



Tiwi Burning: fire and carbon on the Tiwi Islands



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Further information

Ms Kate Hadden

Secretary – Land and Resources
Tiwi Land Council
Phone: 08 8944 8416
Email: tiwilcnrm@bigpond.com

Prof Alan Andersen

Chief Research Scientist
CSIRO Ecosystem Sciences
Phone: 08 8944 8431
Email: Alan.Andersen@csiro.au

Cover images

From left Desmond Bruppacher (Tiwi Land Ranger) lighting experimental fires, and Willie Rioli (Tiwi Land Ranger mentor and supervisor) collecting litter samples with Kieran Apuatimi and Anthony Farmer (Tiwi College) and Anna Richards (CSIRO).

Production and artwork

Production: Barbara McKaige.

Original painting for cover banner: Sheila Puruntatameri.

Design and layout: First Class in Graphic Design, Darwin.





Introduction

This is an information book for Tiwi people about how fire increases the Greenhouse effect, and how reduced burning can benefit Tiwi people. It is based on work done by the Tiwi Land Council and CSIRO over the past 5 years as part of the Tiwi Carbon Study.

Looking after the country with the right fires will:

- Help keep more carbon stored on Tiwi land;
- Potentially earn money for Tiwi people; and
- Keep the country healthy for future generations.



Tiwi Land Ranger, Leon Puruntatameri, lighting experimental fires on Melville Island as part of the Tiwi Carbon Study.



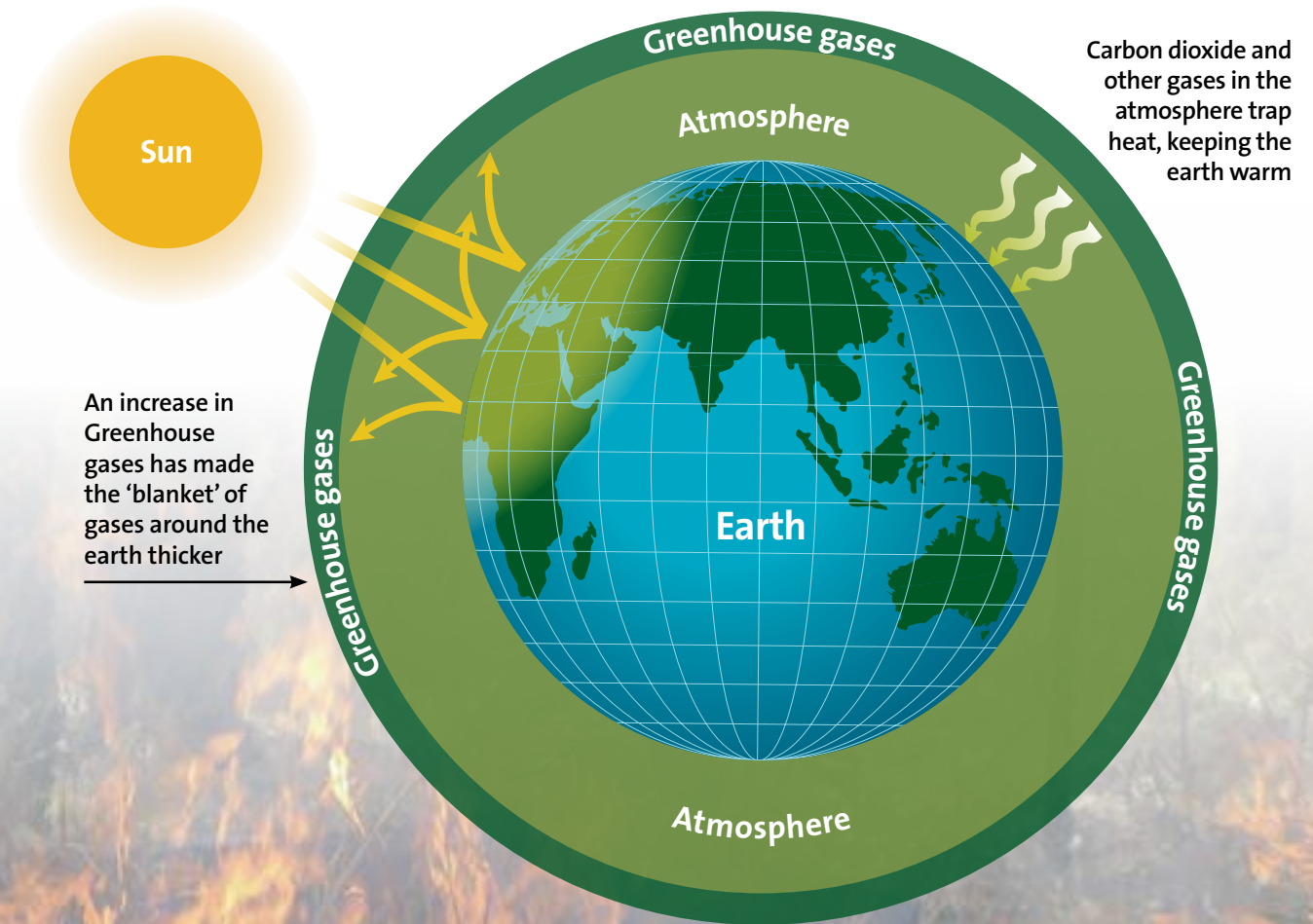
“Tiwi people have always understood and cared for country – but now we need to use new knowledge because the world around us is changing.”

