



2020 Fire Science Seminar Series

Facing Fire in a Changing Climate

Virtual delivery

Tuesday 10th, 17th and 24th November 2020

www.fireandbiodiversity.org.au

First Nations Acknowledgment

We acknowledge that the place we now live has been nurtured by Australia's First Peoples for tens of thousands of years. We believe the spiritual, cultural and physical consciousness gained through this custodianship is vital to maintaining the future of our region.

The Queensland Fire and Biodiversity Consortium



Established in 1998, the Queensland Fire and Biodiversity Consortium is a network of land managers and stakeholders committed to improving fire and biodiversity management outcomes, supporting and disseminating fire ecology research, facilitating partnerships between key stakeholders and building the capacity of land managers and private land owners.

The Queensland Fire and Biodiversity Consortium offers a range of resources and services, including Fire Management Planning workshops, training and practical information.

For more information please visit: www.fireandbiodiversity.org.au.

Healthy Land and Water



The Queensland Fire and Biodiversity Consortium is a program of Healthy Land and Water. Healthy Land and Water is an independent not-for-profit organisation working to improve the sustainable use of land and waterways in South East Queensland. Healthy Land and Water is the regional delivery body for the Federal Governments' National Regional Land Partnerships program. Healthy Land and Water works in partnership with Traditional Owners, government, private industry, utilities and the community, to deliver innovative and science-based solutions to the challenges affecting the environment.

For more information, please visit: www.hlw.org.au, email: info@hlw.org.au, or telephone (07) 3177 9100.

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Photo credits

Front Cover photo: Ravensbourne Fire, Queensland 2019 (Andrew Churchwood)

Back Cover photo: Queensland Fire and Biodiversity Consortium, Fire Management Planning Workshop, Sunshine Coast, 2017 (Craig Welden).

Welcome to the

Queensland Fire and Biodiversity Consortium Fire Science Forum

Welcome to the Queensland Fire and Biodiversity Consortium **2020 Virtual Fire Science Seminar Series**. This year we have chosen the theme *Facing Fire in a Changing Climate*, to reflect the changing face of fire in our landscape, a highly relevant topic considering recent bushfire events. We have brought together a range of world-class speakers and the Seminar Series aims to showcase applied fire ecology and fire management projects, with a focus on climate change and fire climatology. This year, we also take a closer look at the 19/20 fire season, its significance and impacts upon our ecological values.

After 22 years of operations, the South East Queensland Fire and Biodiversity Consortium has rebranded to the Queensland Fire and Biodiversity Consortium, reflecting increasing demand for our services by stakeholders and community in broader Queensland and the state-wide interests of some of our partners. Whilst we will maintain our core focus in South East Queensland, we welcome the opportunity to collaborate with new partners, remaining respectful of existing fire management programs and networks across Queensland. We look forward to an exciting time going forward.

Finally, we would like to welcome and thank our Event Sponsors - Fireland, Ausecology and LRM Fire and Rescue, and our Promotional Partners - NRM Jobs and the Environmental Institute of Australia and New Zealand. We also gratefully acknowledge the tireless efforts of our Steering Committee, our Coordinator Craig Welden and the support provided by Healthy Land and Water.

Welcome and enjoy!

Chandra Wood and Dr Samantha Lloyd

Chandra Wood

Chair, Steering Committee

Queensland Fire and Biodiversity
Consortium

Senior Co-ordinator Natural Environment
Brisbane City Council

Dr Samantha Lloyd

Manager

Queensland Fire and Biodiversity
Consortium

Healthy Land and Water

20 Year Anniversary Forum

Established in 1998, with funding from the National Heritage Trust, the Queensland Fire and Biodiversity Consortium has been operating for 22 years. Collaborating and working in partnership with a range of stakeholders, the Queensland Fire and Biodiversity Consortium strives to deliver high quality services, resources and support to improve fire and biodiversity outcomes.

Last year's Fire Science Forum (11th June 2019, Mt-Coot-tha Botanic Gardens) provided an opportunity to celebrate the 20th Anniversary (of the SEQ Fire and Biodiversity Consortium at the time), through the lens of *Fire, Research and Partnerships*. The Program featured 17 presentations, delivered by 30 presenters from 21 different organisations to 200 delegates.

Engaging keynote presentations were delivered by Professor Alan York (University of Melbourne) and Elizabeth Ashman (Vic. Dept. of Environment, Land, Water and Planning) on their decade-long applied research partnership; and Emeritus Professor Rob Whelan (University of Wollongong) who spoke about the value of long-term partnerships in relation to fire management.

