EWWF

The England & Wales Wildfire Forum

WILDFIRE CONFERENCE

CARDIFF 2019

BOOK OF ABSTRACTS

Table of Contents

Section 1 : Keynote Presentations

Joining FRS with scientists to better understand wildfire

Claire Belcher, wildFIRE Lab, U. Exeter, c.belcher@exeter.ac.uk
Losiak, Al., wildFIRE Lab, U. Exeter
Elliott, A., wildFIRE Lab, U. Exeter; WildfireTAC
Clay, G., Geography, U. Manchester

Abstract

The UK has a relatively unique set of ecosystems, that are partially created by land management practices and sit amongst a rural-urban interface that present challenges both to fire and rescue services (FRS) and scientists in their understanding of fire behaviour and the impacts of fire on ecosystems.

Both FRS and scientists are interested in gaining knowledge of how fire behaviour varies in UK wildfires and how we can work together with land managers to understand fuel conditions, the resulting fires and build true
prescription burns that will work with safety and ecosystem resilience in mind.

One of the most frustrating things for scientists is their lack of ability to react rapidly to wildfires occurring in the UK, it is not always possible for them to reach the location of a fire or indeed be allowed access to a burning area for safety reasons. This limits our ability to gather information from wildfires, such as observations of flame height, rate of spread and heat variations across the burned area. This is in contrast to fire and rescue services that have first hand experience and access at the time of the fire. This leaves the field with disjointed information making it hard for both parties to work together to improve our ability to manage fuels and understanding fire behaviour, fire threats and protect our natural landscapes and communities in the face of future climate challenges.

Our aim is to interface with FRS to co-design and develop small monitoring equipment that can be deployed by FRS into wildfires and by those undertaking prescribed or management burns to will gain an array of information. In this poster we will present some prototype ideas that include items such a cheap disposable energy sensors and sticks with heat sensitive paint. This is with the aim that the equipment should be simple to deploy and not influence fire fighter safety. The equipment and deployment strategies must be co-designed
by scientists and FRS together if this approach is to work, so we hope that the FRS community will be interested to extend their links with us to work together so that we can better understand and manage UK wildfires.

Key words:

Fire behaviour, Monitoring, fire management, prescribed burns

6th Generation wildfires and landscape management

Marc Castellnou, Bombers GRAF. Catalonia Fire Service, mcastellnou@gencat.cat

Abstract

During recent years fires have been showing extreme Fire-line intensity (FLI) and have been spreading faster than expected. Some of the biggest fire events ever recorded had been happening in Europe during October 2017 fires, when some fronts that afternoon were burning at a pace of 14000 ha/hour. Those fires where the first to be classified as 6th generation wildfires in Europe. This fire behavior evolution is a global trend but is specially increasing in central and northern Europe, where a change to a more urban society, lack of landscape management and recent trend to mild winters and hot and dry summers are creating a Portuguese-like environment prone to Extreme Wildfire Events. Socioeconomic and climate change are the ones to blame but also fire paradox effect. Answer to the extreme fire events normally is a fear driven policy that concentrates action on and buildup of firefighting resources. But lessons learned from different experiences worldwide, clearly show that only reducing energy available in our landscapes seems to have a real effect in decreasing fire behavior ROS or FLI. This is because fire behavior depends on fuel load among weather and topography. Managing fuel, we manage fires, and that is a lesson learned that has been working when applied, until today.

Last fires around the planet are showing a new trend, already seen in UK in 2018 season: Fire dynamics itself can overrun the effect of fuel load under the climate crisis effect. What we know of those extreme events? What should we incorporate in our risk management and landscape Planning? Future ahead is challenging, but some lessons can already be discussed to fix a new strategy

Key words:

EWE, 6th Generation, fire behavior, fire paradox, fire ecology, climate change

Why is FireSmart not happening

Alexander Held, European Forest Institute EFI, Resilience Program, alexander.held@efi.int

Abstract

Hundred or more years of firefighting and accumulated expertise in firefighting have formed a strong institutional memory and fire culture. As human beings we rely on past experience and history to provide direction into the unknown future, as hardly anything is really new and we can indeed find useful expertise in the past.

Now, we are facing destructive disaster fires more regular than ever in the fire prone countries and we are facing increasing fire occurrence in countries that still have to accept this disturbance agent as something new of the future. In the fire-experienced countries we observe all too often a "past-expertise" approach in managing fires, i.e. doing the same but better. And we are witnessing that this all too often does not work anymore. (Portugal, Greece, California). In the "new fire countries" we basically start managing fires without that past expertise, or limited past expertise and we orientate the "how-to" naturally along the expertise of the fire-experienced countries. Despite the fact the one can observe some mistakes, challenges and growing helplessness.

On the contrary, we do have wast expertise and knowledge available also on indigenous fire management, historical fire-use by farmers, etc. All this without news and records on disaster fires and excited discussions on aerial firefighting (like in Germany). We do have knowledge repositories on the WWW, fire wise concepts and even a EU publication on "Sparking fire-smart policies".

So in theory, the knowledge and means and tools to change the fire paradigm, to orientate and guide past fire management expertise with new (or very old) thinking towards a new "living with fire" paradigm are available. Yet, with this presentation I would like to provoke the discussion why FireSmart is not happening on landscape scale and what we as the fire community can do to overcome those hindrances and challenges before we have to learn the hard (and hot!) way.

