WILD FIRE IN CENTRAL AUSTRALIA

(AN EMERGING THREAT)

Jacqueline Arnold BA, BSN, MPH

WILD FIRE RISK IN CENTRAL AUSTRALIA

The frequency, intensity and reach of wildfires in central Australia is increasing

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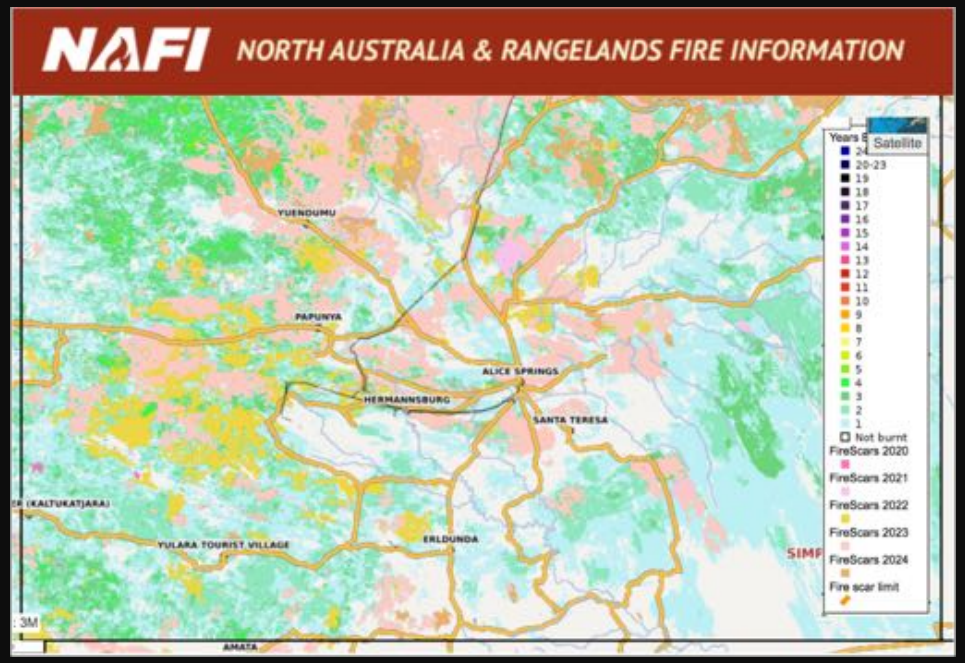

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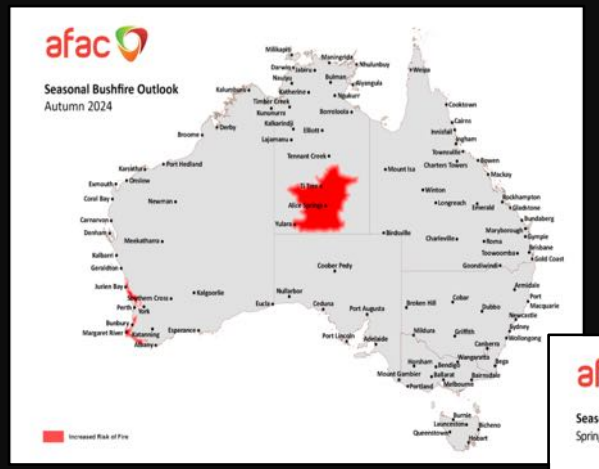

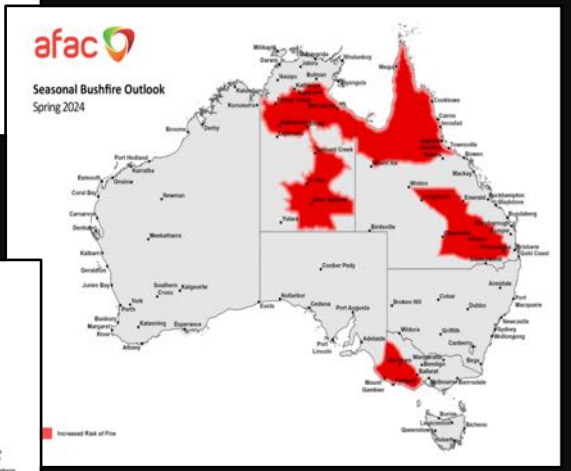

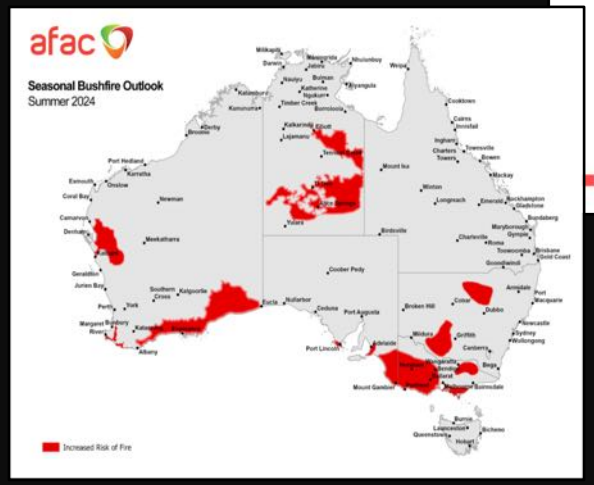

WILD FIRE RISK IN MPARNTWE

3

Image: Enhanced satellite image showing the location of the fire front on Sunday, August 13, 2023. Source: EO Browser / Sentinel-2

Multiple fires burned to the west of Alice Springs earlier this month. *(ABC News: Alex Barwick)*

4

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WHY ARE WILD FIRES IN CENTRAL AUSTRALIA GETTING WORSE?

Seasonal Bushfire Outlook for Autumn 2024

*"Above-relative surface fuel loads, continuity of grass fuels and high densities of invasive **buffel grass**, (Cenchrus ciliaris) in Central Australia and the Barkly regions contributed to large, landscape-wide wildfires over the last six months. In these regions, wildfire frequency is typically once a decade following a series of high rainfall events in the semi-arid to arid regions. However, recently burnt areas are carrying fire with average wind speeds due to **buffel grass** regrowth and curing."*

Seasonal Bushfire Outlook Winter 2023

*"Much of Central Australia is showing above normal fire potential for this outlook due to **reduced rainfall, higher temperatures, and higher fuel loads, including of the invasive Buffel Grass**."*

CLIMATE CHANGE

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Regional fact sheet - Australasia

8

Central Australia (CAU)

- Greater observed and projected warming than coastal regions under all future scenarios (*high confidence*).
- A projected increase in heavy rainfall and river flooding (*medium confidence*).

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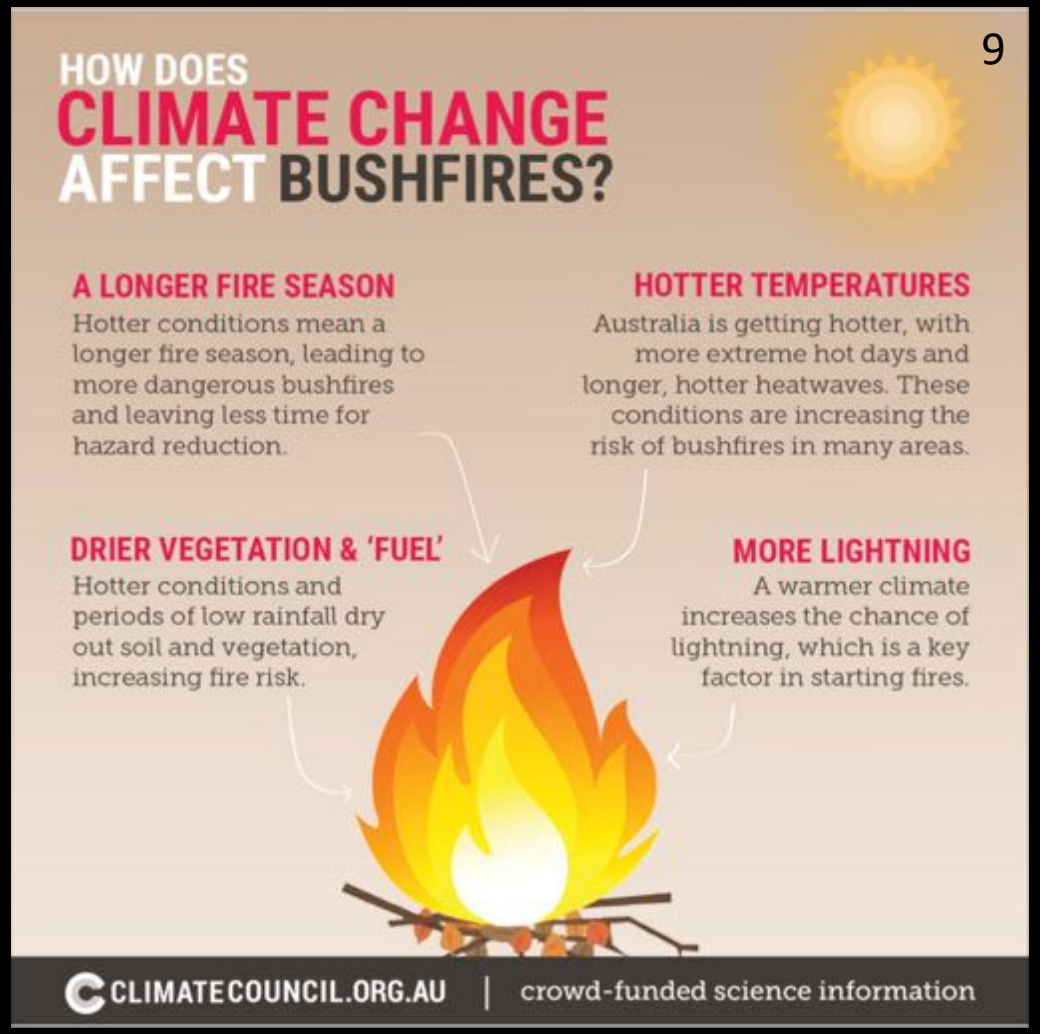


FIRE MANAGEMENT

Since invasion and occupation / colonisation fire regimes and fire management has changed dramatically in central Australia[10].