A highlight of the day was the presentation by Quandamooka Yoolooburrabee Aboriginal Corporation, Queensland Parks and Wildlife Service and Healthy Land and Water. This presentation showcased a very successful collaborative approach to strategic fire management on Minjerribah (North Stradbroke Island), led by Traditional Owners and informed by indigenous fire management practices, cultural values and western fire management. This event was a true example of the value of collaboration and partnerships in fostering and delivering applied fire outcomes.

For more information, or to subscribe to the Enews service, visit: www.fireandbiodiversity.org.au.



Photo above – Current Co-ordinator Craig Weldon, former Co-ordinator’s Dr Penny Watson & Dr Cuong Tran and current Manager Dr Sam Lloyd at the SEQFBC 20th Anniversary Forum 2019



Photo above – Speakers at the SEQFBC 20th Anniversary Fire Forum, 2019

Queensland Fire and Biodiversity Steering Committee

The Queensland Fire and Biodiversity Consortium Steering Committee meets approximately four times a year to guide and support effective delivery of a high quality program. The Queensland Fire and Biodiversity Consortium gratefully acknowledges the contribution and commitment of previous Steering Committee members and the following current Steering Committee members:

- Chandra Wood (Chair) - Brisbane City Council
- Rodney Anderson - City of Gold Coast
- Bruce Bunkum - Moreton Bay Regional Council
- Paul Donatiu - Healthy Land and Water
- James Haig - Queensland Fire and Emergency Services
- Francis Hines - Queensland Fire and Emergency Services
- Peter Leeson – Member of the Institute of Foresters of Australia, Forest Fire Management Committee
- Dr Samantha Lloyd (Manager) – Queensland Fire and Biodiversity Consortium/Healthy Land and Water
- Amy McLaren - Queensland Parks and Wildlife Service
- Stephen Martin - Powerlink
- Guy Morgan - Sunshine Coast Council
- David O’Connell - Logan City Council
- Nathan Connor - Queensland Parks and Wildlife Service
- Mark Ready - Toowoomba Regional Council
- Michael Reif - Sunshine Coast Council
- Dr Tim Robson - City of Gold Coast
- Nick Swanson - Logan City Council
- Clare Rogers - Brisbane City Council
- Cuong Tran – Ten Rivers
- Lee-Anne Veage – Logan City Council
- Craig Welden (Coordinator) – Queensland Fire and Biodiversity Consortium/Healthy Land and Water
- John Young - Ipswich City Council



Photo: Dr Sam Lloyd - Manager, Queensland Fire and Biodiversity Consortium (left) and Chandra Wood - Chair, Steering Committee, Queensland Fire and Biodiversity Consortium and Brisbane City Council (right).



Photo: Queensland Fire and Biodiversity Consortium Manager (Dr Sam Lloyd) and Coordinator (Craig Welden).

Queensland Fire and Biodiversity Consortium Partners

One of the key strengths of the Queensland Fire and Biodiversity Consortium is the number and diversity of partners. Each partner organisation contributes financially and in kind and these contributions increase significantly the value, networking reach, influence, skills and knowledge potential of the Queensland Fire and Biodiversity Consortium.

The Queensland Fire and Biodiversity Consortium gratefully acknowledges support from the following partners: Brisbane City Council, The City of Gold Coast, Gympie Regional Council, Ipswich City Council, Lockyer Valley Regional Council, Logan City Council, Moreton Bay Regional Council, Noosa Council, Redlands City Council, Scenic Rim Regional Council, Somerset Regional Council, South Burnett Regional Council, Sunshine Coast Council, Toowoomba Regional Council, Powerlink, Queensland Fire and Emergency Services, Queensland Parks and Wildlife Service, Department of Transport and Main Roads and SEQ Water. This impressive list of supporting organisations (our largest to date) reflects the extensive support for the program.



NB: the Queensland Government logo represents the Department of Transport and Main Roads.

Thank you to our Sponsors



Gold – Fireland

Fireland is a Queensland privately owned and operated company specialising in land and bushfire management. Our team of professionals have a passion and strong commitment to the environment, and we assist communities in need. We strive to set the standard for land management, hazard assessment, fire management planning, prescribed burning and wildfire suppression. Fireland employ dedicated and highly skilled staff and provide the equipment, training and support to ensure every project is a success in reducing bushfire risk.



Bronze – Ausecology

Ausecology provides specialist ecological and restoration solutions at scale. The Ausecology team delivers targeted ecological services, including fire management, threatened species restoration, revegetation, ecological surveys, environmental monitoring and GIS management. The area of land managed by Ausecology for long-term conservation outcomes now exceeds 10,000 hectares (Ausecology.com).