– Willie Rioli, Tiwi Land Ranger mentor and supervisor

The Greenhouse effect

The Greenhouse effect is a natural process where gases in the air act like a blanket around the earth. This 'blanket' holds in heat from the sun. It keeps the Earth at a good temperature to support life.

The main gas that makes up this 'blanket' is carbon dioxide, but methane and nitrous oxide are also important. These are called Greenhouse gases.



People's activities over the past two hundred years have put many more Greenhouse gases into the air than there should be. This is mostly from burning of fossil fuels like oil, petrol and diesel that contain carbon. This has made the Earth's 'blanket' thicker and so the Earth's climate is starting to get warmer. This is called global warming.

Most scientists agree that global warming is changing our climate. It is changing the rainfall patterns and making more storms and more very hot days. Scientists think that over time climate change will make it harder for people to grow food and to live safely on their country. They also think that it will make it harder for all the different types of plants and animals to survive in the future.

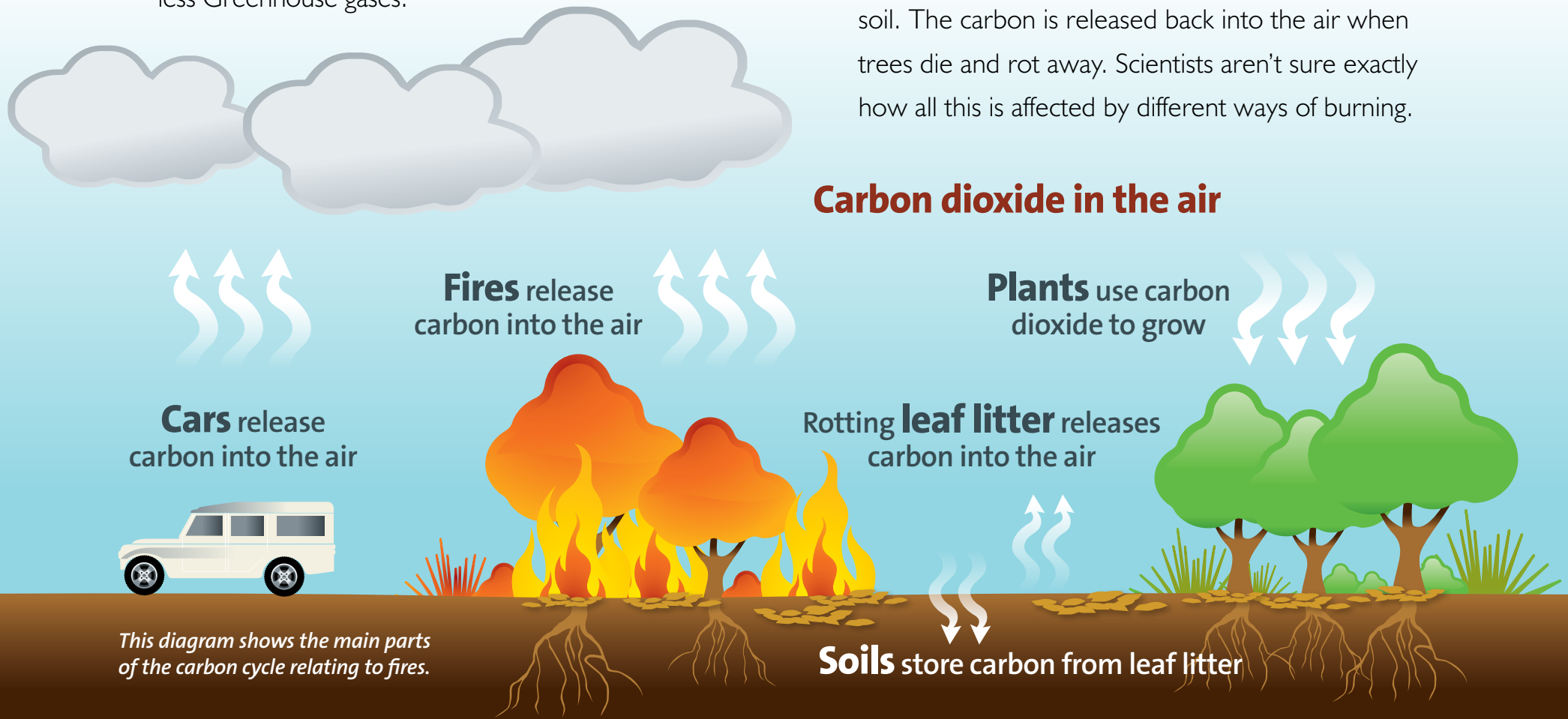
Fire makes gases that add to the Greenhouse effect.