Key words:

FireWise, FireSmart, "Living with Fire"

Past and future fire weather hazard for the UK

Matthew Perry, Met Office, matthew.perry@metoffice.gov.uk

Abstract

The prolonged period of hot, dry weather during the summer of 2018 led to severe fire weather conditions and the outbreak of several large wildfires across the UK. Satellite-derived spatial data of burnt area and time series of fire weather indices calculated by the Met Office Fire Severity Index model (MOFSI) model are used to put this season into context compared to past trends. The MOFSI model, an implementation of the Canadian Fire Weather Index, uses temperature, humidity, rainfall and wind speed information to estimate how the weather conditions would influence a wildfire should one be ignited.

Climate change has already led to an increasing trend in air temperature and changing patterns of rainfall across the UK, and this will be shown using observed datasets. A new set of climate model projections, UKCP18, has recently been released, and provides the most up-to-date assessment of how the UK may change over the 21st century. For example, the projections suggest an increased chance of hotter, drier summers.

New research being undertaken is looking at how climate change is projected to affect the weather-related wildfire hazard. UKCP18 data have been used to generate future values of fire weather indices, which are compared to those for a baseline period. Initial results show that high fire danger levels are projected to become more frequent, more widespread and more severe during the 21st century.

Key words:

Climate change, trends, fire weather hazard

What we mean when we say ‘Fuels’: finding the story of fuels and fire in our work and media

Ron Steffens, Wildfire Magazine (International Association of Wildland Fire),
editor@wildfiremagazine.org

Abstract

As an editor of wildfire writing and as a student, trainer and practitioner of wildfire management around the globe, it’s easy to follow the flames. But it’s the fuel that comes before the flames. Yet in a recent issue of Wildfire Magazine, some version of the word “fuel” appeared 26 times (out of 40 pages of print) while “fire” appeared a whopping 600 times. Equally telling, both words were almost always some form of noun — a label — and not a verb — an action. In the practice of fire and fuels management, though, it’s the verb forms that are key — we fire out a line, we fuel up a truck or chainsaw. Here, then, are some stories of fueling up our fires — as learned in Africa, Europe and the United States — and some thoughts on how the way we tell our fuel stories may shape our success in managing the fuel-and-fire challenges we face.

Key words:

Fuels management; global story of fuels

Mafra County - Case study of Wildfire management in Portugal

Carlos Júlio Trindade, Mafra County Civil Protection Service , trindade.cjb@gmail.com / gtf.mafra@cm-mafra.pt

Abstract

The Portuguese forest is a reflection of the richness and diversity of the forest patrimony, together with the constant and dominant influence of mankind over the centuries. The forest area has increased significantly between the nineteenth and the late twentieth centuries due to public policies and private actions of forestry plantations. In the public area, more than 1 million hectares were forested. However, and with the increase in the number of fires and burnt areas (particularly in heavily forested areas and low demographic presence), since 1995 the forestry area has failed to increase and even decreased slightly (-4.6%) in 2010.

In the 1960s the traditional rural society foundations are weakened. Growing industrialization in coastal areas, the big city services and the reconstruction of Europe attracted people that were no longer useful to a mechanized agriculture, and the depopulation of the interior begins. The land was abandoned, the shrub lands increased, and the natural wildfire breaks disappear.
In Portugal, when the wildfires increase, politicians chose to work on the symptoms of the problem, on the fire, rather than acting on its causes.

The Wildfire Defence System ("System") is trapped in the fire suppression, where through physical and political interactions a vicious cycle has set in. This cycle works like this: the lack of prevention increases the forest fuel loads, which produces larger fires that mobilize public opinion, which calls for government action. This pressure forces the politicians to have short-term results, they invest in firefighting systems which consequently increases costs in this area in detriment of investing in the prevention.

Since 2006, the Municipality of Mafra , has been working together with the various local civil protection agents on the application of a "fire control model". Through legislative tools, fuel management (prescribed fire is one of the main tools), first response and combat, we have achieved good results, which allows us to classify the wildfires problem as "controlled". However, it leaves us exposed to an extreme wildfire event, because of the increasing fuel loads. In 12 years, the Mafra municipality left the classification of county with many wildfire incidences and considerable burned area, for one county with few incidences and small burned area - classification of the Forest Defence National Plan.

Key words:

Fuel Management; Wildfire Defence System; Mafra

Section 2 : Oral Presentations

Firewise UK - Dorset

Paul Attwell, Urban Heaths Partnership, paul.attwell@dorsetcouncil.gov.uk
Lin Kettley, Urban Heaths Partnership

Abstract

Every year, wildfires burn in Dorset on our heathland and forested sites, these fires threaten people, property, habitat and wildlife. The Urban Heaths Partnership (UHP) works with partners to engage a number of intervention methods to reduce the number of these fires.

In 2016 we were introduced to the Firewise Communities programme, an international programme lead by the National Fire Protection Association of America, the concept being that by working together residents close to areas at risk from wildfire can make their own property and their neighbourhood more resilient to the risk. We decided to pursue the idea of rolling out Firewise in Dorset, developing it from the Firewise USA programme.

Funding was secured to run a pilot project until March 2020 from the UHP, Dorset Police Commissioners Office and Dorset and Wiltshire Fire and Rescue Service (DWFRS). Information leaflets and webpages (hosted by DWFRS) have been produced in consultation with partners and key stakeholders. Our first pilot community has been set up for almost a year and is operating successfully, we are now starting to set up our next communities.