Bronze - LRM Fire & Rescue

LRM Fire & Rescue provide professional bushfire management services. Based in Qld and NSW, our highly skilled and autonomous team facilitate all aspects of planning, fuel modification, conservation burning, hazardous tree removal, post-burn consolidation and reporting together with bushfire monitoring and response services.

Thank you to our Promotional Partners



Media Partner – NRMJobs

NRMjobs is a niche service – communicating and promoting jobs and opportunities in the environment, water and natural resource management and targeted at people who work, study or are seeking work in the environment water and natural resource management field in Australia.



Environment Institute
of Australia and
New Zealand Inc.

Promotional Partner – Environmental Institute of Australia and New Zealand (EIANZ)

The EIANZ is a not-for-profit, professional association for environmental practitioners from across Australia and New Zealand. The Institute supports environmental practitioners and promotes independent and interdisciplinary discussion on environmental issues. The Institute also advocates environmental knowledge and awareness, advancing ethical and competent environmental practice.

Program Overview - Seminar One

2020 Fire Science Seminar Series: *Facing Fire in a Changing Climate*

Seminar 1: Tuesday 10th November 9.30am - 11.00am

Welcome, First Nations Acknowledgment & Introduction

Opening Address

Deputy Commissioner Mike Wassing AFSM, Queensland Fire and Emergency Services

Keynote Presentation

Managing forest fuels and smoke, now and into the future

Dr Owen Price, Centre for Environmental Risk Management of Bushfires - University of Wollongong

Overview of the Queensland 2019 bushfire season

Superintendent James Haig, Queensland Fire and Emergency Services

Q & A Panel

Changes to fire weather in Queensland

Dr David Jones and Brenton Phillips, Bureau of Meteorology and Queensland Fire and Emergency Services

2019 - 2020 fire season overview

Nathan Connor, Queensland Parks and Wildlife Service

JIGIJA Indigenous fire training: Indigenous fire knowledge and best practice contemporary fire management

Murradoo Yanner, Gangalidda and Garawa Native Title Aboriginal Corporation

Q & A Panel & Close

Program Overview - Seminar Two

2020 Fire Science Seminar Series: *Facing Fire in a Changing Climate*

Seminar 2: Tuesday 17th November 9.30am - 11.00am

Welcome, First Nations Acknowledgment & Introduction

Opening Address

Lee Johnson AFSM, Former Commissioner of the Queensland Fire and Emergency Services, Emergency Leaders for Climate Action

Keynote Presentation

Climate change and prescribed burning: What do we know?

Dr Hamish Clarke, Centre for Environmental Risk Management of Bushfires - University of Wollongong

Q & A Panel

Powerlink/BOM strategic partnership in a changing climate

Steve Hadley and Steve Martin, Bureau of Meteorology and Powerlink

Managing for a molecule: The potential market for carbon abatement and fire management

Dr Cuong Tran and Dianna Virkki, Ten Rivers

Defining inappropriate: Reviewing research available for estimating appropriate fire regimes for ecological communities

Andy Wiechnik, University of Queensland and University of Sydney

Q & A Panel & Close

Program Overview - Seminar Three

2020 Fire Science Seminar Series: *Facing Fire in a Changing Climate*

Seminar 3: Tuesday 24th November 9.30am - 11.00am

First Nations Acknowledgment & Introduction

Welcome

Stephen Robertson, Chairman, Healthy Land and Water

Opening Address

Julie McLellan, CEO, Healthy Land and Water

Keynote Presentation

Making fire ecology useful in the climate crisis

Dr Annabel Smith, University of Queensland

Keynote Presentation

Changing fire regimes in the sub-tropics and the potential ecological responses

Dr Garry Cook and Dr Anna Richards, CSIRO Land and Water

Q & A Panel

Bonye Dargan (Bunya Country) Cultural Fire – Reconnecting country through fire practice

Paul Dawson and Damon Miri Anderson, Bunya Peoples' Aboriginal Corporation

Rapid ecological assessment: How did SEQ fare in the 2019 bushfire season?

Shannon Mooney, Healthy Land and Water

Saving an endangered bettong with fire

Chris Pocknee, University of Queensland

Q & A Panel & Close

Welcome and Opening

Lee A Johnson AFSM: Former Commissioner, Queensland Fire and Emergency Services; Emergency Leaders for Climate Action



Lee Johnson joined the QFES in 1975 and served at all rank levels across stations in Townsville, Gold Coast, Logan, Rockhampton and State HQ in Brisbane. During his career he was the President of AFAC (Australasian Fire and Emergency Service Authorities Council) 2009-2013, Board Director of NAFC (National Aerial Firefighting Centre) 2003-2015, Board Director of BNHCRC (Bushfire and Natural Hazards Co-operative Research Centre) 2013-Current. Lee Johnson also chaired a number of National Committees for AFAC including AIIIMS review and USAR National establishment.