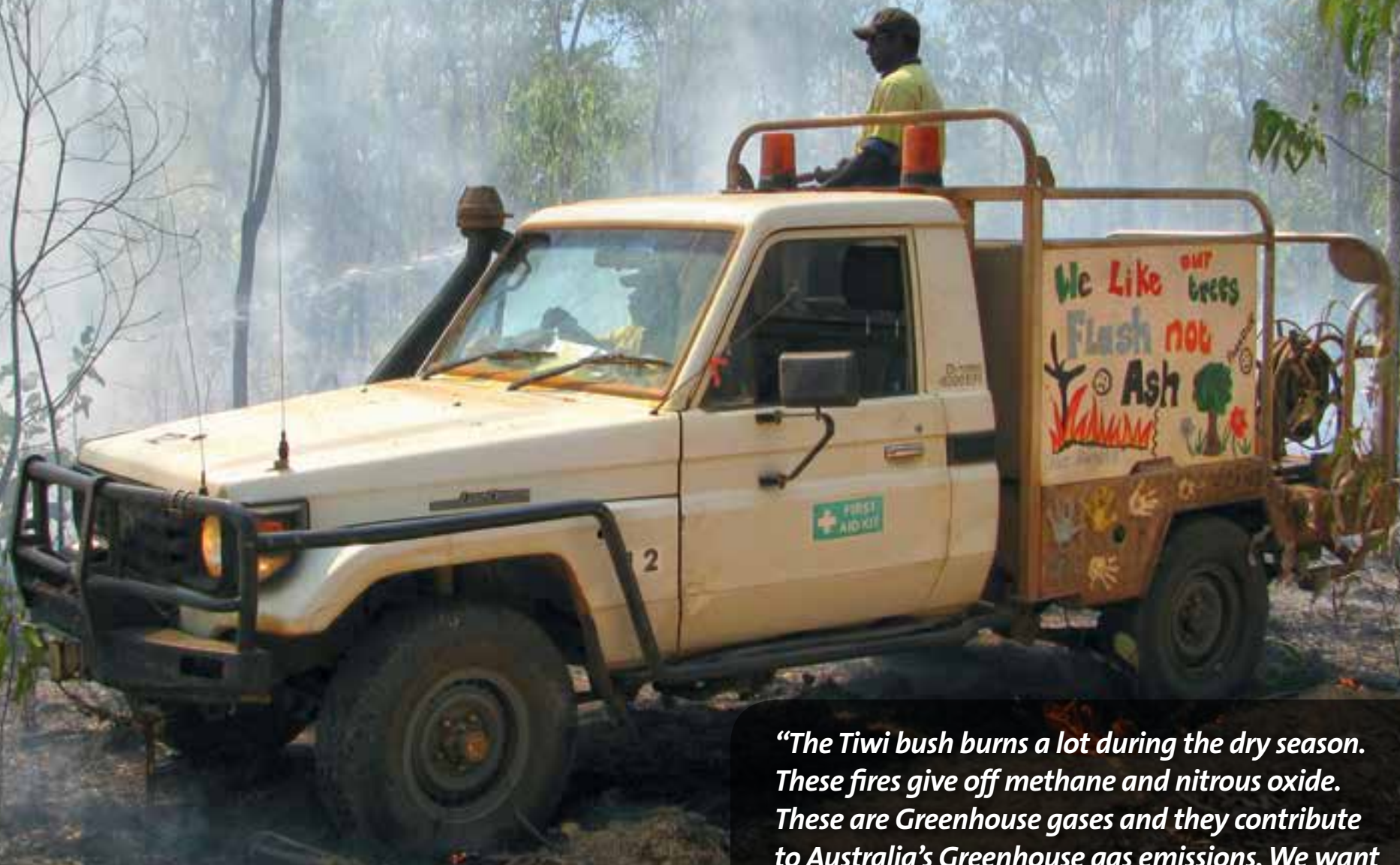


Fire and Greenhouse gases

Fire changes the amount of Greenhouse gas in the atmosphere in two ways:

1. Burning gives off methane and nitrous oxide – these are important Greenhouse gases. Less burning means less Greenhouse gases.
2. Burning can change the amount of carbon stored in plants and in the soil. Plants take carbon from the air through a process called photosynthesis. A lot of this carbon makes the wood in trees. Some of it ends up on the ground as organic matter in the soil. The carbon is released back into the air when trees die and rot away. Scientists aren't sure exactly how all this is affected by different ways of burning.