We continue to work collaboratively with NFPA on community engagement and research, Lin Kettley, the Project Assistant is due to fly out to America in June to attend and present at their annual conference and gain first-hand experience how their programme works across many countries, being part of this international programme is a great privilege and could make a real difference to our communities.

Key words:

Firewise UK, wildfire resilient communities

An Interactive Wildland Urban Interface Wildfire Risk Assessment Tool

Jonathan Bell, NCC Environmental Services (Pty) Ltd, jonathanjab@ncc-group.co.za
Dean Ferreira, NCC Environmental Services (Pty) Ltd, deanf@ncc-group.co.za

Abstract

Compilation of a Wildfire Risk Assessment for the North and West Wards of the Cape Peninsula Fire Protection Association (CPFPA) within the boundaries of the City of Cape Town.

The need for urban development and the reality of urban sprawl in a fire-prone environment results in a Wildland Urban Interface (WUI) along-which the risk of wildfires to assets and to human life is of real concern. NCC Environmental Services has identified, assessed, mapped and prioritised the wildfire risks in the CPFPA's North & West Wards. The tool includes interventions to reduce the risk. The benefits of such an assessment for management agencies, private landowners and communities are numerous and can be summarised as follows:

1. Decisions for the allocation of resources become defensible, supported by concrete data.
2. A visual, practical assessment is a strong base for raising fire awareness with those who might otherwise not maintain their individual defensible spaces;
3. It is a strong base for motivations for management interventions, such as alien clearing, prescribed and stack burning and the availing of necessary suppression resources;
4. The risk to life and to economy may be graphed over time, showing mitigation, improvements or concerns and compared to other areas.

One of the outcomes of this ongoing project is an ArcGIS Online (AGOL) web mapping application that graphically and interactively maps emergency service response time, slope, land use and fuel characteristics that allows for implementation of an interactive widget-based decision support tool that decision makers and firefighters can use for integrated wildfire management.

Key words:

Wildland-urban interface, AS/NZS ISO 31000:2009, GIS, ArcGIS Online, Integrated Wildfire Management, Wildfire planning, preparedness and response, Collaboration

Wildfire management to prevent uncontrollable wildfires

Nienke Brouwer, Institute for Safety and Netherlands Fire Service, nienke.brouwer@ifv.nl

Abstract

To be able to manage the fuel in order to reduce the risk you need to know the amount of fuel and structure to determine the potential risk. The institute for safety (the Netherlands) performed fuel research in the Netherlands and UK. The fuel research is conducted to gain information about the biomass type and size of the vegetation. With this information twenty custom fuel models for North West European vegetation were created and validated. These fuel models are used in the Dutch Wildfire Spreadmodel. This model simulates the potential rate of spread of a wildfire. This information can be used during an incident but moreover for risk management by making scenarios of potential wildfires. Besides the amount of fuel there are other factors that determine the risk and effect of an uncontrollable wildfire. With the Risk Index Wildfires the Netherlands Fire Services can determine the risk of an uncontrollable wildfire per square kilometre by combining seventeen different parameters. In order to translate the information about the fuels to a location a vegetation map is developed with satellite data with a 12 meter resolution tailor-made for the Netherlands Fire Service. This map is implemented in the Wildfire Spreadmodel and the Risk Index Wildfires. Both application are necessary to conduct wildfire prevention measures, a cooperation between safety regions and land owners.

The above described projects and applications are part of the National Programme of the Netherlands Fire Service. With this programme we try to to make the risk on an uncontrollable wildfire as small as possible.

Key words:

wildfire prevention measures, fuel management, Risk Index Wildfires

Wildfires, Insurance and Recovery in the Blue Mountains, Australia

Dr Christine Eriksen, University of Wollongong, Australia, ceriksen@uow.edu.au

Abstract

Post-disaster accounts of insurance experiences have largely been confined to government reports and submissions. For the 2013 Blue Mountain wildfires in New South Wales, Legal Aid NSW reported that high rates of under-insurance only became apparent to claimants post-disaster, and that a lack of information or misinformation from insurers was contributing factors to under-insurance. This paper examines wildfire survivors' experiences of recovering, rebuilding and relocating. In connection with the fourth anniversary of the 2013 Blue Mountains wildfires, interviews were carried out with residents whose home or property was destroyed or damaged by the wildfires. The interviews examined how residents prepared for and recovered from the wildfires, and the means and support networks that assisted the recovery process. This paper will specifically focus on how house and contents insurance (or the lack thereof) impacted: i) perceptions of vulnerability and resilience, and ii) decisions to rebuild or relocate.

Key words:

risk communication, recovery, under-insurance, coping capacity

Fire at Will: Managing Wildfire on Military Land

Duncan Glen, Landmarc Support Services Ltd & Defence Infrastructure Organisation,
duncan.glen@landmarc.mod.uk
George Peet, Landmarc Support Services Ltd & Defence Infrastructure Organisation

Abstract

The Defence Training Estate covers approximately 240,000 hectares of land within the UK. It's primary use is to train armed forces whilst balancing the requirements of a wide range of other sustainable land uses such as forestry, agriculture, natural and historic environments and public access.

Many of the training estates are in remote upland locations but all habitat types are represented. Due to the nature of military activity including live firing and use of pyrotechnics, these places are particularly susceptible to wildfire particularly in the face of changing climatic conditions.