“I consider that my achievements within QFES led to a highly effective agency across all Fire and Emergency Service disciplines in particular a much more able Rural Fire arm of QFES with strategies like the iZone, Operation Cool Burn and the Fire Behaviour Unit. I am

particularly interested in how organisations such as QFES build capacity and capability to respond to large scale natural disasters across Queensland as I am certain the state will need to deal with increasingly severe disasters over the years ahead.”

Lee Johnson is also a founding member of ELCA (Emergency Leaders for Climate Action) advocating for stronger National Bushfire Capability including increased aerial support and better Land Management with recognition of Indigenous practices and research.

Welcome and Opening

Julie McLellan: Chief Executive Officer, Healthy Land and Water



Julie McLellan has been the Chief Executive Officer of Healthy Land and Water since its inception in 2013. Julie has over 25 years' experience leading high-performance organisations and is an expert in waterway management, governance, strategy, risk and company finance.

Prior to her role at Healthy Land and Water, Julie held senior positions at Queensland Urban Utilities and Brisbane City Council and was responsible for portfolios including research and businesses development, innovation, service delivery and design.

Julie is passionate about improving the quality of landscapes and waterways in South East Queensland through strategic initiatives and productive partnerships. She understands the importance of collaboration and enjoys working closely with all levels of government, industry groups and community members on initiatives that ensure South East Queensland is protected for future generations.

Welcome and Opening

Stephen Robertson: Chairman, Healthy Land and Water



Stephen Robertson is a consulting expert in environmental sustainability and natural resource management and was elected inaugural Chair of Healthy Land and Water in 2016.

Prior to joining Healthy Land and Water, Stephen was a member of the Queensland Parliament for 20 years. He served as a senior Government Minister for 13 years responsible for portfolios including Natural Resources, Energy, Water, Mines, Health, Trade and Emergency Services.

Stephen is highly regarded for his insight and his ability to identify emerging challenges and develop strategies to effectively deal with them. He is passionate about community engagement and collaboration and is dedicated to finding science-based solutions to environmental issues affecting South East Queensland and beyond.

Stephen is a former Chair of NRM Regions QLD and Non-executive Director of Greening Australia. He is currently Chair of the Lockyer Valley and Somerset Water Collaborative and a non-Executive Director of the West Moreton Hospital and Health Board.

Welcome and Opening

Mike Wassing AFSM:

Deputy Commissioner, Queensland Fire and Emergency Services; Chief Officer, Rural Fire Service; Chief Officer, State Emergency Service



As Deputy Commissioner for the Emergency Management, Volunteerism and Community Resilience (EMVCR) Division within Queensland Fire and Emergency Services (QFES), Mike is committed to enhancing volunteerism, strengthening QFES capabilities and promoting an inclusive and supportive culture that enriches our ability to support our local communities.

He is responsible for the accountabilities for the State Emergency Service (SES), Rural Fire Service (RFS), Community Resilience and Risk Mitigation, and Volunteer Capability and Coordination within the Department, including support to approximately 37,000 volunteers.

Serving in emergency services in both Queensland and Victoria for more than 25 years, Mike has extensive experience leading the management and coordination of prevention, preparedness, response and recovery for all hazards as well as strategic control and coordination for major emergencies. He has been instrumental in driving the QFES Volunteerism Strategy and champions many initiatives in the workplace to positively change organisational culture. His most notable achievement has been increasing women's equality within the workplace by providing support, coaching and mentoring to many officers to guide their progression.

Mike holds a Bachelor of Applied Science in Environmental Management and Land Use Policy, a Diploma in Firefighting Operations and Fire Management, and a Graduate Diploma of Business (Strategic Management). He was awarded the National Emergency Medal for the 2009 Black Saturday fires in Victoria and was a participant in the Executive Fellowship Program of Australia and New Zealand School of Government 2017. In 2019, Mike received the Australian Fire Service Medal (AFSM) for consistently demonstrating exceptional leadership to enhance volunteerism in emergency services and driving organisational change.

Keynote Speakers

Dr Hamish Clarke

Centre for Environmental Risk Management of Bushfires, University of Wollongong



Hamish Clarke is a research fellow at the Centre for Environmental Risk Management of Bushfires at the University of Wollongong and is also part of the Hawkesbury Institute for the Environment at Western Sydney University. He is interested in the drivers of bushfire risk and the impacts of planned and unplanned fire, with research to date focusing on fire weather, climate change and prescribed burning. Prior to joining academia, Hamish worked for the NSW environment department. He is committed to public interest science and effective engagement with fire managers, policy makers and the general public. Hamish also runs the Blue Mountains community science initiative, Science at the Local.