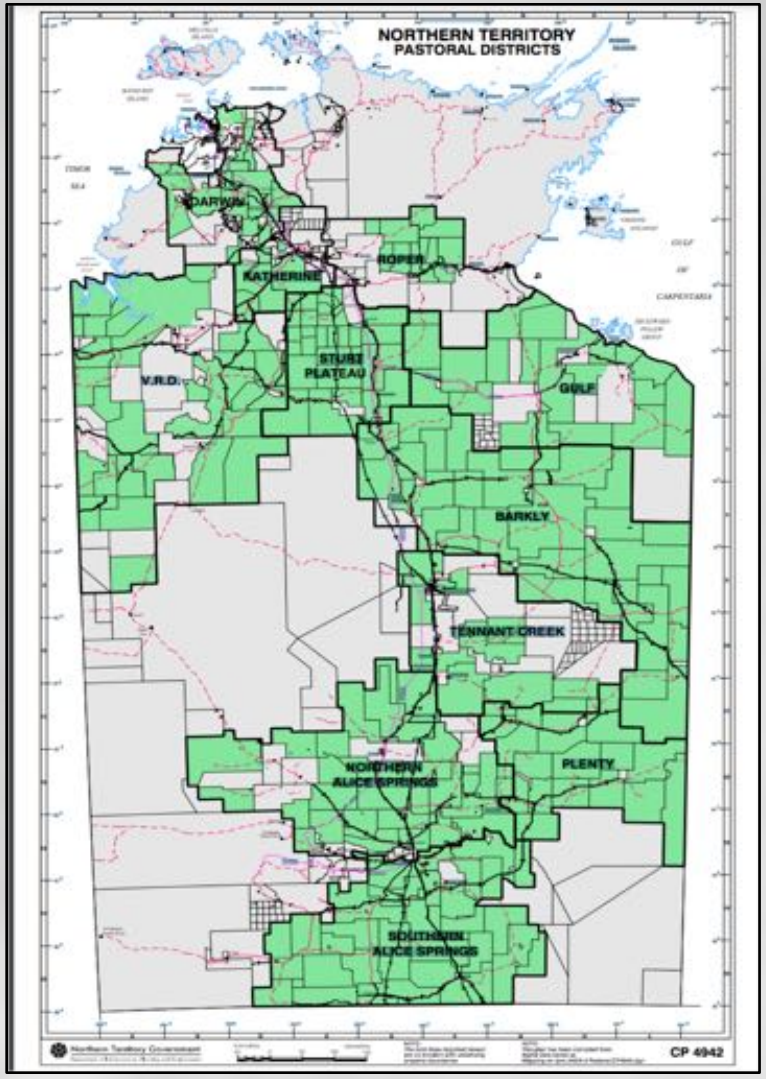
FIRE MANAGEMENT

Aboriginal peoples' opportunities to manage fire have been significantly constrained through impeded access to knowledge and country[11].

FIRE MANAGEMENT – LAND ‘USE’ CHANGE

Large parts of the country are now leased for ‘pastoral purposes’.

Management objectives are often one of fire exclusion[12] or burning to clear land and promote growth of ‘pasture grasses’[13].



FIRE MANAGEMENT – FUEL LOAD CHANGES

Introduction of high fuel load invasive plants such as buffel grass that respond well to fire has meant fire management strategies like burning for fuel reduction are:

- Harder to control - increased risk of dangerous, unplanned spread and intensity that can result in widespread death, destruction and accelerates ecosystem collapse[14]
- Often counterproductive without follow up treatment (such as herbicide application) so ineffective in many invaded areas[15].

FIRE MANAGEMENT - ECOSYSTEM DESTRUCTION

- Reduces number of native fire retardant plants[16]
- Reduces numbers of native animals that process fuel loads[17]
- Buffel grass invasion reduces natural wind and fire breaks[18,19, 20]

BUFFEL GRASS

Buffel grass infestation increases the frequency, intensity and spread of wildfires[20].

- Creates an extremely high fuel load[21]
- Burns very hot (900°C)[22]
- Covers large areas with uniform intensity[23]
- Responds very well to fire (has a positive fire feedback loop)[24, 25]

The remains of a corkwood tree after an unplanned bushfire in an area heavily invaded by buffel grass near Simpsons Gap. Very few large old corkwood trees now remain in this area. Author provided

BUFFEL GRASS - FUELING WILD FIRES AROUND THE WORLD

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tucson.com

Ecologists issue call to action after buffelgrass fire scorches saguaros in Catalinas

Henry Brean Aug 30, 2019 Updated Apr 18, 2022

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ABC NEWS

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Buffel grass prompts bushfire warning as weed infests unprotected states

By Tamara Clark | By Elise Kennedy | ABC Mildura-Swan Hill | Environment

Thu 8 Aug

A fire fuelled by buffel grass near Alice Springs. (Facebook: Bushfires NT)

In short:

Buffel grass is spreading to more Australian states, posing a significant threat as climate change increases fire risk.

In recent years, the highly flammable plant has fuelled devastating fires in the NT and on the Hawaiian island of Maui.

What's next?

An expert has called on the Australian government to declare buffel grass a weed of national significance.

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12NEWS

News | Weather | Sports

ARIZONA

Apache Junction working to address invasive species to help reduce wildfires

Invasive species are believed to be increasing fire intensity across the Sonoran Desert.

Author: Colleen Sikora
Published: 9:13 PM PDT July 29, 2024
Updated: 9:13 PM PDT July 29, 2024

APACHE JUNCTION, Ariz — Researchers have identified invasive species as part of an increase in fire danger across the desert.

This is why the City of Apache Junction is trying various techniques to try and get them more under control and help prevent wildfires.

Both buffel grass and stinknet can be found in Silly Mountain Park in Apache Junction.

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THE AUSTRALIAN BUSINESS JOURNAL

Home › Lifestyle

Invasive Buffel Grass That Helped Fuel Deadly Maui Fires Also Threatening Australia

by Simona Badita — September 26, 2023 in Lifestyle 0

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INDEPENDENT

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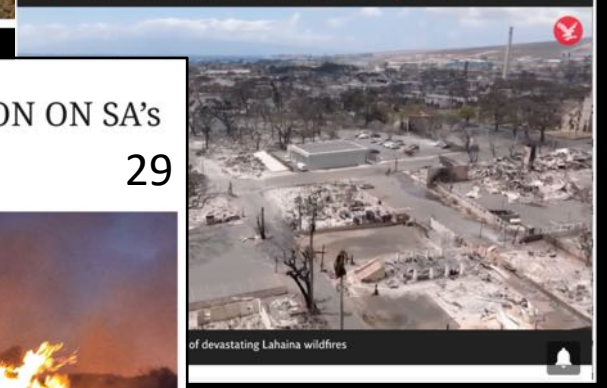
News > World > Americas

Highly flammable grasses in Hawaii fueled spread of deadly Maui wildfires, experts say

The death toll in the Maui wildfires surpassed 100 this this week and 1,000 are still missing

Andrea Cavallier • Thursday 17 August 2023 09:12 BST • Comments



of devastating Lahaina wildfires

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COOBER PEDY NEWS & EVENTS

HOPE OF SOME SERIOUS ACTION ON SA's BUFFEL GRASS CRISIS!

BY COOBER PEDY REGIONAL TIMES ON NOVEMBER 28, 2024 • (3 COMMENTS)

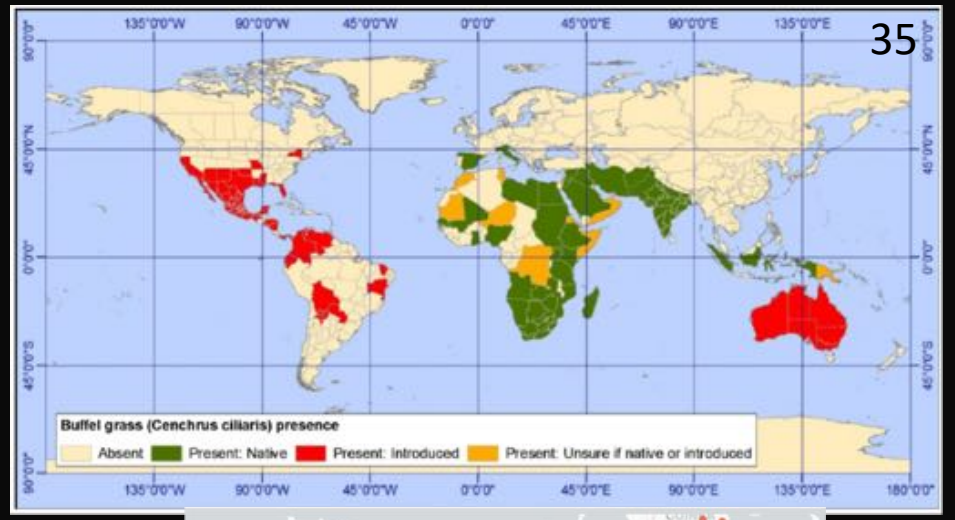
At Coober Pedy, volunteer firefighters have grave concerns about the out-of-control buffel grass problem across the state

WHAT IS BUFFEL GRASS & WHY ARE WE SURROUNDED BY IT?