With the use of case studies, this paper will explore the unique challenges faced by the managers of the DTE in terms of the process of reducing the overall risk, wildfire prevention measures, dealing with incidents that do occur, wider land use management to reduce fuel loads and the need to take into account issues such as unexploded ordnance.

Examples of post-wildfire mitigation projects will also be presented and an analysis of potential opportunities that arise from wildfire events.

Key words:

Military Training, Prevention, Management of Risks. Mitigation, Opportunities

Experimental investigation of the role of fuel load, fuel structure, and environmental conditions on low-intensity prescribed fires

Rory Hadden, University of Edinburgh, UK, r.hadden@ed.ac.uk
Zakary Campbell-Lochrie, University of Edinburgh, UK
Carlos Walker-Ravena, University of Edinburgh, UK
Eric V. Mueller, University of Edinburgh, UK
Simone Zen, University of Edinburgh, UK
Michael Gallagher, USDA Forest Service, USA
Nicholas Skowronski, USDA Forest Service, USA
Kenneth L. Clark, USDA Forest Service, USA

Abstract

The use of low intensity fires is a common land management technique across the globe. Such fires can be used primarily for wildfire risk reduction, or for habitat management and agricultural reasons. Despite the use of low intensity fires on the landscape, there remains relatively little quantitative information on the processes which control these fires and the effect of the environmental and fuel variables on the fire behaviour. Using a series of 15 highly instrumented, low-intensity experimental fires in the New Jersey Pine Barrens, the effect of fuel loading, structure, and moisture, as well as environmental variables such as wind and relative humidity on fire behaviour were measured. Measurements of burning rate, temperature and plume characteristics were made to allow characterisation of the fire dynamics. Fuel structure and fuel load were manipulated to explore the effects on fire behaviour and ambient weather conditions were recorded at immediately adjacent to the
burn unit. Fire behaviour was characterised by the spread rate and flame height. In general, increasing the fuel load resulted in an increase in the spread rate and flame length however it was observed that these effects could be overwhelmed by the environmental variables, most notably the ambient wind. Fire behaviour was also sensitive to the relative humidity with high resulting in lower spread rates. Manipulating the fuel structure (increasing the bulk density) resulted in lower spread rates. Quantifying the effect of these variables on the fire behaviour will allow land management practices to reach desired outcomes and will inform laboratory studies of fire spread phenomena.

Key words:

flame spread, fuel structure, prescribed fire

Fuel Reduction through Vegetation Management in the Cheviot Hills

Bruce Hardy, Northumberland Fire and Rescue Service, bruce.hardy@northumberland.gov.uk

Abstract

This presentation will explain the benefits and limitations of fuel load reduction through the management of vegetation for livestock such as sheep, cattle and game birds. It will present examples of different practices used in the Cheviot Hills in Northumberland.

The presentation will begin by explaining the different requirements and techniques used to manage vegetation for different animals and game birds. It will also compare the risks and benefits associated with prescribed (or controlled) burning and cutting vegetation and how these different practices can affect potential future fire behaviour during wildfire incidents. The presentation will then discuss how and why vegetation management should be considered and applied at a wider landscape level through the strategic identification of key areas for burning and/or cutting. This strategic approach can provide significant benefits in terms of managing vegetation and fuel loads in areas that present significant risk for the spread and control of potential wildfires. This approach can also help to provide better protection for particularly sensitive or valuable sites. The presentation will conclude by explaining the mutual benefits to the Fire and Rescue Service, land managers/owners and other key stakeholders in adopting a collaborative approach to vegetation management. In particular, the presentation will highlight the positive outcomes that can be achieved through the exchange of knowledge, experience and good practice, the sharing of equipment and personnel and joint training.

Key words:

Land management, fuel management, prescribed burning, cutting, collaboration

Healthy Hillsides

John Jenkins, South Wales Fire and Rescue Service, j-jenkins@southwales-fire.gov.uk

Sarah Woodcock, Wildlife Trust Wales

Abstract

This presentation is about how over the last 2 years a number of organisations have come together to form a partnership that 'Work together in South Wales to sustainably manage and enhance the natural environment, reduce the risk of wildfires and improve the health and well-being of people and communities.'

Our objectives are

1) Continue the 'on the ground' approach, testing new collaborative ways of working, this includes developing management plans for the eight identified sites.

2) Test and inform the approach against legislation and policy, using evidence and research. 'Raise the profile of collaborative approach with Public Service Boards (PSB's), partner organisations and local communities, through Area Statements, and by ensuring good communication between project partners.'

We would like to share how we got this point what we are currently working on and what in the future we aim to achieve.

We feel that by sharing our experiences successes and failures other interested parties may want to form similar groups or carry out similar workstreams.

Key words:

Partnerships, Prevention, Value

The impact of wildfire on contaminated moorland catchment water quality

Nicholas Kettridge, University of Birmingham, n.kettridge@bham.ac.uk

Emma Shuttleworth, University of Manchester
Jonay Neris, Swansea University
Stefan Doerr, Swansea University
Cristina Santin, Swansea University
Claire Belcher, University of Exeter
Gareth Clay, University of Manchester
Danny Croghan, University of Birmingham
Stefan Krause, University of Birmingham
Alex Hurley, University of Birmingham
Kieran Khamis, University of Birmingham
Angeliki Kourmouli, University of Birmingham
Samantha Leader, University of Birmingham
Sami Ullah, University of Birmingham

Abstract

The large-scale, high-severity Saddleworth wildfire burned over 1000 hectares of moorland surrounding key water supply reservoirs. The burn is situated in the heart of a formerly industrialised region that has been exposed to high atmospheric deposition of contaminants such as heavy metals. Such wildfires and the concurrent drought are projected to increase in frequency under future climate change, posing unknown risks to UK industry and public health due to the importance of these upland areas as drinking water sources. Utilizing the Saddleworth wildfire, we characterise down-stream moorland water quality immediately post fire and through recurrent rainfall events in response to the compound impacts of extensive, severe wildfire and extreme drought conditions.

