remnants are now characterized by long intervals between fires and may be experiencing a different contemporary fire regime from the regime prior to land clearance and from contemporary regimes in uncleared portions of the landscape. Patterns of fire ignition, spread and suppression are possibly different in wheatbelt vegetation remnants.

It is largely unknown what may constitute an appropriate fire regime for biodiversity conservation in the WA wheatbelt. In this study, we aim to:

1) map recent fire histories across our sample study area of the southern WA wheatbelt to determine if differences in fire regime (fire frequency, season, intensity and extent) are related to remnant size
2) determine the upper and lower limits of temporal variability in fire regimes needed to maintain plant community diversity.

Outcomes
Stay tuned! This project commenced in early 2007 and runs to 2010. We hope to release some preliminary findings by early 2008.

Partners
This research is jointly supported by the WA Department of Environment and Conservation (DEC) and CSIRO Sustainable Ecosystems. We are collaborating with staff in both the Science Division and Narrogin Region of DEC.

Fast facts:

- The native vegetation in the Western Australian wheatbelt has been extensively cleared and fragmented
- Remaining fragments are likely to be experiencing different fire regimes to unfragmented areas, due to different patterns of fire ignition, spread and suppression
- Altered fire regimes may significantly affect plant communities, *e.g.* reducing opportunities for recruitment and leading to local population declines or extinctions

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Links: Science Division (DEC)
http://www.naturebase.net/content/view/2475/1338/
Plant Conservation Research (DEC)
http://www.naturebase.net/content/view/2470/1332/

Dead *Banksia baueri* (Woolly Banksia) in long-unburnt heath

Increasing abundance of *Allocasuarina huegeliana* (Rock Sheoak) in long-unburnt heath