Buffel grass (cenchrus ciliaris, c. pennisetiformis) is a perennial tussock grass native to parts of Africa, the Middle East and India[32].

It has been widely planted to support colonisation and beef production[33].

Buffel grass is highly invasive and continues to spread far beyond planted areas[34].



GRASS FUELLED WILD FIRES

Standing grass is:

Surrounded by oxygen

- can ignite easily
- grow rapidly

Directly affected by wind speed and direction

- can spread very quickly over many kilometres.
- slight wind change can steer the fire in many different directions.

SMOKE

BUSHFIRE SMOKE IN THE BARKLY 2023 [38]

BUSHFIRE SMOKE IN MPARNTWE 2023

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Bushfires NT
8 November 2023 ·

Aircraft have been out mapping the active fire around Alice Springs this morning.

Thick smoke from fires surrounding Alice Springs is likely to impact the township and surrounds today and may be a risk to people with respiratory ailments. Take precautions if you have a medical condition that may be exacerbated by bushfire smoke:

FEROCITY OF FIRES – GLENN HELEN

SKY IN ALICE SPRINGS

HEALTH SERVICE IMPACTS IN CENTRAL AUSTRALIA

"Alice Springs Hospital has seen a significant number of presentations to ED as a result of respiratory distress due to smoke from fires in the region. The poor air quality and particle concentration will be affecting all areas including remote locations.

Many of the patients presenting with respiratory conditions are improving much more slowly than under normal conditions. It is expected that length of stay, bed occupancy and patient flow may be affected as well as attendance to ED and remote community clinics.

NT Health staff are encouraged to consider the risk of smoke inhalation to themselves and their patients and take appropriate precautions. Health Clinics should also plan for increased presentations[43]."

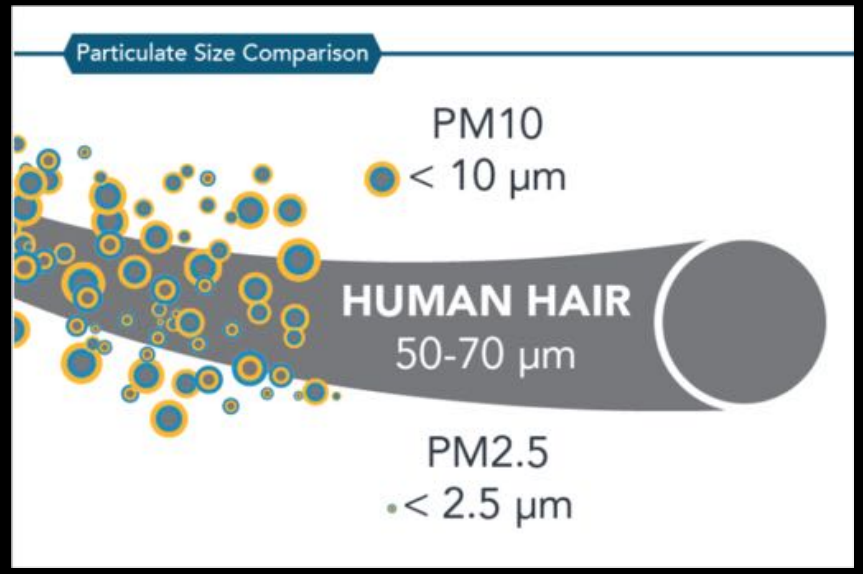
BUSH FIRE SMOKE

The smoke generated by bushfires can affect health over large geographical areas.

Particulate matter represents the main component of bushfire smoke and poses the primary threat to health[44].

PM_{10} – particles smaller than 10 microns in diameter[45]

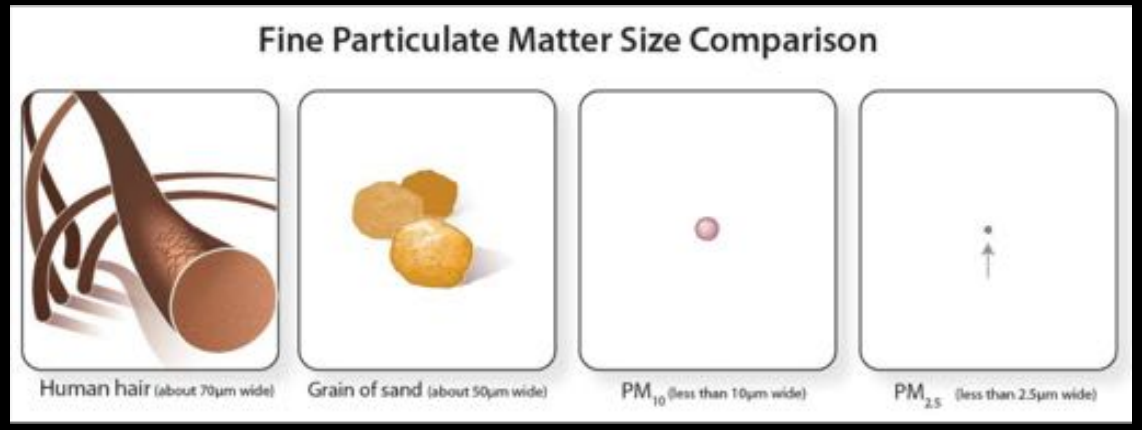
- Contributes to visible smoke haze
- Can irritate the eyes, throat and lungs



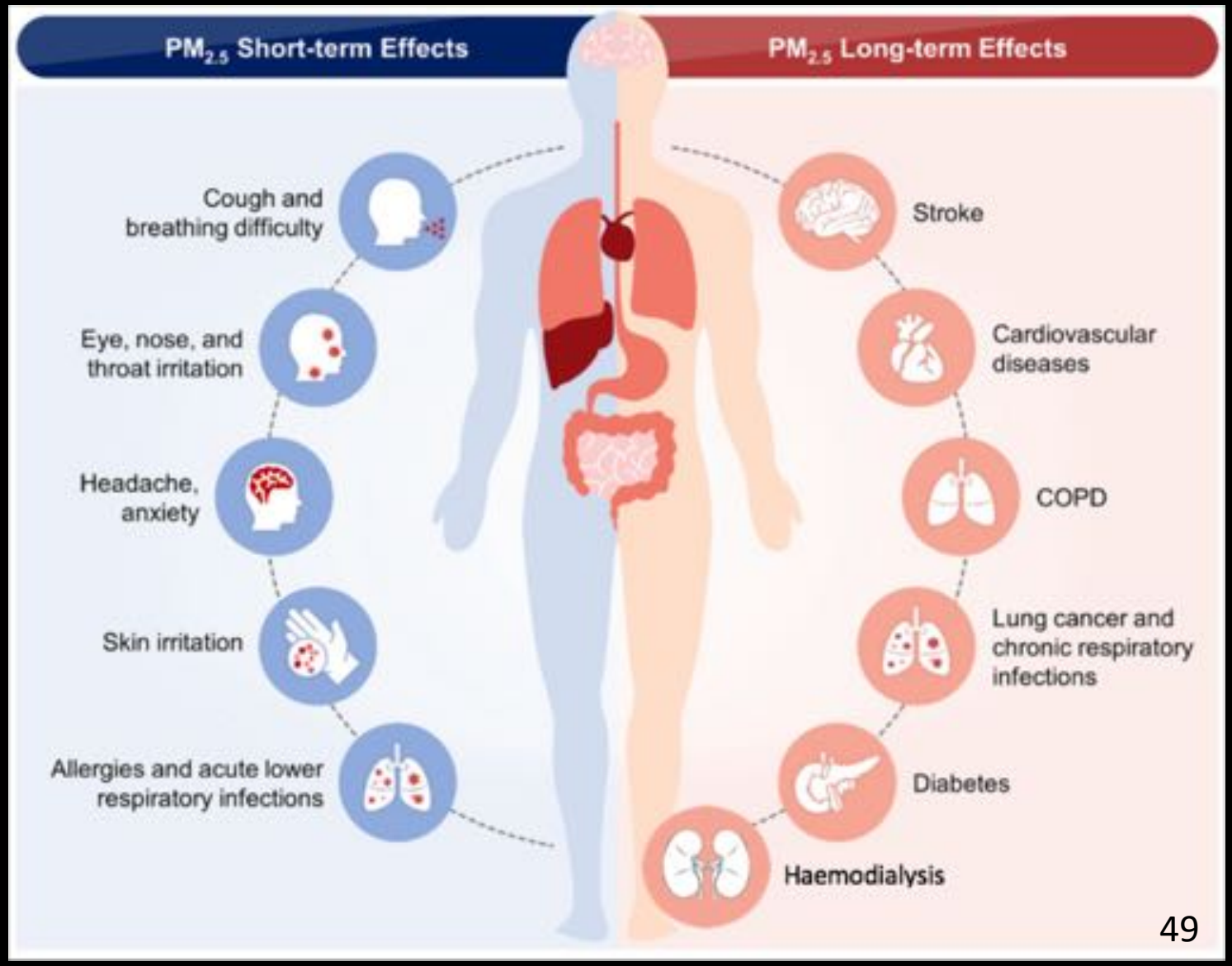
BUSH FIRE SMOKE

$PM_{2.5}$ – particles smaller than 2.5 microns in diameter

- Too small to be seen
- Can cross
  - from lungs into blood stream
  - from nasal mucosa into the central nervous system
- Trigger oxidative stress in organs and systemic inflammation [46, 47, 48]