“The Tiwi bush burns a lot during the dry season. These fires give off methane and nitrous oxide. These are Greenhouse gases and they contribute to Australia’s Greenhouse gas emissions. We want to cut back those Greenhouse gases and get more carbon stored in the soil and plants. In the future this could earn us money as a carbon offset project.”

— Willie Rioli

Tiwi Carbon Study Research Site



PLEASE DO NOT BURN

Naki ngawa ngapamurumi – ngajirti yikwani awungara

For information:
Free Call 1800 622 001

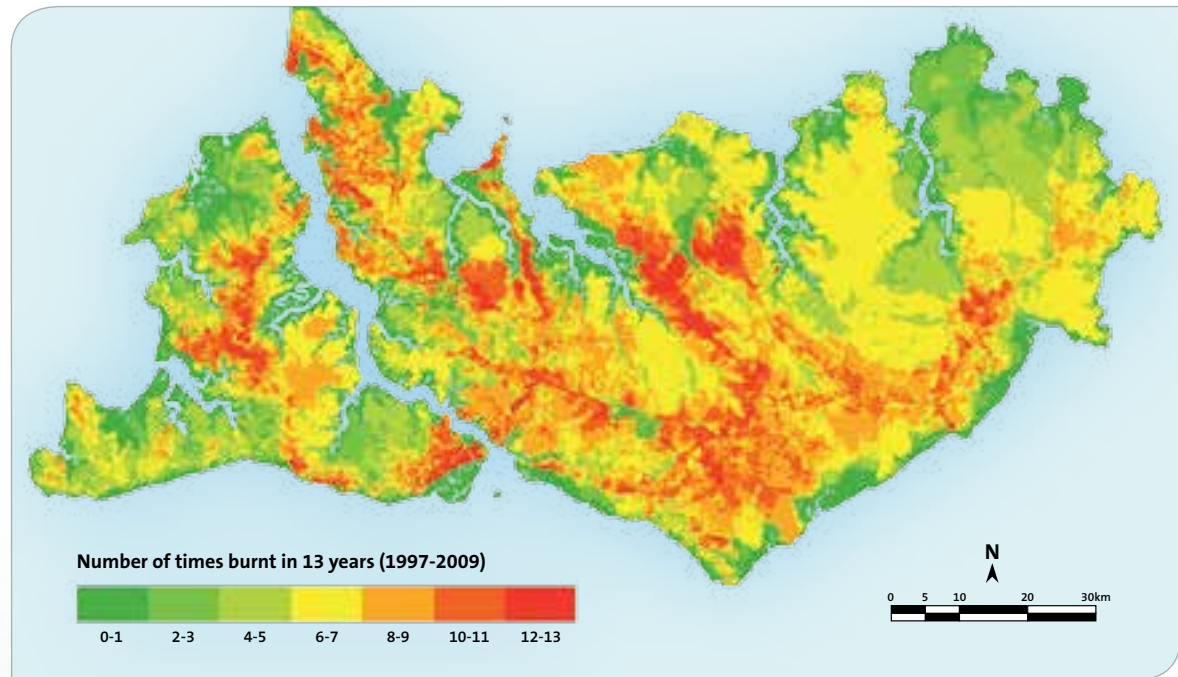


GREAT SOUTHERN
FARMERS RT Pty Ltd

There is an opportunity for Tiwi people to earn money by reducing the amount of Greenhouse gases that are released into the air.