Concentrations of lead within the ash were up to 4500 ppm, higher than any concentrations observed previously within nearby unburned moorlands. This suggests that the combustion concentrates atmospherically derived contaminants within organic soils. However, high metal concentrations did not lead to acute stream water contamination. The first post-fire storm event, anintense 30 mm precipitation event, induced in-stream lead concentration up to 0.76 ppb. During the first high turbidity autumn storm event, peak lead concentrations increased to 4.6 ppb. These concentrations are within previously observed limits of unburned moorland catchments. This is likely due to any contaminants being strongly bound within ash deposits. However, despite the low severity of the immediate water quality response to fire, concentrated heavy metals may provide a potential chronic impact on water quality if subsequently transported through leaching or sediment erosional processes.

Key words:

Water quality, moorland, Saddleworth

Why there are so few forest fires in Finland?

Henrik Lindberg, Häme University of Applied Sciences, henrik.lindberg@hamk.fi

Abstract

Recently Finland has gained increasing reputation as forested country with surprisingly small risk of wildfires. E.g neighbouring Sweden with relatively similar vegetation and weather conditions faced problematically large and severe forest fires during summers 2014 and 2018, whereas in Finland, despite similar warm and dry circumstances, no major fires occurred.

The Finnish forest fires have decreased significantly during last century, with especially steep decline during 1950`s and 1960`s when the annual burned area dropped from thousands or even tens of thousands burned hectares to hundreds. After that the annual wildfire areas have stabilized to an annual average of 500-600 (0,03/1 000) hectares with occasional peak years of over 1 000 hectares. The average fire size has respectively decreased to under 0,5 hectares.

There are probably many reasons for the small areas burned by wildfires in Finland and the current situation is arguably a combined effect of “arrows pointing to same direction”. After WWII a heavy effort was put to strengthen fire suppression e,g by developing a watchtower network which was later replaced by airplane patrolling. Yet it is highly probable that also changes in forest structure, both stand and landscape level, explain the decline. In post-war forest management policies, the forests were transformed by clear-cutting and thinning to even-aged, mostly pine-dominated stands reducing fuel load and decreasing crown fire risk. This was made possible by building a dense and extensive forest road network, which functions as fire breaks and improves the accessibility of fire trucks, thus helping the fire suppression.

Key words:

fuel management, forest fire suppression

Forest fire probability mapping in Serbia using logistic regression

Slobodan Milanovic, Faculty of Forestry University of Belgrade, slobodan.milanovic@sfb.bg.ac.rs
Nenad Markovic, Faculty of Forestry University of Belgrade
Jovana Bjekic, Faculty of Forestry University of Belgrade
Sladjan Milanovic, Faculty of Forestry University of Belgrade

Abstract

Due to climate changes, the incidence and size of forest fires increase from year to year in the Republic of Serbia. Only in 2007, more than 30000 hectares of forest land was burned and 16000 hectares of forest land were destroyed. The value of the wood loss was estimated at 40 million euros. An information system with forest fire probability estimation component is recognized as an effective tool to decrease the area of burned forest in the Republic of Serbia. Therefore we have gathered historical data about forest fires that occurred in Serbia for the period 2012-2017. For each fire event, we collected a set of various data regarding fuel type, topography, and human activity. At the same time, we have generated raster values of the Canadian fire weather index (FWI) and the grid of 1 by 1 km for the Eastern part of Serbia. Also. the same set of data as those for fire events were collected or generated for each cell in the grid. According to the fact if the fire event happened in the sample period or not, each cell in the grid is described as positive or negative. To find a pair of each "positive" cell, the propensity score matching method is applied with the FWI as matching criteria. After that, logistic regression was performed to define a probability of fire occurrence for each cell, with fuel type, topography and human activity factors as predictors. According to the obtained probabilities for each cell in the grid, the probability map for forest fire occurrence was created.

Key words:

Forest fire probability, logistic regression, fire weather index, Eastern Serbia

PERIL: toolkit for the design of wildfire trigger buffers in WUI evacuations

Harry Mitchell, Hazelab, Imperial College London, HM2315@ic.ac.uk
Guillermo Rein, Hazelab, Imperial College London

Abstract

Wildfires are an issue that impact millions of people across the planet each year, in a wide range of regions across the planet. The associated risk to person and property is increased significantly when a wildfire transitions from wildland to a populated area (known as the wildland-urban interface, or WUI). To minimise the risk of potential loss of life, evacuation of the local population is a frequently considered strategy by forest fire services. In order to prepare safe and controlled evacuations and uncertainty of the potential risk a wildfire holds, an evacuation is often not triggered immediately at detection of a wildfires presence.