HEALTH IMPACTS OF BUSHFIRE SMOKE



VULNERABLE GROUPS

POPULATIONS MOST AT RISK

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- People with lung disease
- Pregnant women
- Breastfeeding women
- Children
- The elderly
- People with diabetes
- People with cardiovascular disease

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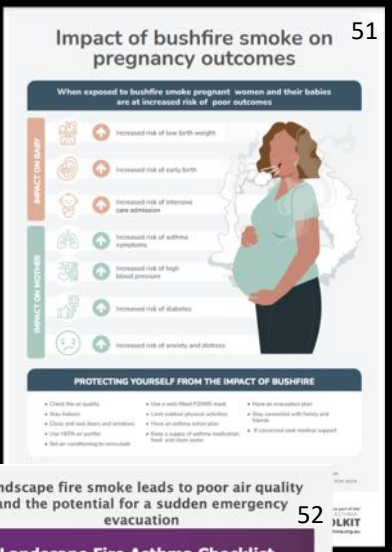

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HEALTH SERVICE IMPACTS

A large body of evidence[54,55] indicates that bush fire smoke increases rates of:

- Respiratory medication use
- Ambulance calls
- Emergency department visits
- Hospital admissions
- All-cause mortality

HOW TO PROTECT YOURSELF AND OTHERS FROM BUSHFIRE SMOKE
1 STAY INDOORS
2 MEDICATION PLAN
3 REDUCE PHYSICAL ACTIVITIES OUTDOORS
4 FACE MASKS
5 TRUST YOUR SENSES
6 KEEP WELL
7 TAKE CARE OF MENTAL HEALTH
8 FOLLOW BUSHFIRE NEWS AND ADVICE
9 FOLLOW AIR QUALITY INFORMATION
10 HELP OTHERS
National Centre for Epidemiology & Population Health
Research School of Population Health
College of Health & Medicine
Australian National University

NATURAL PROTECTION FROM BUSH FIRE SMOKE

Natural ecosystems with a diversity of ground, mid and upper storey vegetation.

- Decreases particulate dispersal[57]
- Filters particulate matter[58]

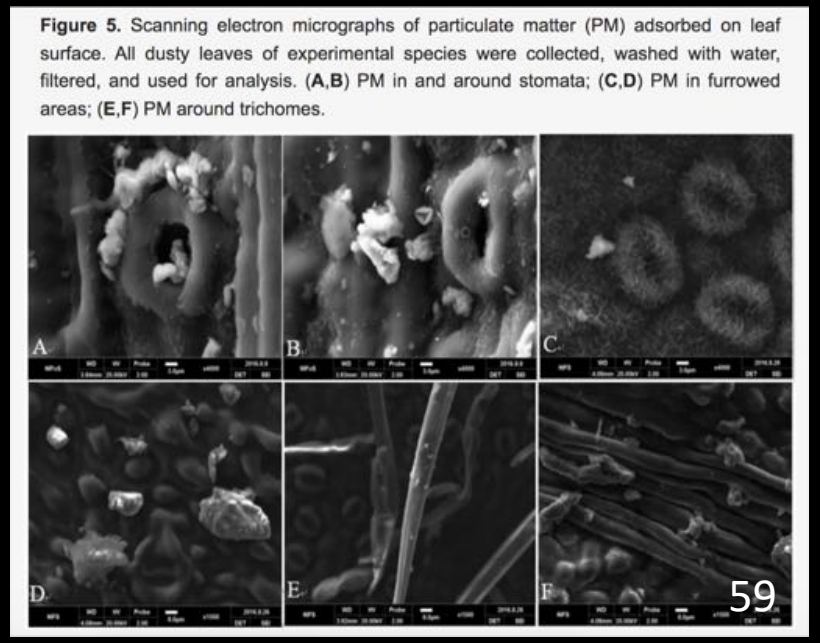


Figure 5. Scanning electron micrographs of particulate matter (PM) adsorbed on leaf surface. All dusty leaves of experimental species were collected, washed with water, filtered, and used for analysis. (**A**,**B**) PM in and around stomata; (**C**,**D**) PM in furrowed areas; (**E**,**F**) PM around trichomes.

A LANDSCAPE IN CENTRAL AUSTRALIA WHERE BUFFEL FUELED FIRES HAVE WIPED OUT NATIVE VEGETATION

INJURY

Wild fires can cause serious injury and death

Physical injuries can occur when people:

- **Are trapped**
- **During firefighting efforts**
- **During evacuations**

BURNS

LACERATIONS

IMPACT INJURIES

HEAD INJURIES

MUSCLE SPRAINS

MENTAL HEALTH[62]

Wild fires can trigger new, and exacerbate existing mental health problems

Lived experience of bushfire has been found to increase the occurrence of psychological and behavioural disorders such as:

- Anxiety
- Depression
- Post-traumatic stress disorder
- Substance misuse

The effects can persist for years after the impact

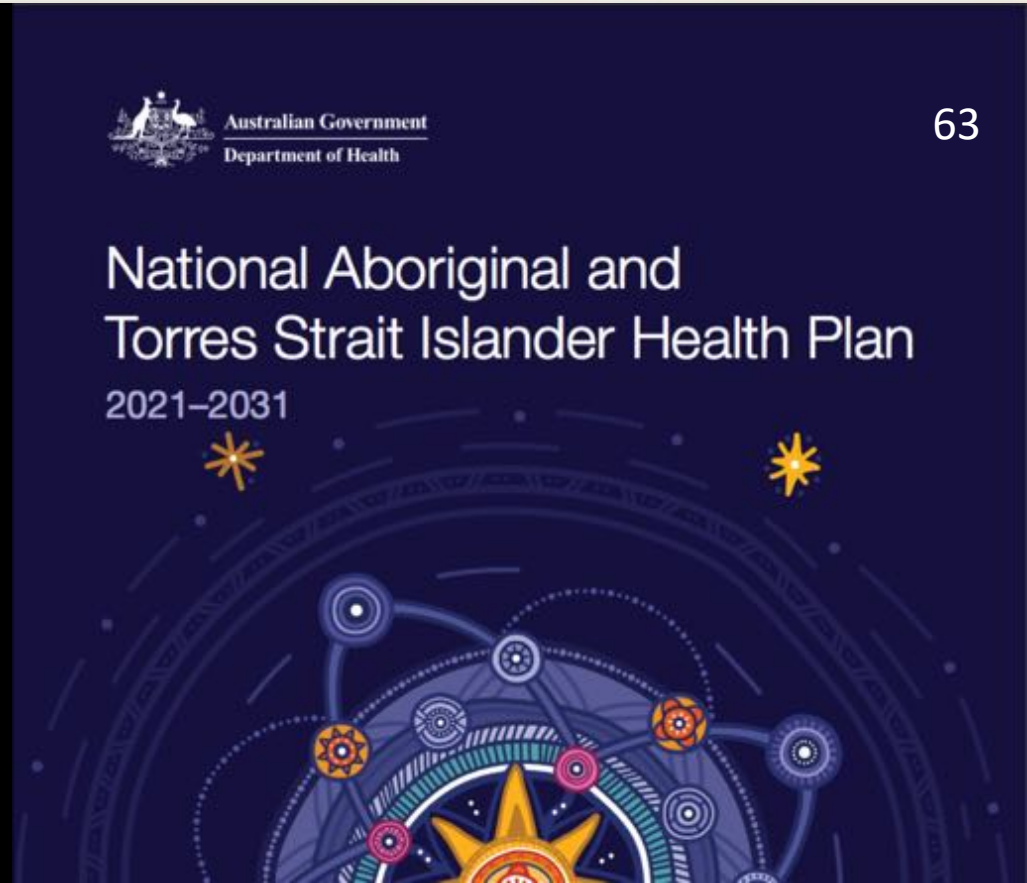
CULTURE

Culture is a foundation for Aboriginal and Torres Strait Islander health and wellbeing. It is a protective factor across the life course, and has a direct influence on broader social determinants outcomes. Gains across these broader determinants, in turn, reinforce cultural connectedness, maintenance, resurgence, nation building and pride in cultural identity.

Culture and country are inseparable.