The Tiwi Carbon Study

The Tiwi Land Council and CSIRO are working together to work out how much burning is happening on the Tiwi islands, how much Greenhouse gas is produced, and how changing the way people burn can affect the amount of carbon stored in the plants and soil. This information will be used to develop a fire management programme that could provide job opportunities in land management for Tiwi people, while looking after the special plants and animals that live on the Tiwi Islands.



This map shows the number of times areas on the Tiwi Islands have been burnt over 13 years – from 1997 to 2009. The areas that are orange and red have been burnt nearly every year, while the areas that are green have not been burnt as often. If we reduce the amount of orange and red areas, we can store more carbon on the Tiwi Islands.

A man in a green and yellow cap and a light-colored jacket is standing in a forest, holding a drip torch. He is lighting a fire in the undergrowth. The fire is bright orange and yellow, and there is a lot of smoke in the air. The background shows many trees and more smoke.

*Tiwi Land Ranger, Leon
Puruntatameri, lighting
fires at Pickertaramoor.*

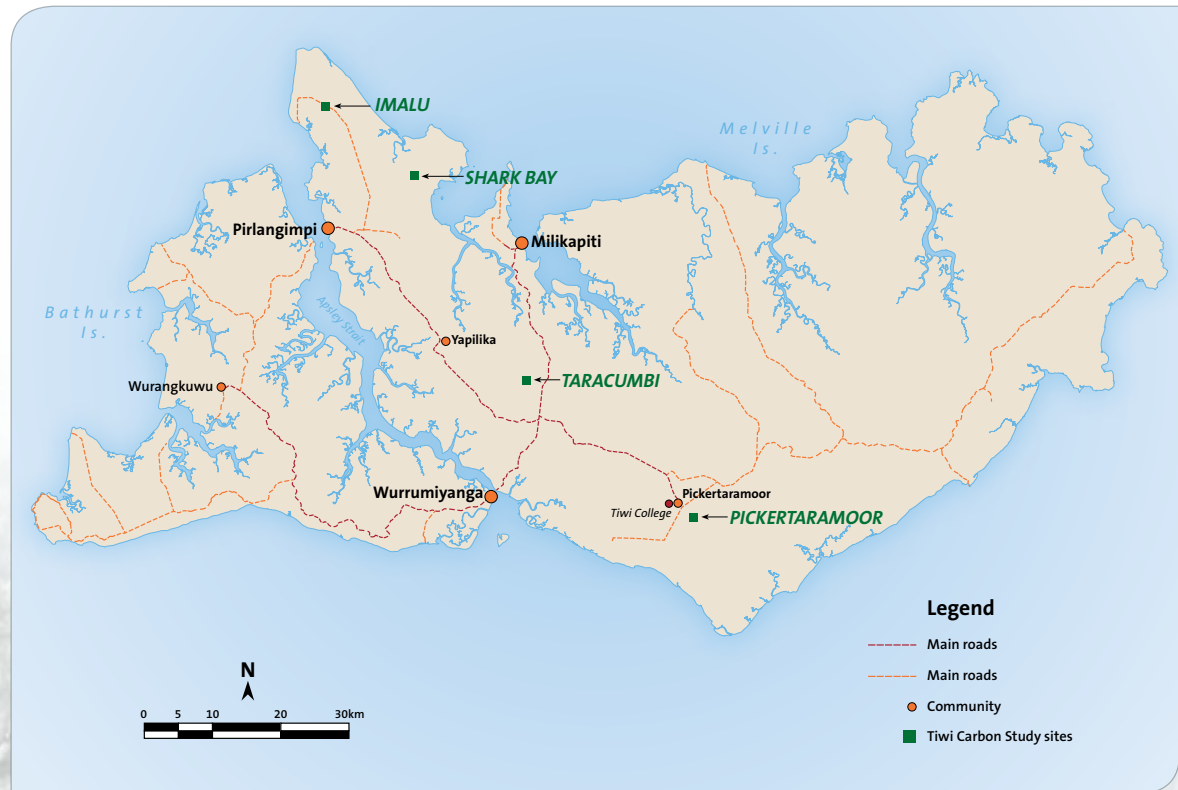
*“We use drip torches to light fires
in the early dry season. These fires
are not so big - and they break up
the country so we don’t get those
big hot fires later in the year.”*