Evacuation triggers can be used to determine when and where an at-risk populated area should begin evacuation. In practical application, wildfire evacuation triggers are rarely implemented, but when done they are often formed from either an arbitrary perimeter around the urban area or from trivial landmarks; however, this is not safe because it does not usually take into account how the weather, topography and type of forest impacts the rate and direction of fire spread. It is therefore necessary in future work to develop methods of calculating evacuation triggers and inform evacuation strategies in the WUI. The project has developed a novel method and tool known as PERIL (Population Evacuation trigger algorithm) for generating "trigger buffer" perimeters around any populated area in a WUI site. It describes the boundary at which the available evacuation time is equal to the required evacuation time (multiplied by a safety factor). This perimeter dictates that when any fire intersects the perimeter an evacuation of the population should be triggered, giving enough time for evacuation. This was achieved using fire spread modelling simulations, and applying output data from these to determine minimum fire travel times using shortest path algorithms. This was tested using a range of scenarios, and then used to design the trigger buffer perimeters for Swinley forest in Berkshire, UK, which burnt in 2011. This tool has potential to be applied worldwide to inform wildfire strategies and provide safer WUI communities.

Key words:

Wildfire, Wildland-urban interface, Population evacuation modeling

LOCALLY LED - European Innovation Partnership (EIP)/ Rural Development Programme (RDP) approaches to Fire management in Irish Uplands

Ciaran Nugent, Department of Agriculture, Food and the Marine, IRELAND,
ciaran.nugent@agriculture.gov.ie

Abstract

Fire is an increasingly visible issue in many upland areas of Ireland, and greater emphasis is now required on land management approaches to fire risk reduction and fuels management. A viable upland farming sector is central not only to vegetation and fuels management in upland areas, but also to successful biodiversity outcomes in these landscapes.

A wide variety of projects are currently being undertaken under the DAFM EIP/locally-led schemes programme in Ireland with the aim of assisting this. DAFM is now investing €59m in 23 of these new types of schemes. Projects go through a rigorous design and selection process before being approved for funding.

Current projects cover a variety of land types and thematic areas. Some of these projects focus on particular landscape areas, with broad farm viability and biodiversity objectives, while other large scale projects with nationwide coverage are focussed on the delivery of results based measures targeting conservation of individual species, such as the Hen Harrier and Freshwater Pearl Mussel. Fire poses a major risk to some of these species.

A number of projects currently underway contain specific fire management measures, including the use of prescribed fire and training for landowners to support and underpin upland farming and vegetation management, and towards improving the safety and effectiveness of fire use by local landowners.

This presentation will outline the types of measures being undertaken, with practical examples drawn from a number of projects in different regions of Ireland. The presentation will demonstrate how locally led approaches can influence fire outcomes in fire prone landscapes.

Key words:

Fuel management, uplands, fire risk, biodiversity, farmers

Expanding collaborations through the Pau Costa Foundation: from theory to practice

Nuria Prat-Guitart, Pau Costa Foundation, nprat@paucostafoundation.org
J Vendrell, Pau Costa Foundation
S Lahaye, Pau Costa Foundation
H Ballart, Pau Costa Foundation
M Borras, Pau Costa Foundation
O Vilalta, Pau Costa Foundation

Abstract

Collaborations between fire managers, researchers, industry and society are fundamental to identify and develop solutions that effectively address wildfire risk reduction. Since 2011, the Pau Costa Foundation (PCF) serves as a coordination platform and contact point for exchanging knowledge on fire ecology and wildfire and crisis management at an international level.

PCF works for and with the fire community to foster the exchange of science, lessons learned and experiences on a range of topics that focus on the current wildfire challenges. Often, this is done through engaging different actors in projects that address socio-ecological challenges at local and regional scales. The Foundation also creates and supports initiatives that aim at exchanging fire management knowledge among the fire communities world-wide. Following a proactive strategy, PCF is making the existing knowledge accessible to other regions and this is helping to develop sustainable, efficient and useful research and innovation projects and services.

In this presentation we analyse the current gaps and opportunities to engage all the actors that play a role in wildfire risk reduction and propose some study cases where PCF is playing a role as facilitator. We identify essential aspects for effective collaborations, strengths and weaknesses of regional and international collaborations and opportunities given the present wildfire challenges.

Key words:

cooperation, engagement, wildfire challenges, co-production, knowledge exchange

Effectiveness of community-based initiatives for mitigation of land degradation after wildfires.

Sergio Prats, UA-CESAM (Portugal), sergio.alegre@ua.pt
Pablo Sierra-Abain A Rente do Chan (Spain)
Alvaro Moraña-Fontan A Rente do Chan (Spain)
Luis Sampedro, Mision Biológica de Galicia-CSIC (Spain)
Xoaquin Moreira Mision Biológica de Galicia-CSIC (Spain)
Felisa Covelo, Universidad Pablo de Olavide (Spain)
Rafael Zas, Mision Biológica de Galicia-CSIC (Spain)

Abstract

In October 2017 a wildfire burned 2900 ha in Pontecaldelas (Galicia, Spain). The local communities implemented a set of land degradation mitigation techniques based on recent research findings. During November and December 2017 local voluntary field crews (20-30 persons) applied three post-fire mulch treatments and one ecosystem restoration measure in burned slopes. The three mulch techniques were: the classical straw mulch at a rate of 2 Mg ha-1 (straw), a new mulch based on corn residue mulch on all the plot surface at 4 Mg ha-1 (corn) and corn residue mulch on a strip at the half-bottom of the plot at 1 Mg ha-1 (corn strip). The ecosystem restoration measure consisted in Quercus robur acorn planting (n=512) in untreated and straw mulched burnt sites. The aim of this study was to assess the effectiveness of mulches to reduce erosion with sediment fenced plots and introduce authoctonous tree species by acorn planting.