Increased frequency, intensity and spread of wild fires:

- Incinerates country
- Disrupts, and in some cases discontinues, cultural practices including caring for country activities such as traditional burning[64,65,66]



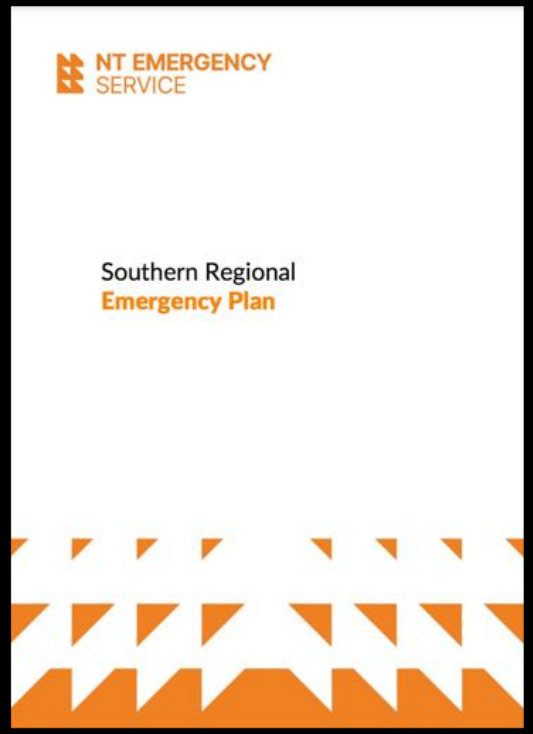
ECONOMIC IMPACTS

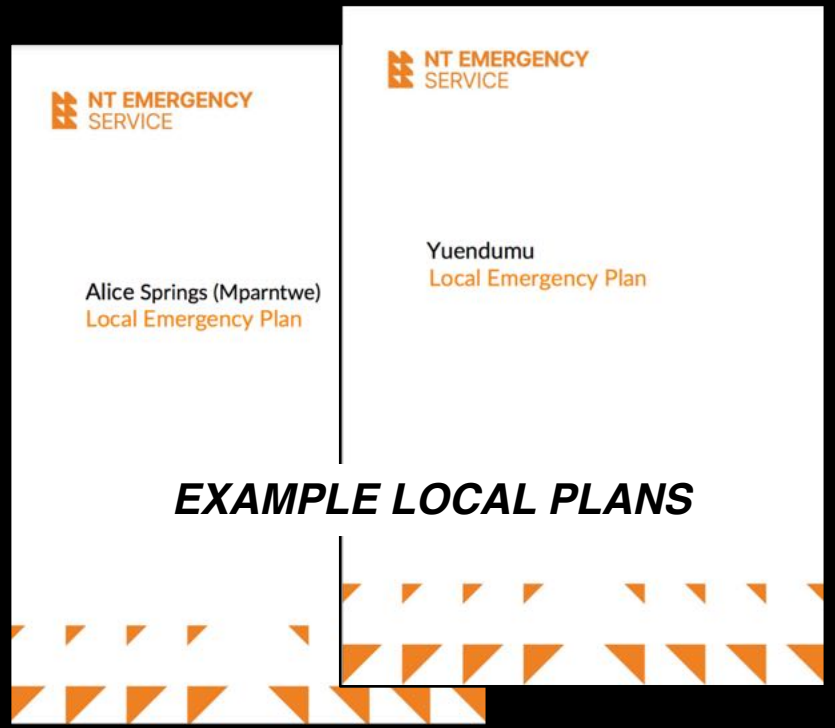
A recent estimate of the burden of bushfires in Australia over 10 years from 2021 to 2030[67] predicted:

- Healthcare costs arising from deaths for smoke-related conditions, hospitalizations = **$110 million**.
- The impact on gross domestic product = **$17.2 billion**.

PREPARATION

PREPARATION





EXAMPLE LOCAL PLANS

PREPARATION

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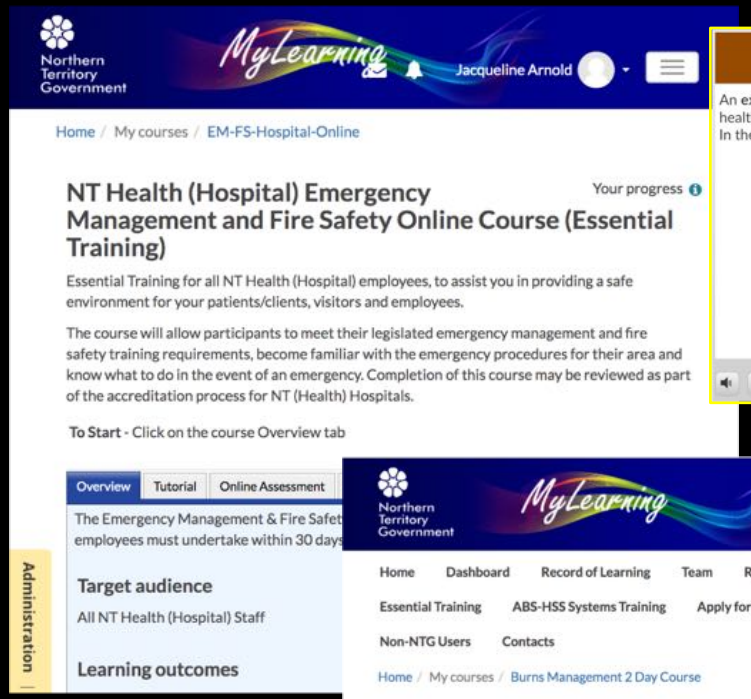

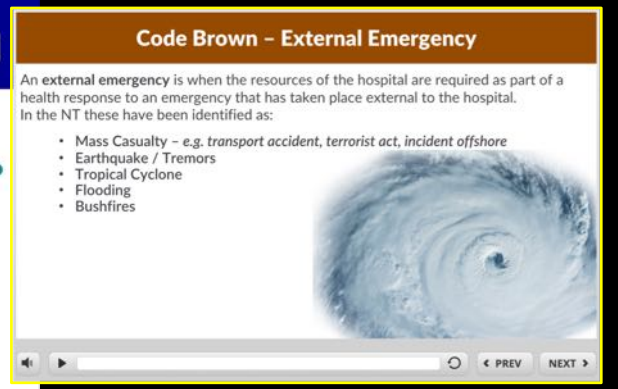

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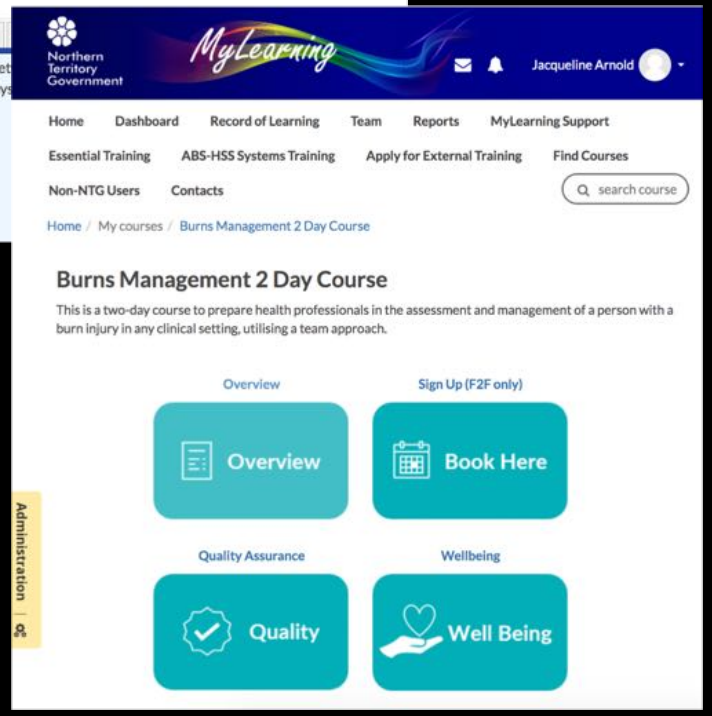
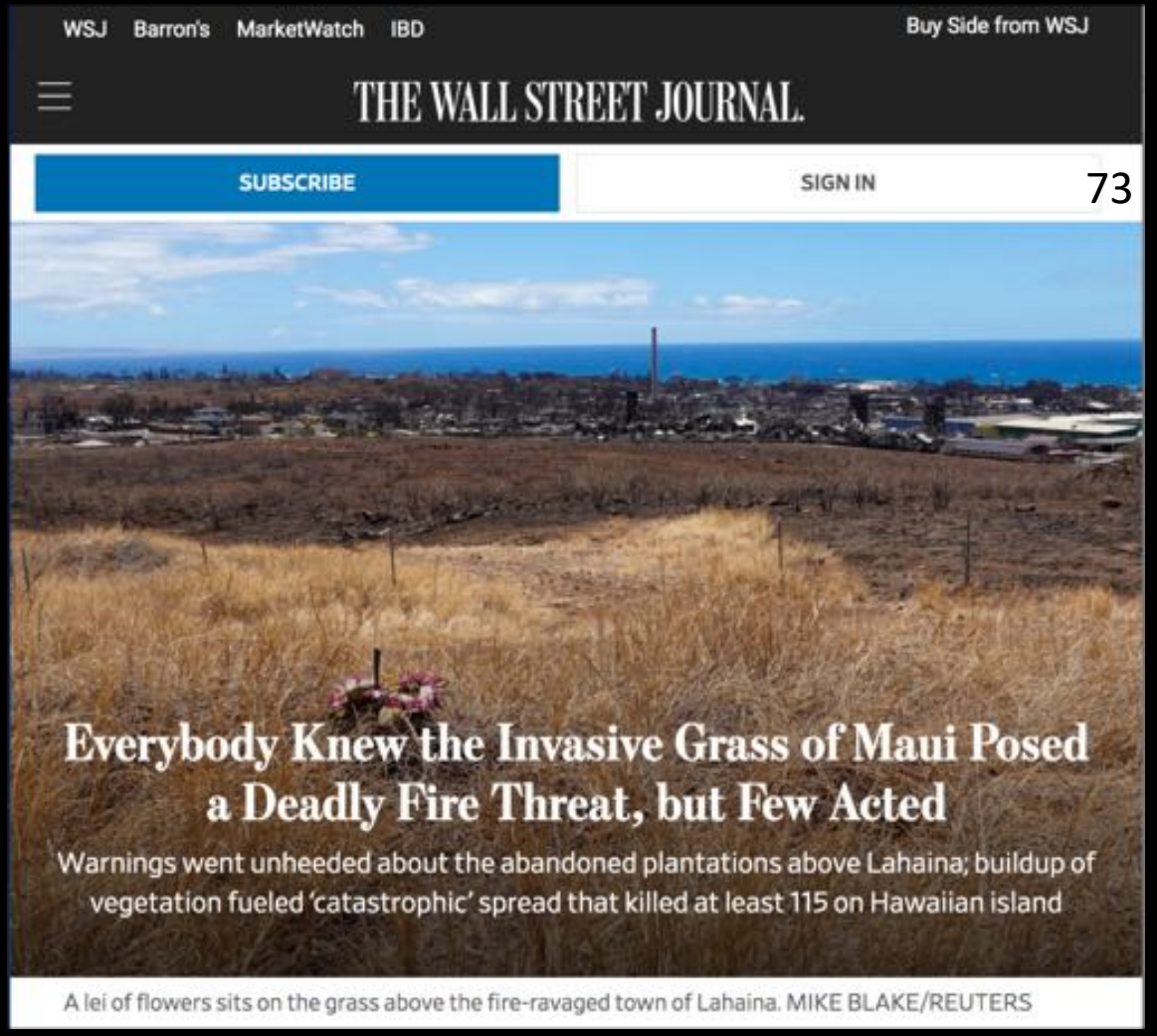