— Willie Rioli



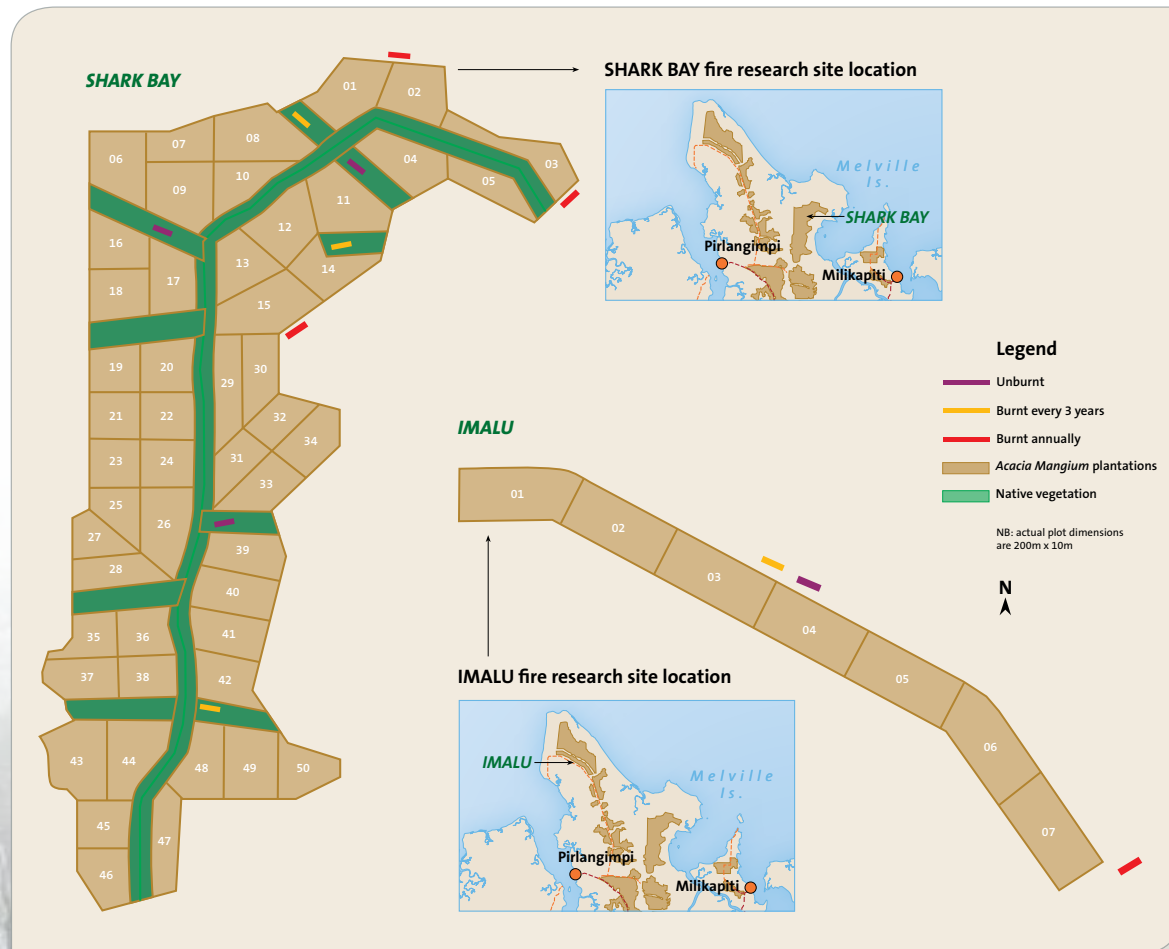
The Tiwi fire experiment

The Tiwi Land Council and CSIRO have established a long-term fire experiment around the forestry plantations on Melville Island. There are 18 experimental plots (each 50 -100 hectares in size), located at Imalu, Shark Bay, Taracumbi, and Pickertaramoor. The plots are marked by large signs.



The experimental plots are either left unburnt, burnt every three years, or burnt every year. Tiwi Forests staff and the Tiwi Land Rangers do the burning.

This map of the Shark Bay and Imalu fire research sites shows the a) unburnt, b) burnt every year and c) burnt every three years experimental plots. The same fire treatments are also at Taracumbi and Pickertaramoor.



What is being measured?