Dr Garry Cook and Dr Anna Richards

CSIRO Land and Water



Dr Garry Cook is an ecologist with over three decades experience conducting research into fires in tropical savannas of Australia. He has published over 100 scientific papers on northern Australian ecology with a particular emphasis on the effects of fire on vegetation dynamics and emissions. His research has supported improved fire management in the north, with benefits to livelihoods, biodiversity and greenhouse gas abatement.

Dr Anna Richards is a savannah ecologist based in Darwin, Northern Territory. She has a broad interest in vegetation and soil dynamics in tropical savannas and the influence of land management practices on these processes. She has published a range of studies related to carbon sequestration science. She is interested in methods for monitoring soil and vegetation condition. She co-leads a project, in collaboration with the

Department of Agriculture, Water and the Environment, to develop dynamic ecosystem models for Australia's native vegetation within a framework designed to incorporate both endogenous (reference) and exogenous (recent, transformative) disturbance regimes. The framework aims to improve decision making in natural resource management, including supporting prioritisation, monitoring and evaluation.

Keynote Speakers

Dr Owen Price

Centre for Environmental Risk Management of Bushfires, University of Wollongong



Owen is a senior research fellow at the Centre for Environmental Risk Management of Bushfires, where he leads the Bushfire Risk Research Hub work package 3 researching air quality in prescribed fires.

Owen was born in Devon (UK) in 1964 and studied a degree in Biology and Masters in Information Technology. He then worked as a research assistant at the Zoology Department of the University of Cambridge. After moving to Darwin in 1992 with his Aussie partner, he worked for the Northern Territory Parks and Wildlife Commission for 13 years on such diverse projects as land use planning, fire ecology and wildlife survey on aboriginal lands. Along the way, he completed a PhD on the movement patterns of fruit-eating birds through the Australian National University. Since 2007 he has worked at the Bushfire Centre at the

University of Wollongong, researching a variety of topics around mitigating bushfire hazards. Most importantly, he has pioneered empirical research on the effectiveness of prescribed burning. In recent years, this has expanded to measuring and understanding the impact of prescribed burns on air quality.

He has written or co-written 96 peer reviewed papers and 40 reports.

Dr Annabel Smith

School of Agriculture and Food Science, University of Queensland



Annabel Smith is a fire ecologist working on the biology underlying species' responses to fire. She recently developed a model, based on a decade of field research, which describes how reproduction, movement and dispersal, population growth rates and inter-specific interactions combine to influence the responses of animals to fire. In addition to her work on native Australian animals (including reptiles and invertebrates), Annabel has worked on the fire ecology of mountain ash forests and invasive species. She has a particular interest in applying population and landscape genetics to fire ecology. Currently, Annabel is a Lecturer in Wildlife Management in the School of Agriculture and Food Science at UQ's Gatton Campus.

Web: www.smitheecology.org

Speaker Abstracts

Keynote Speakers

Dr Hamish Clarke

Centre for Environmental Risk Management of Bushfires, Research Fellow, University of Wollongong

Climate change and prescribed burning – what do we know?

A key component of prescribed burning is the specification of weather conditions that allow fires to burn at a controllable intensity i.e. within prescription. There is particular uncertainty in the effects of climate change on the weather conditions suitable for prescribed burning, in contrast to the relatively large body of research on average and extreme fire weather conditions under climate change. We estimate potential changes in the number of prescribed burning days out to 2070 in south-eastern Australia, a fire-prone area dominated by dry sclerophyll forests. Burning days are calculated from an objectively designed regional climate model ensemble using multiple definitions of suitable weather conditions.

We find that the evidence for a decrease in prescribed burning days under projected future climates is surprisingly weak. There is a complex pattern of changes, with the potential for substantial and widespread increases in the current burning seasons of autumn (March-May) and spring (August-October). The magnitude of projected changes is highly sensitive to which definition of suitable weather conditions was used, with a relatively small change for a definition drawn from operational guidelines (+0.3 to +1.9 days per year) and larger ranges for definitions based on weather observed during burns (+0.2 to +7.9 days) and a literature review (+1.7 to +6.2 days). Year to year fluctuations in the number of burning days are projected to increase slightly in most scenarios.

Our study highlights the need to improve our understanding of the weather conditions required for safe and effective prescribed burning. These quantitative estimates may help practitioners to assess their exposure to a range of potential changes in the frequency, seasonality and variability of prescribed burning weather conditions.