MANAGING RISK

In December 2023 John Patterson, Chief Executive Officer of the *Aboriginal Medical Services Northern Territory* stated:

*"**Buffel grass is destroying our people's health, our culture and our country. We have an opportunity to change this**…The fires earlier this year are a demonstration of the danger buffel grass poses to our whole community, and particularly those with respiratory conditions like asthma*[72]*"*



Preparing for bushfires and your responsibilities

Bushfires: landholder responsibilities
Support for landholders and communities to meet their responsibilities.

Fire safety on rural blocks
Tips on how to keep your home safe for bushfire season.

Install and maintain firebreaks
Be prepared, install your firebreaks.

Permit to burn and lighting fires
Find out when you need to get a permit to burn, and what you need to do.

Fire bans and fire danger periods
What you can or can't do during a fire ban and fire danger period, and how it's announced.

Property bushfire management and survival plans
Developing a property bushfire management plan and how to prepare, act and survive in the event of a bushfire.

Report bushfire arson and suspicious fires
You must report suspicious fire behaviour.

Bushfire seasons
Bushfire seasons in Top End and Central Australia.

Driving near bushfires
Find out what to do in the NT when driving around bushfires.

Mental health after bushfires
Bushfires can be traumatic, find out where you can get help to talk with someone.

Protect your business from bushfires
Steps for businesses to take before, during and after a bushfire.

Staying safe from bushfire smoke
What to do if you're affected by bushfire smoke and how to get help.

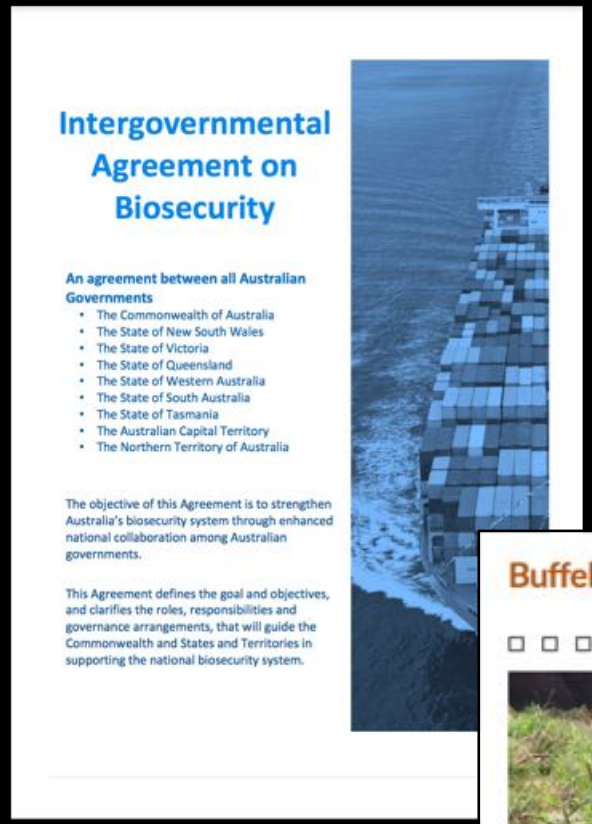
Fire weather forecast areas
What fire weather forecast areas are, how they are defined and how to view them.

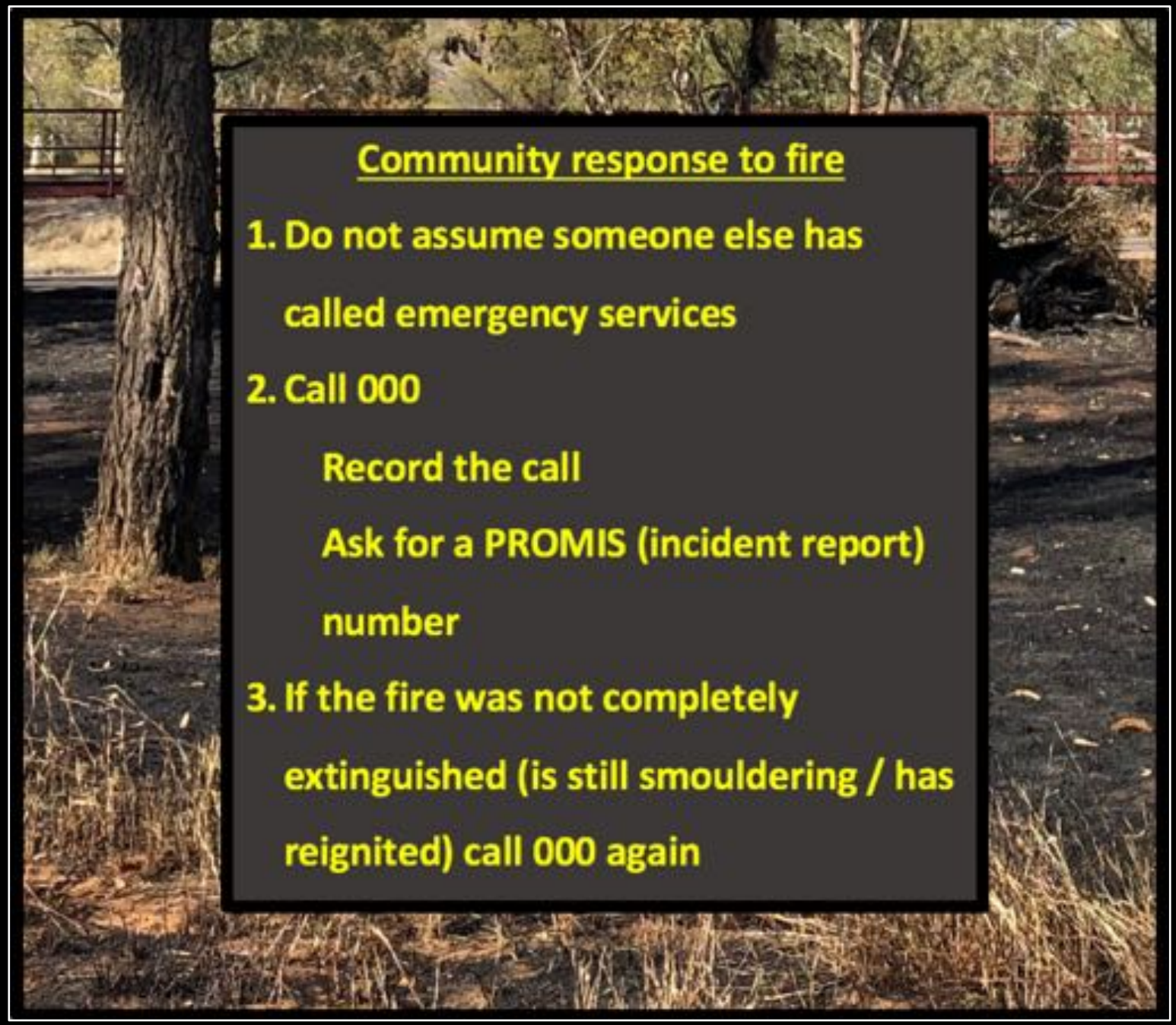
MANAGING RISK

Healthy Country = Healthy People[75]

Functioning natural ecosystems, with a diversity of native plants and animals provide critical defense against many health risks.