Soil erosion during the first post-fire year ranged between 9 and 21 Mg ha-1, and mulching was very effective for decreasing soil erosion with straw (94% less erosion than in untreated plots) as well as with corn and corn strip mulches (95 and 77% less). Acorn germination in August 2018 was a bit higher (8%) in mulched plots than on untreated plots (5%). Plant height was also greater in mulched than in untreated plots (100 versus 62 cm). Overall, mulching strongly reduced post-fire soil erosion, while acorn planting was not adequate for ecosystem restoration.

Key words:

Wildfire, mulching, post-fire erosion, community-based

The evolution of fire traits in plants, plant invasives and wildfire challenges

Andrew C. Scott, Department of Earth Sciences, Royal Holloway University of London, A.Scott@rhul.ac.uk

Abstract

The diversity of plant flammability creates a significant challenge for those involved with wildfire, either in terms of fuel management or fire suppression. Wildfire has been a significant part of the Earth System for over 400 million years but it was probably during the “high fire” world of the Cretaceous (around 100 million years ago) that a number of plant groups developed traits that are associated with fire. Some of these allow the plants to survive fire, some need fire for their survival and some may even promote fire. This presentation considers the development of many of these such as thick bark especially in Pines, post-fire re-sprouting in woody species such as Eucalyptus and fire-stimulated germination as in a range of flowering plants.

The problem of fuels and fire comes not only from native plants such as gorse (Ulex europaeus) with typical fire return intervals of 5-20 years and also with significant flame heights that also act as a ladder or bridging fuel, brooms (Cytisus scoparius) (both perennials that spread easily and are extremely flammable because of their oil content) and holly (Ilex aquifolium) (oils found in the thick skin of holly leaves produce a flammable vapour when heated, which causes them to ignite easily), but also from plant invasives (or even planned introductions including Eucalyptus and some grasses) that have severe implications for fire occurrence and management. I shall consider the implications of not managing fuels in a changing climate.

References

Scott, A.C. 2018. Burning Planet. Oxford University Press.
Scott, A.C. 2020 (forthcoming Feb/Mar). Fire. A very short introduction. Oxford University Press.

Key words:

Fuels; Flammability; Evolution; Hazard

Estimating the Impacts of Wildfire on Ecosystem Services in California

Emma C. Underwood, University of Davis, California, USA and Southampton University, UK,
eunderwoodrussell@ucdavis.edu

Abstract

Chaparral-type shrublands characterize the world's Mediterranean-type climate regions. In southern California they are the most extensive ecosystem and dominate the four southern US Forest Service National Forests. Wildfire is a natural disturbance in California's shrublands and critical for its healthy functioning. However, a rise in anthropogenic ignitions has resulted in increased fire frequency, which is having disastrous effects on property and human lives and incurring millions of dollars in suppression costs. Less obvious, though, are the intangible environmental impacts of wildfires – the consequences on the provision of ecosystem services to the millions of people who live in close proximity in some of the fastest growing cities in the USA. Our study estimates six ecosystem services in shrubland-dominated southern California: carbon storage, water runoff and recharge, sediment erosion, recreation, and biodiversity, and quantifies the impacts of wildfire. The removal of vegetation post-fire increases water runoff, recharge, and sediment erosion (with often drastic consequences for downstream communities), and decreases carbon storage immediately post-fire. Moreover, frequent short-interval fire is causing the type-conversion of native shrubs to invasive annual grasses. Understanding the ecological, financial, and social impacts of wildfire can be used to assess environmental damages caused by wildfire and help guide post-fire ecological restoration.

Key words:

Ecosystem services, management tools, Mediterranean-type ecosystems, National Forest

Supporting Fire Incident Commanders to Manage the Fuel

Shaun Walton, National Fire Chiefs Council - Wildfire Tactical Advisor Lead Officer,
shaunwalton@lancsfirerescue.org.uk

Abstract

Due to UK land management restrictions in relation to managing fuels and changes in land management/use even with best endeavours in future years wildfires are envisaged to occur in the UK with more intensity and with greater frequency. These wildfires require Fire Incident Commanders to make tactical decisions to effectively manage the risk posed by wildfires. these decision can be based on information gained from Partner Agencies and Wildfire Tactical Advisors.

Interpretation of the fuel (vegetation) in terms of potential fire behaviour is a key element to a successful outcome to manage fuels that could become challenging if wildfire conditions occur. The overarching aim of Fire Incident Commanders is to minimise the risk to responders/public and maximising the opportunities to reduce the impact of the wildfire on our communities, national and local infrastructure and the environment.
Fire & Rescue Services across the UK are in different places in terms of wildfire prevention and response capability based on local Integrated Risk Management Plans thereby occasionally necessitating the need for support to Incident Commanders from NFCC Wildfire Tactical Advisors (WTA) to support FRS's to reduce the risk and manage the fuel during operational incidents.

WTA's are fully conversant with Fire & Rescue Command and Control principles, are experienced in wildfire and have specialist knowledge of to support Fire Incident Commanders in tactical planning and delivery.
WTA's also have access to local/ national fire assets databases and contacts for local/national Partner Agencies whom can support FRS's with specialist advice and resources that may add value to the Fire Incident Commander's tactical plan.