Dr Garry Cook and Dr Anna Richardson
CSIRO Land and Water

Changing fire regimes in the sub-tropics and the potential ecological responses

Ecosystems are highly variable and dynamic across space and time. With changing fire regimes, changing climate and invasive species, how do we know what ecosystem disturbances we need to manage for, in order to maintain different ecosystem services, and how or if we can achieve it? These changes in disturbance regimes and other environmental drivers are likely to see changing composition of ecosystems across landscapes. Fire and temperature sensitive ecosystems are likely to become much more restricted in the future.

The Australian Ecosystems Models framework provides a conceptual basis, derived from expert knowledge, for taking account of the dynamic nature of ecosystems and developing scenarios to manage transitions between ecosystem states. We provide some examples of the variation that can exist within reference ecosystem states, and a template for articulating changes to ecosystem condition when ecosystems transition to alternative states. Such states might include those likely to occur under a changing climate, with hypothesised changes in the dynamic expression of ecosystem attributes and subsequent impacts on ecological function.

The key question facing land managers is what actions can be taken that could maintain ecological integrity of a landscape while meeting other community needs. Fire management and choosing a fire regime is one of the most critical. The dynamics of ecosystems and the potential to manage those dynamics are specific to each region. We will highlight some regionally-specific examples, where the Australian Ecosystem Models framework has been used to address these issues.

Dr Owen Price

Centre for Environmental Risk Management of Bushfires, University of Wollongong

Managing forest fuels & smoke, now & into the future

Abundant fuel is a pre-requisite for bushfire, so it makes sense that reducing fuel will reduce bushfire risk. Sounds simple, but the reality is far more complicated. In this talk I will explore past and emerging knowledge about fuel dynamics in Australian forests, how Hazard Reduction (HR) burns affect those dynamics and how climate change will likely affect fuels and our ability to manage bushfire risk. Assessments of bushfire risk needs to incorporate smoke since this affects people's health. Since HR burns also produce smoke, we need to understand the trade-off between introducing HR smoke and therefore reducing bushfire smoke. The take-home messages include:

- HR burns remove ~10 tonnes/ha of fine fuels, but this varies greatly among burns.
- These recover to hazardous levels within 3-4 years.
- High severity fire promotes shrub growth which increases fuel hazard compared to the pre-fire condition.
- Fuel loads are likely to decrease in a warming world, but HR treatment will need to increase dramatically if it is to be used to prevent bushfire area from increasing.
- While the biggest smoke exposure events have been caused by bushfires (especially in the last year), HR smoke events are significant and increasing HR treatment rates are likely to increase smoke exposure.

**Dr Annabel Smith,
University of Queensland**

Making Fire ecology useful in the climate crisis

Fire ecology, as a scientific discipline, has taken great leaps in the past 15 years, with two notable developments. First, we have deepened our understanding of the biological processes behind plant and animal responses to fire, which has increased the predictive capacity of ecological fire management. Second, we have advanced understanding of how spatial patterns of fire influence ecological communities at a landscape scale, making us rethink the ‘pyrodiversity begets biodiversity’ hypothesis.

All of this work was done with the understanding that landscape change – such as habitat loss and fragmentation – must be incorporated into fire management for biodiversity. Climate change has similarly been acknowledged as likely to impact biodiversity through its interaction with fire regimes. Until this past fire season, however, the extent of this impact had not been observed in the field.

In 2018, I developed a novel, mechanistic model of post-fire population dynamics that described how key biological process influence species responses to fire. Unfortunately, the bushfire crisis of the past few months has limited the usefulness of this model. In some regions, the extent of the bushfires surpassed the tolerable limits for ecological communities predicted from historical fire return intervals. In other regions, isolated wilderness areas were entirely burnt within days – situations which models of dispersal and reproduction predict will lead to local extinctions.

Fire ecology, therefore, needs new models that draw on other disciplines. I will present an updated version of the mechanistic population model that incorporates understanding from two key disciplines: restoration ecology and wildlife management. Seeds collection and storage, revegetation, translocation and genetic management will become increasingly important, even in areas that are not otherwise impacted by human activity. For this to work however, it must be based on a strong understanding of species’ biology and the processes that shape their response to disturbance.

Presentation Abstracts

Nathan Connor

Principal Conservation Officer, Queensland Parks and Wildlife Services

2019 - 2020 Fire Season Overview

The 2019/20 Fire Season will long be remembered for its devastating impact not only on Queenslanders but the nation in general. This presentation will look to provide an overview of how the Queensland Parks and Wildlife Service (QPWS) adapted to one of the worst fire seasons experienced on record and how the lessons from 2018 factored into resource management across the state.

Key areas of focus will include:

- Analysis of preceding year's fire history.
- Contributing factors including record low soil moisture and subsequent limited opportunity to burn.
- General statistical snapshot.
- Lessons learnt and moving forward.