MANAGING RISK - BIOSECURITY [76- 79]




Community response to fire
1. Do not assume someone else has called emergency services
2. Call 000
Record the call
Ask for a PROMIS (incident report) number
3. If the fire was not completely extinguished (is still smouldering / has reignited) call 000 again

REFERENCES

1. Charles Darwin University *North Australia Rangelands Fire Information* https://www.firenorth.org.au/nafi3/
2. AFAC *Seasonal Bushfire Outlook* https://www.afac.com.au/seasonal-outlook
3. Weatherzone *Dry Red Centre fuels fires near Alice Springs*. (2023, August 14). https://www.weatherzone.com.au/news/dry-red-centre-fuels-fires-near-alice-springs/1446195
4. Hislop, J. (2023, August 14). *Northern Territory to see worst bushfire season in more than a decade due to high fuel loads*. ABC News. https://www.abc.net.au/news/2023-08-14/worst-fire-season-in-a-decade-expected-for-northern-territory/102726614
5. NT News *Centralian fires 'only the start' as authorities warn of horror season ahead* https://www.ntnews.com.au/subscribe/news/1/?sourceCode=NTWEB_WRE170_a_GGL&dest=https%3A%2F%2Fwww.ntnews.com.au%2Fbusiness%2Fnt-business%2Fhorror-centralian-fires-only-the-start-as-authorities-warn-of-horror-bushfire-season-ahead%2Fnews-story%2F8c8e08e190bc1f448641acad8f00debc&memtype=anonymous&mode=premium
6. Image Slide 4 -Willcocks, S. (2025, January 13). *CLC wants NT government to declare buffel grass a weed - Central Land Council*. Central Land Council. https://www.clc.org.au/media-release-clc-wants-nt-government-to-declare-buffel-grass-a-weed/
7. AFAC *Seasonal Bushfire Outlook* https://www.afac.com.au/seasonal-outlook
8. Working Group I – The Physical Science Basis. (n.d.). *SIXTH ASSESSMENT REPORT*. https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Australasia.pdf
9. Council, C. (2020, January 23). *The Facts about hazard Reduction*. Climate Council. https://www.climatecouncil.org.au/facts-about-hazard-reduction/
10. Edwards, G. P., Allan, G. E., Brock, C., Duguid, A., Gabrys, K., & Vaarzon-Morel, P. (2008). Fire and its management in central Australia. *The Rangeland Journal*, *30*(1), 109. https://doi.org/10.1071/rj07037
11. Robinson, C., Barber, M., Hill, R., Gerrard, E., James, G., & CSIRO. (2016). *Protocols for Indigenous fire management partnerships*. CSIRO. https://www.aidr.org.au/media/4916/protocols_for-indigenous_fire_management_partn.pdf

REFERENCES

12. Edwards, G. P., Allan, G. E., Brock, C., Duguid, A., Gabrys, K., & Vaarzon-Morel, P. (2008). Fire and its management in central Australia. *The Rangeland Journal*, *30*(1), 109. https://doi.org/10.1071/rj07037
13. Ward, J. (2025b, June 23). *Before it all goes up in smoke – proactive fire planning for Central Australia - FutureBeef*. FutureBeef. https://futurebeef.com.au/before-it-all-goes-up-in-smoke-proactive-fire-planning-for-central-australia/#:~:text=Like%20many%20others%20in%20the,of%20pasture%20in%20one%20go.%E2%80%9D
14. Edwards, A., Schlesinger, C., Ryan-Colton, E., Barber, G., Jacklyn, P. (2023) *Invasive grasses are worsening bushfires across Australia's drylands* https://www.preventionweb.net/news/invasive-grasses-are-worsening-bushfires-across-australias-drylands
15. PIRSA. (n.d.). *Buffel grass control* https://www.pir.sa.gov.au/__data/assets/pdf_file/0011/275906/4108_PIRSA_factsheet_Buffel_Grass_Control.pdf
16. Flora, S. (2021, August 22). *Bushfire resistance*. State Flora. https://www.stateflora.sa.gov.au/the-australian-garden/why-choose-native-plants/bushfire-resistance
17. Ryan, C. M., Hobbs, R. J., & Valentine, L. E. (2019). Bioturbation by a reintroduced digging mammal reduces fuel loads in an urban reserve. *Ecological Applications*, *30*(2). https://doi.org/10.1002/eap.2018
18. Banerjee, T., Heilman, W., Goodrick, S., Hiers, J. K., & Linn, R. (2020). Effects of canopy midstory management and fuel moisture on wildfire behavior. *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-74338-9
19. PIRSA SA Weed Control Handbook. (n.d.). *Buffel grass*. https://cdn.environment.sa.gov.au/landscape/docs/ny/Buffel-grass-fact-sheet.pdf

REFERENCES

20. Threatened Species Scientific Committee. (2022). Fire regimes that cause declines in biodiversity. In *Advice to the Minister for the Environment From the Threatened Species Scientific Committee on Amendments to the List of Key Threatening Processes Under the Environment Protection and Biodiversity Conservation Act 1999* [Report]. https://awe.gov.au/environment/biodiversity/threatened/key-threatening-processes

21. AFAC *Seasonal Bushfire Outlook* McDonald, C. J., & McPherson, G. R. (2013). Creating hotter fires in the Sonoran desert: buffelgrass produces copious fuels and high fire temperatures. *Fire Ecology*, *9*(2), 26–39. https://doi.org/10.4996/fireecology.0902026

21. PIRSA SA Weed Control Handbook. (n.d.). *Buffel grass*. https://cdn.environment.sa.gov.au/landscape/docs/ny/Buffel-grass-fact-sheet.pdf

22. NT Government *Factors That Create Bushfire Riskhttps*://nt.gov.au/emergency/bushfire/factors-that-create-bushfire-risk

23. NT Government *Bushfires NT Central Australia Planning Guide* https://nt.gov.au/__data/assets/pdf_file/0006/1220496/bushfires-nt-central-australia-planning-guide.pdf

24. Clark, T., & Kennedy, E. (2024, August 7). *Buffel grass prompts bushfire warning as weed infests unprotected states*. ABC News. https://www.abc.net.au/news/2024-08-08/invasive-weed-buffel-grass-maui-northern-territory-bushfires/104136376

25. Brean, H. (2022, April 18)., Ecologists issue call to action after buffelgrass fire scorches saguaros in Catalinas https://tucson.com/news/local/ecologists-issue-call-to-action-after-buffelgrass-fire-scorches-saguaros-in-catalinas/article_c630a967-366b-5c37-998e-4a188bda5489.html

26. Sikora, C. (2024, July 30). Apache Junction working to address invasive species to help reduce wildfires. *12news.com*. https://www.12news.com/article/news/local/arizona/apache-junction-working-to-address-invasive-species-to-help-reduce-wildfires/75-0d6baa87-4e83-485f-9f81-bc6858642788

27. Times, C. P. R. (2024, November 28). *HOPE OF SOME SERIOUS ACTION ON SA's BUFFEL GRASS CRISIS!* Coober Pedy Regional Times. https://cooberpedytimes.com/2024/11/28/hope-of-some-serious-action-on-sas-buffel-grass-crisis/

28. Badita, S., & Badita, S. (2023, September 22). *Invasive buffel grass that helped fuel deadly Maui fires also threatening Australia*. Australian Business Journal. https://theabj.com.au/2023/09/26/buffel-grass/

29. Cavallier, A. (2023, August 17). Highly flammable grasses in Hawaii fueled spread of deadly Maui wildfires, experts say. *The Independent*. https://www.independent.co.uk/news/world/americas/wildfires-hawaii-flammable-grass-b2394562.html

REFERENCES

32. Marshall, V.M. & Lewis, Megan & Ostendorf, Bertram. (2012). *Buffel grass (Cenchrus ciliaris) as an invader and threat to biodiversity in arid environments: A review*. Journal of Arid Environments. 78. 1–12. 10.1016/j.jaridenv.2011.11.005.

33. Friedel MH. *Unwelcome guests: a selective history of weed introductions to arid and semi-arid Australia*. Australian Journal of Botany. 2020;68(2):75. doi:10.1071/bt20030.

34. Australian Government. *Threat Abatement Advice For Ecosystem Degradation, Habitat Loss And Species Decline In Arid And Semi-Arid Australia Due To The Invasion Of Buffel Grass (Cenchrus Ciliaris AND C. Pennisetiformis)*.; 2015. https://www.dcceew.gov.au/sites/default/files/env/pages/19e6108c-d6a4-489f-9ac9-9f0754788080/files/threat-abatement-advice-buffel-grass_1.pdf.

35. Marshall, V.M. & Lewis, Megan & Ostendorf, Bertram. (2012). *Buffel grass (Cenchrus ciliaris) as an invader and threat to biodiversity in arid environments: A review*. Journal of Arid Environments. 78. 1–12. 10.1016/j.jaridenv.2011.11.005.

36. Atlas of Living Australia Cenchrus ciliais Buffel Grass https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2891090

37. Mullins, G., Rice, M., Gergis, J., Karoly, D., & Climate Council of Australia Limited. (2023). Powder keg: Australia primed to burn. In *Climate Council of Australia Limited*.

38. Bushfires NT Facebook (2023) https://www.facebook.com/BushfiresNT/videos/1339368763370647

39. Bushfires NT Facebook (2023) https://www.facebook.com/BushfiresNT

40. Bushfires NT Facebook (2023) https://www.facebook.com/BushfiresNT/videos/208486192201946

41. Bushfires NT Facebook https://www.facebook.com/reel/1021344282447768

42. Jacqueline Arnold (2023)

REFERENCES

43. Northern Territory Department of Health *NT Health Broadcast Central Australia Smoke and Air Quality Warnings for Central Australia Region* November 8, 2023

44. US EPA (2023, October 13) *Why Wildfire Smoke is a Health Concern* Retrieved 21 August 2024 from https://www.epa.gov/wildfire-smoke-course/why-wildfire-smoke-health-concern#:~:text=Wildfire%20smoke%20is%20comprised%20of,the%20principal%20public%20health%20threat.