Tiwi Land Rangers, Tiwi College students and CSIRO scientists are taking lots of measurements of plants, animals and soils at the experimental plots.


This will help them work out the best fires to look after country and to reduce the amount of greenhouse gases released into the air.



CSIRO's Dr Anna Richards and Tiwi Land Ranger, Kim Brooks Wommatakimmi, collecting vegetation data before experimental burning.

“Before we light the fires we’ve got to take some measurements. Litter and grass cuttings from the fire plots are weighed and put into bags. For the soil we use augers and bulk density rings. CSIRO can then measure the carbon in the soil samples. Shrubs are measured and recorded. Leaves store carbon and when they burn, they release greenhouse gas. We need to know how to burn to help the bush store more carbon.”

— Willie Rioli

A man, identified as Willie Rioli, is shown in profile, looking through a rangefinder. He is wearing a brown and yellow baseball cap with sunglasses perched on top, and a light-colored button-down shirt. He is in a forest setting with many thin tree trunks in the background. A red string is visible hanging from his hand.

“We use a GPS to locate the trees on the study sites. We are all involved in measuring the height and diameter of trees. We need this information for the carbon calculations.”

— Willie Rioli

Tiwi Land Ranger, Willie Rioli, measuring tree heights to calculate the amount of carbon stored.



Brian Tipungwuti (Tiwi Land Ranger) collecting soil samples to measure soil carbon.



Tiwi Land Rangers and CSIRO scientists collecting measurements after the fires.



Jon Schatz (CSIRO) showing (from left) Willie Rioli (Tiwi Land Ranger) and Kim Brooks Wommatakimmi (Tiwi Land Ranger) how litter samples are oven dried before carbon analysis.



CSIRO's Jon Schatz (far right) discussing carbon data from litter samples from the Tiwi Islands with from left, Kate Hadden (Tiwi Land Council), Colin Kerinauia (Tiwi Land Ranger) and Bruce Holland (Tiwi Forests).

“It’s still too early to know how the fires affect carbon stocks. But there may be a lot more carbon in plants and soil than we realise – and this could be really important for the amount of carbon credits we get.”

– Willie Rioli

“After we burn we go back to the plots and do more measurements. We collect litter, vacuum up the ash and put it all into a bag.”

— Willie Rioli

Tiwi Land Ranger,
Brian Tipungwuti.





Tiwi plants and animals

At the start of the Tiwi Carbon Study the most common plants and animals on all of the experimental plots were measured. This will be used as baseline information for working out how they are affected by the different fires.

Plants


The most common plants were 20 different types of grasses and 29 shrubs. The main grass was the same (*Eriachne trisetata*) at Imalu, Shark Bay and Taracumbi, but different (two species of *Chrysopogon*) at Pickertaramoor. At Pickertaramoor the cycad *Cycas armstrongii* was very common; this plant needs to be looked after as its conservation status is listed as 'Vulnerable' in the Northern Territory.



After experimental burning, ash is vacuumed and collected to calculate Greenhouse gas emissions. From left: Gabriel Henry (Tiwi College), Freddy Apuatimi (Tiwi College), Curtis Tipiloura (Tiwi College), Ben Ullungura (Tiwi College), Vivian Kerinauia (Tiwi Land Ranger), Jodie Hayward (CSIRO), Sila Pati (Tiwi College), Adrian Mungatopi (Tiwi College) and Colin Kerinauia (Tiwi Land Ranger).



Tiwi College student, Luke Apuatimi, preparing plants from the Tiwi Carbon Study plots for the Tiwi College herbarium.



Cycads are very common
at Pickertaramoor.

*“We must bring together
our knowledge of the past
with the new science. What
do the fires do? What’s
happening with the animals
and plants? What’s happening
underground in the soil?”*

— Willie Rioli

Animals

Thirty-two bird species were seen in the fire plots, including the Partridge Pigeon and Australia's rarest bird of prey, the Red Goshawk. The most common birds were the Rainbow Bee-eater, Varied Lorikeet and the Silver-crowned Friarbird.

Three snake, ten lizard, five frog and five small mammal species were recorded on the plots. The most common ones were Bynoe's Gecko *Heteronotia binoei*, the Skink *Glaphyromorphus darwinensis* and the Delicate Mouse *Pseudomys delicatulus*. Two mammals of special conservation significance were found on the experimental plots:

- the Brush-tailed Rabbit Rat *Conilurus penicillatus*
- the Black-footed Tree Rat *Mesembriomys gouldi*

Nearly 100 ant species were recorded in the fire plots. Some of these ants are not found anywhere else in the world! The most common ants collected were species of *Iridomyrmex*, *Monomorium*, *Pheidole* and *Rhytidoponera*.