Paul Dawson and Damon Miri Anderson, Bunya Peoples' Aboriginal Corporation

Bonye Dargan (Bunya Country) Cultural Fire – Reconnecting country through fire practice

Significant land use and land management changes throughout the broader Bunya landscape (Bonye Dargan) has resulted in isolating the Bunya Mountains from the healthy systems that used to be strongly connected and interdependent. One of the key management tools used by Aboriginal people to maintain the health and connectivity of systems was fire. Reinstating appropriate fire across this landscape is foundational to improving health and connectivity.

The Bunya Peoples' Aboriginal Rangers have been working on reviving cultural fire practice through strategic partnerships at the landscape scale. This presentation will discuss this important work. <http://www.facebook.com/bunyarangers4BPAC>

Steve Hadley

Bureau of Meteorology

Steve Martin

Powerlink

Powerlink and Bureau of Meteorology: Strategic Partnership in a Changing Climate

Queensland's high voltage network is essential to power economic growth and enrich lifestyles across the state. In the context of climate change, Powerlink needs to adapt to ensure its network continues to deliver safe, cost effective and reliable solutions.

Powerlink is partnering with the Bureau of Meteorology to explore alternatives for integrated solutions to various climatic threats to the electricity networks. Cyclones, Fire, Hydrology, Climatology and Space Weather are amongst the considerations for possible integrated

solutions. A better understanding of climatic factors can inform Powerlink's planning, operation and maintenance decision making to benefit all Queenslanders.

Steve Martin and Steve Hadley will present the results from collaborative work undertaken between these organisations.

Superintendent James Haig

Executive Manager Bushfire Mitigation, Queensland Fire and Emergency Services

Inspector Francis Hines

Queensland Fire and Emergency Services

Overview of the Queensland 2019 Bushfire Season

The 2019/20 Queensland bushfire season saw over 6.6 million hectares of land directly impacted leading to the loss of 49 houses. These fires also impacted on significant other built, agricultural, environmental and cultural assets. Superintendent Haig will provide an overview of the key aspects of the fire season whilst Inspector Hines will provide an insight into some of the fire behaviour conditions experienced across a number of the significant fires.

Dr David Jones

Manager Climate Services, Climate Information Services, Bureau of Meteorology

Brenton Phillips

Queensland Fire and Emergency Services

Changes to Fire Weather in Queensland

Working with Queensland Fire and Emergency Services (QFES) the Bureau of Meteorology has recently completed a comprehensive analysis of observed changes in the climate of Queensland with a focus on those variables which most impact fire behaviour. Using a mix of temperature, wind, rainfall and humidity data at daily and monthly timescales for 1950-2018, the analysis has revealed substantial and continuing changes, broadly leading to a longer and more severe fire season.

Specifically, we find:

General warming, with the greatest temperature rises being evident in southwest Queensland where maximum temperatures have risen by more than 2°C.

Mixed changes in rainfall, with increases over the far north and west of the State but declines in most eastern areas which exceed 100mm in the southeast.

A quite general increase in fire danger as measured by the Forest Fire Danger Index (FFDI), which are particularly large in southern areas. In the southeast of Queensland, the aggregate fire season severity has increased by typically 25 to 50%.

Increased severity of the worst fire days in southern Queensland, with the annual maximum daily FFDI rising by 15 FFDI point or more in some parts and the number of very high fire danger days also increasing.

A general broadening of the fire season, meaning that fire danger is present for more of the year and the period of low fire risk which might be best suited to fire mitigation works is shrinking.

Further information and details on this work can be found in the associated report available at https://www.ruralfire.qld.gov.au/Bushfire_Planning/Pages/Changes-to-Fire-Weather.aspx

Shannon Mooney
Healthy Land and Water

Rapid Ecological Assessment – How did SEQ fare in the 2019 Bushfire Season?

What started out as a rapid ecological assessment of potential wildfire impacts to the Sarabah to Beechmont environments, resulted in over 10 wildfires assessed across South East Queensland during September to December 2019.

Rapid ecological and landscape assessments spatially assess wildfire extent creating a footprint of the potential fire impact zone. This intelligence is then used to evaluate the natural assets and built environment potentially affected by wildfires. Ground-truthing of the assessments results in a thorough understanding of assets affected and informs local habitat and species recovery efforts.

The natural assets assessed include Matters of National and State Environmental Significance, ecosystem services valuations, local waterway health, topography and Cultural Heritage. The 2019 wildfire footprints are now available online which will be showcased at the Forum.