45. Chen, H., Samet, J.M., Bromberg, P.A. *et al.* (2021) Cardiovascular health impacts of wildfire smoke exposure. *Part Fibre Toxicol* **18**

46. Xi Y, Kshirsagar AV, Wade TJ, Richardson DB, Brookhart MA, Wyatt L, Rappold AG. Mortality in US Hemodialysis Patients Following Exposure to Wildfire Smoke. J Am Soc Nephrol. 2020 Aug;31(8):1824-1835. doi: 10.1681/ASN.2019101066. Epub 2020 Jul 16. PMID: 32675302; PMCID: PMC7460895.

47. NSW Government, NSW Health, Common health concerns during a bushfire, Retrieved 21 August, 2024 from https://www.health.nsw.gov.au/environment/bushfire/Pages/bushfire-illness

48. Wells, Y., Clune, S., Mahoney, A.-M., & Tham, R. (2023). Literature review on health impacts of exposure to particulate matter emitted by fire smoke: Final report (Version 1). La Trobe.

49. Basith, S., Manavalan, B., Shin, T. H., Park, C. B., Lee, W., Kim, J., & Lee, G. (2022). The impact of fine particulate Matter 2.5 on the cardiovascular system: A review of the Invisible Killer. *Nanomaterials*, *12*(15), 2656. https://doi.org/10.3390/nano12152656

50. *Which Populations Experience Greater Risks of Adverse Health Effects Resulting from Wildfire Smoke Exposure? | US EPA*. (2025, January 30). US EPA. https://www.epa.gov/wildfire-smoke-course/which-populations-experience-greater-risks-adverse-health-effects-resulting

REFERENCES

51. *Impact of bushfire smoke on pregnancy outcomes infographic - Asthma in Pregnancy Toolkit*. (2023, September 14). Asthma in Pregnancy Toolkit. https://asthmapregnancytoolkit.org.au/resources/impact-of-bushfire-smoke-on-pregnancy-outcomes-infographic/

52. McDonald, V. M., Archbold, G., Beyene, T., Brew, B. K., Franklin, P., Gibson, P. G., Harrington, J., Hansbro, P. M., Johnston, F. H., Robinson, P. D., Sutherland, M., Yates, D., Zosky, G. R., & Abramson, M. J. (2023). Asthma and landscape fire smoke: A Thoracic Society of Australia and New Zealand position statement. *Respirology*, *28*(11), 1023–1035. https://doi.org/10.1111/resp.14593

53. *Bushfire smoke and our health: a guide for kids and grown-ups*. (n.d.). ANU National Centre for Epidemiology and Population Health. https://nceph.anu.edu.au/research/research-projects/bushfire-smoke-and-our-health-guide-kids-and-grown-ups

54. Rice MB, Henderson SB, Lambert AA, Cromar KR, Hall JA, Cascio WE, Smith PG, Marsh BJ, Coefield S, Balmes JR, Kamal A, Gilmour MI, Carlsten C, Navarro KM, Collman GW, Rappold A, Miller MD, Stone SL, Costa DL. Respiratory Impacts of Wildland Fire Smoke: Future Challenges and Policy Opportunities. An Official American Thoracic Society Workshop Report. Ann Am Thorac Soc. 2021 Jun;18(6):921-930. doi: 10.1513/AnnalsATS.202102-148ST. PMID: 33938390; PMCID: PMC8456726.

55. Australian Institute of Health and Welfare Web Report (last updated 27 Nov 2024) *Chronic Respiratory Conditions* https://www.aihw.gov.au/getmedia/4e7245bb-fa7e-417c-b492-6d537686a655/chronic-respiratory-conditions.pdf

56. *Bushfire smoke risk communication and health protection*. (n.d.). ANU National Centre for Epidemiology and Population Health. https://nceph.anu.edu.au/research/research-projects/bushfire-smoke-risk-communication-and-health-protection

57. Hong, B., Qin, H., Jiang, R., Xu, M., & Niu, J. (2018). How Outdoor Trees Affect Indoor Particulate Matter Dispersion: CFD Simulations in a Naturally Ventilated Auditorium. *International journal of environmental research and public health*, *15*(12), 2862. https://doi.org/10.3390/ijerph15122862

REFERENCES

58. Tomson, N., Michael, R. N., & Agranovski, I. E. (2021). Removal of particulate air pollutants by Australian vegetation potentially used for green barriers. *Atmospheric Pollution Research*, *12*(6), 101070. https://doi.org/10.1016/j.apr.2021.101070

59. Jin, Eon & Yoon, Jun & Bae, Eun & Jeong, Byoung Ryong & Yong, Seong & Choi, Myung. (2021). Particulate Matter Removal Ability of Ten Evergreen Trees Planted in Korea Urban Greening. Forests. 12. 438. 10.3390/f12040438.

60. The Arid Lands Environment Centre (2024) *FireStorm* https://assets.nationbuilder.com/aridlands/pages/4308/attachments/original/1722228789/240626_NT_Buffel_Position_Paper_%28ALEC%29_FINAL.pdf?1722228789

61. Delatorre, A. (2021, July 13). *The most common types of wildland firefighter injuries*. supplycache.com. https://www.supplycache.com/blogs/news/the-most-common-types-of-wildland-firefighter-injuries?srsltid=AfmBOorHnduBolXn-utOP0AbfnbP7mDaT-0LVOxuri00bV0KRM0J24IP

62. *Taking care of mental health after bushfires*. (n.d.). ANU National Centre for Epidemiology and Population Health. https://nceph.anu.edu.au/news-events/news/taking-care-mental-health-after-bushfires

63. *National Aboriginal and Torres Strait Islander Health Plan 2013–2023*. (2013, July 1). Australian Government Department of Health and Aged Care. Retrieved August 19, 2024, from https://www.health.gov.au/resources/publications/national-aboriginal-and-torres-strait-

64. *Buffel grass management in the Alinytjara Wilurara Region - Landcare Australia Landcare Australia*. (n.d.). Landcare Australia. Retrieved August 19, 2024, from https://landcareaustralia.org.au/project/buffel-grass-management-alinytjara-wilurara-region/

65. *Ecosystem degradation, habitat loss and species decline in arid and semi-arid Australia due to the invasion of buffel grass (Cenchrus ciliaris and C. pennisetiformis) - Introduction*. (2021, October 3). DCCEEW. Retrieved August 19, 2024, from https://www.dcceew.gov.au/environment/biodiversity/threatened/threat-abatement-advices/buffel-grass-introduction

66. Dobson, V., Dobson C., Arnold J., (2024) *The health Impacts of Buffel Grass Invasion in Central Australia Presentation* Australasian Weeds Conference

REFERENCES

67. Ademi, Z., Zomer, E., Marquina, C., Lee, P., Talic, S., Guo, Y., Liew,D., (2023) *The Hospitalizations for Cardiovascular and Respiratory Conditions, Emergency Department Presentations and Economic Burden of Bushfires in Australia Between 2021 and 2030: A Modelling Study,* Current Problems in Cardiology, Volume 48, Issue 1, 101416. https://doi.org/10.1016/j.cpcardiol.2022.101416.

68. NT Government (2025) *Bushfire Seasons* https://nt.gov.au/emergency/bushfire/prepare-and-plan/bushfire-seasons

69. NT Government *Emergency Service Publications* https://pfes.nt.gov.au/emergency-service/publications

70. Australian Government, Department of Health and Aged Care (2024) *EnHealth guidance – Guidance for public health agencies – Managing prolonged smoke event from landscape fires,* Retrieved 21 August, 2024 from https://www.health.gov.au/resources/publications/enhealth-guidance-guidance-for-public-health-agencies-managing-prolonged-smoke-events-from-landscape-fires?language=en

71. NT Government *My Learning* https://mylearning.nt.gov.au/

72. Arid Lands Environment Centre Media Release: Highly Flammable Buffel Grass Threatens the Health of Territorians https://www.alec.org.au/media_release_highly_flammable_buffel_grass#:~:text=%E2%80%9CBuffel%20grass%20is%20destroying%20our%20people's%20health%2C,to%20change%20this.%E2%80%9D%20%E2%80%9CThe%20fires%20earlier%20this

73. The Wall Street (2023) *Journal Everybody Knew the Invasive Grass of Maui Posed a Deadly Fire Threat, but Few Acted* https://www.wsj.com/us-news/climate-environment/maui-fire-invasive-grass-cf6dbca2

74. NT Government (2025) *Preparing for Bushfires and Your Responsibilities* https://nt.gov.au/emergency/bushfire/prepare-and-plan

75. Akeyulerre *Healing Poster* https://www.akeyulerre.org.au/product/healing-poster

REFERENCES

76. *Intergovernmental Agreement on Biosecurity | Federation*. (2019, January 3). https://federation.gov.au/about/agreements/intergovernmental-agreement-biosecurity

77. Commonwealth of Australia. (2024). National Biosecurity Strategy Implementation Plan: Connected, Resilient, Shared. In *National Biosecurity Strategy Implementation Plan* [Report]. Department of Agriculture, Fisheries and Forestry. https://www.biosecurity.gov.au/sites/default/files/2024-02/national-biosecurity-strategy-implementation-plan-2022-2032.pdf

78. Invasive Plants and Animals Committee 2016, Australian Weeds Strategy 2017 to 2027, Australian Government Department of Agriculture and Water Resources, Canberra.

79. NT Government *Buffel Grass* https://nt.gov.au/environment/weeds/weeds-in-the-nt/A-Z-list-of-weeds-in-the-NT/buffel-grass