Tiwi Land Rangers and CSIRO researchers have collected a number of ants that have never been recorded before in the Northern Territory. One is a new species of the southern Australian genus *Epopostruma*.

“Looking after the Tiwi plants and the animals – the biodiversity – is an important part of the study. We’re looking at lots of animals on the fire plots. For example, there are heaps of ants on the Tiwis – any patch of bush will have millions of ants with more than 100 different species. These ants can tell us a lot. If the ants are in good shape, it’s likely the bush is in good shape.”

– Willie Rioli

Sixteen termite species were recorded on the Tiwi fire plots. The most common were *Microcerotermes nervosus*, *Microcerotermes serratus*, *Ephelotermes taylori*, *Heterotermes venustus*, *Coptotermes acinaciformis* and *Nasutitermis eucalypti*. These termites are common in the Northern Territory, and most occur widely across northern Australia.



From left, Colin Kerinauia (Tiwi Land Ranger), Gibson Farmer (Tiwi Forests) and Vivian Kerinauia (Tiwi Land Ranger) learning more about Tiwi termites.



Gus Wanganeen (CSIRO) (right) helping Colin Kerinauia (Tiwi Land Ranger) identify termites collected on the Tiwi fire plots.



Gibson Farmer (Tiwi Forests) identifying Tiwi ants with Magen Pettit (CSIRO).

“Collecting all this information – about carbon and biodiversity – means the rangers and students are getting good skills in scientific research.”

– Willie Rioli



Tiwi College students

Tiwi College students are working with the Tiwi Land Rangers and CSIRO researchers on the fire plots. The students help collect information from the fire plots as part of their Certificate I in Conservation and Land Management. This is part of the Vocational Education and Training Program delivered to the Tiwi College by Charles Darwin University.

“It’s important that we provide opportunities for our kids so they can have choices for the future. We include Tiwi College students in our work so they learn more about science and more about their country. Maybe some of them will end up being a ranger like me!”

– Willie Rioli



Jon Schatz (CSIRO) showing Kieran Apuatimi (Tiwi College), Anthony Farmer (Tiwi College) and Willie Rioli (Tiwi Land Ranger) how to locate study sites using a GPS.



From left: Jason Minniecon (Tiwi College) collecting litter samples with Willie Rioli (Tiwi Land Ranger) and Ricky Tipiloura (Tiwi College).



Changing fire management on the Tiwi Islands

The government is making modern industries pay for the Greenhouse gases they release into the air. One way they can do this is to pay for projects that cut down the Greenhouse gases from fires. This is already happening in western Arnhem Land, where the gas company

ConocoPhilips is paying Aboriginal rangers and Traditional Owners to burn early in the dry season so that the hot wildfires in the late dry season don't get too big.

On the Tiwi Islands, changing fire management could also earn Tiwi people money. This table shows just how much.

Fire Management options	Potential earnings each year*
1. Same areas burnt, but all before August in the Dry Season	\$570,000 
2. Half as much burning	\$780,000 
3. Half as much burning, and all before August in the Dry Season	\$1,000,000 

* These figures are based on the Federal Government's approved way of calculating emissions from savanna burning, and using a carbon price of \$23/tonne.

Tiwi Fire Management Planning

The Tiwi Carbon Study is providing information for a Tiwi Fire Management Plan that best meets the needs of Tiwi people.

This includes:

- Getting advice from Traditional Owners about where to burn, and when to burn;
- Working out the best types of fires for storing more carbon;
- Looking after the special Tiwi plants and animals;
- Measuring how much money could be made for Tiwi people by cutting back Greenhouse gases through changed fire management; and
- Protecting important Tiwi assets such as plantation forests.



Tiwi Islanders and CSIRO are working together to identify Greenhouse gas abatement and livelihood opportunities from fire management. From left: Anna Richards (CSIRO); Kieran Apuatimi; Anthony Farmer (Tiwi College); Willie Rioli; (Tiwi Land Ranger); Jon Schatz (CSIRO); and Kim Brooks Wommatakimmi (Tiwi Land Ranger).

“To keep our country healthy, and to keep our people healthy, we need new information. Things are changing on the Tiwis and so we’ve got to think about doing things in new ways.”

— Willie Rioli



Further information:

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