Chris Pocknee
University of Queensland

Saving an Endangered Bettong with Fire

The endangered northern bettong (*Bettongia tropica*) occurs only in two populations at the western edge of the Queensland Wet Tropics region, having disappeared from more than half of its former range in the last few decades. Inappropriate fire regimes, leading to a loss of appropriate bettong habitat, are thought to be a key driver of this decline. The species requires open, sclerophyll forest in areas of sufficient rainfall to promote truffle growth, with relatively frequent burns required to maintain the habitat in this state. I am working on the largest remaining population of the northern bettong, in the Lamb Range of northern Queensland, where cool burns have been carried out at short time intervals for the last 15-20 years, and the bettong population seems to have remained stable throughout this time. I am using a combination of methods, including GPS collaring, mark-recapture surveys and camera trapping to observe the ways that these burns impact the northern bettong, both directly and indirectly, and the ways in which bettongs persist during and after the burns. Early results indicate that the cool, patchy nature of such burns is a key to bettong survival, along with the apparent extremely low densities of feral predators in the area. Working with Queensland Parks staff and Traditional Owners, my research will feed directly back into the management of this land to ensure the persistence of this vital northern bettong population into the future.

Assoc Prof/Dr Cuong Tran and Diana Virkki
Ten Rivers

Managing for a molecule: the potential market for carbon abatement and fire management

Carbon abatement through fire management has been established as a landmark environmentally judicious, economically feasible program that has the opportunity to assist land managers, especially Indigenous corporations with long-term sustainable revenue. With an increased focus on the impacts of a changed climate and the values of Cultural Burning, are

there additional avenues to explore and expand programs using fire management for carbon abatement beyond the northern tropical savanna grasslands? In this talk, we discuss the different options for expanding the program, how to best navigate the regulated frameworks and discuss ways of optimising the program. With schemes such as the Queensland Land Restoration Fund (LRF) focussed on carbon abatement, there needs to be focus on what will get best 'bang for buck' – we explore those options.

Andy Wiechnik

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Defining Inappropriate: Reviewing research available for estimating appropriate fire regimes for ecological communities

Global fire regimes are increasingly altered due to land use changes and climate change, and inappropriate fire regimes are recognised as a threat to biodiversity in state, national and international conservation legislation and frameworks. Despite decent mechanistic understanding of how inappropriate fire regimes can lead to ecological change and community collapse, there is little guidance for conservation managers as to system thresholds. Optimal or even tolerable fire regimes for individual ecosystems are often unknown. We used a systematic review methodology to examine the focus and methods of fire ecology research suitable for informing community level fire management. Recommendations predominantly target fire frequency, and other fire regime aspects are poorly researched. Fire frequency research regularly fails to describe the other aspects of the fire regime experienced by the study site, such as intensity, season, size or connectivity. While interactions with other threatening processes or geological and climatic conditions were often detected if assessed, they were not consistently assessed. Within animal fire response research there is a taxonomic bias towards vertebrates. While plant and vegetation fire response studies were most common, mammal studies were twice as likely to produce quantified recommendations, and mammal and bird studies identified threatened species four times as often as studies featuring plant species. Very few studies assessed both flora and fauna. Fungal, soil biota and below ground vegetation fire responses are major knowledge gaps. The most utilised research methods were not the methods most likely to produce quantified management recommendations. There is a need for updated guidance on the applications, limitations and data requirements of different methods available to fill fire ecology knowledge gaps for conservation management.

Murrandoo Yanner

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JIGIJA Indigenous Fire Training: Indigenous Fire Knowledge and Best Practice Contemporary Fire Management

Throughout Australia there is growing interest from governments, land managers, Indigenous groups and academics alike in utilising Indigenous fire knowledge for various environmental, social, cultural and economic outcomes. The Jigija Indigenous Fire Training Program is a wholly Indigenous owned business providing fire ecology training on the traditional country of the Gangalidda People. We share our traditional fire knowledge and teach participants to conduct controlled burns while demonstrating the planning of fire management planning different landscapes. Our program provides a unique opportunity for us to share our history and traditional

knowledge of fire ecology, together with practical lessons supported by certified accreditation in a program relevant to contemporary fire management across Australia. During this program, you will have the unique opportunity to experience the southern Gulf of Carpentaria region with Gangalidda traditional owners and view the different landscapes through the eyes of the traditional owners of this land.

While there is an increasing recognition of the efficacy of Indigenous fire knowledge and practice across Australia, the Jigija Indigenous Fire Training Program offers a practical way to integrate these insights with conventional fire management practices in present day landscapes, using a mix of traditional and contemporary skills to improve your outcomes. This course is suitable for fire practitioners, fire volunteers, Indigenous rangers, pastoralists and the mining industry who have a role in the management of landscapes. Find out more at www.jigija.com.au



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