From a wider perspective the WTA will utilise traditional and innovative technology to interpret ground conditions and advise on trigger points where fire behaviour may change and windows of opportunity where a suppression tactic could be applied. Long term restoration to reduce the risk by effective management of the fuel and the wildfire can be achieved by supporting the development of long term site specific risk information with aligned cross sector planning to agree priority objectives for wildfire mitigation and response.

Key words:

Intensity Frequency Restrictions Tactical Advice Traditional Innovative

Section 3 : Poster Presentations

Mapping wildfire occurrence, extent and severity in Scotland using remote sensing: some recent advances

Duncan Blake, Scottish Natural Heritage, duncan.blake@nature.scot
Karen Frake, Scottish Natural Heritage
Graham Sullivan, Scottish Natural Heritage

Abstract

Reliable and comprehensive information about wildfire occurrence, extent and severity is crucial for informing wildfire prevention, response, and recovery activities. However, existing sources of information are of variable quality, and while some have partial utility, all have recognised weaknesses in relation to completeness and accuracy.

Over the past eighteen months Scottish Natural Heritage (SNH) has been using data from European Space Agency Sentinel 2 satellites to map wildfires that have occurred in Protected Areas and some other sites in Scotland. We present case studies illustrating the work that has been done, including assessments of the reliability of the mapping and some comparison with existing sources of information. The methods that have been applied and developed are considered to produce meaningful, useful, and accurate results that have current utility at the site level, and the potential to fill important gaps in the national information currently available if applied at a wider scale. Some of the potential uses of reliable, comprehensive information are outlined.

Key words:

wildfire, wildfire extent and severity, wildfire mapping, remote sensing, Sentinel 2, Scotland

Advancing 3D Fuel Mapping for Wildfire Behaviour and Risk Mitigation Modelling

Carlos Cabo, Swansea University, carloscabo.uniovi@gmail.com
Cristina Santin, Swansea University
Stefan Doerr, Swansea University

Abstract

In January 2020, in collaboration with US Forest Service, Forest Research UK, Natural Resources Wales, Forestry Commission and Met Office, we are starting a project aiming at making major strides towards advancing our ability to understand and predict fire behaviour. We will develop new automated methods (algorithms) to implement, for the first time, ground-breaking real 3D fuel data into physics-based wildfire behaviour models. These models are the most advanced in terms of their ability to forecast fire behaviour, but they remain constrained by the lack of detailed fuel information to work with. Therefore, the advancement we aim to deliver here will allow a step-change in physical fire modelling capabilities. The new algorithms will be implemented in the fuel models FUEL3D and STANDFIRE that inform the widely-used fire behaviour models FIRETEC and WFDS. We will apply these to forest stands that typify some of the most common flammable forests in the UK, NW Europe and North America. The algorithms produced will be made publicly available and, therefore, can be adapted and applied to many other forest types around the world.

3D fuel datasets will be acquired in field campaigns using a range of state-of-the-art laser scanning and photogrammetric point clouds, with traditional fuel inventory measurements being carried off for comparison and model validation. Our case studies will focus on conifer stands in England, Scotland, Wales and the US. Our project provides a novel approach for designing and testing of 'virtual fuel treatments' aimed at decreasing fuel hazard and, thus, fire risk, under current and predicted future climatic and land use scenarios. The involvement of key UK end-users as partners will maximise the applicability and impact of the project's outputs. The novel 3D fuel data and algorithms will also present a major advance for other forestry applications (e.g. forestry inventory, timber forecasting, forest carbon budgeting).

Key words:

fuel modelling, 3D modelling, Algorithms

The role of fuel loading and structure on the physical phenomena that control the flame spread process in wildland fuels

Zakary Campbell-Lochrie, University of Edinburgh, Z.Campbell.Lochrie@ed.ac.uk
Mike Gallagher, University of Edinburgh
Carlos Walker-Ravena, US Forest Service

Abstract

Wildfire hazard management practices such as prescribed burning and fuel mastication, result in alteration of the fuel fuels present within a landscape with the aim of reducing the likelihood of a fire spreading. To understand the effectiveness of these techniques, it is necessary to consider the effect of structure on fire behaviour. While fuel loading plays an important role in flame spread within wildland fuels, it alone does not adequately allow prediction of the fire spread behaviour. The porous structure of both individual fuel elements, and the overall fuel structure, also play an important role in the flame spread process. Using data from laboratory flame spread experiments, the independent effect of changes in either fuel loading or bulk density on the overall flame spread rate and fire behaviour for pine needle fuel beds is investigated. By characterising the heat and mass transfer and fluid flow, within, below and above the fuel bed has given mechanistic understanding of the physical phenomena responsible for these changes. Key fire behaviour parameters (flame height, flame spread rate and heat release rate) all increased with increasing fuel load or decreasing bulk density along with increasing radiant and total heat transfer and variations in in-bed flow. Understanding of the effect of the controlling parameters for fire spread will allow the development of physical theories to better describe the nature of porous flame spread, as well as allowing the development and validation of modelling approaches. Through consideration of clearly defined structural characteristics and accurately described physical mechanisms it is then possible to examine the wider applicability of these physical models to other vegetation types, and inform fire management practices and methodologies.

Key words:

flame spread, fuel structure, fuels

Toward a UK fire danger rating system

Gareth Clay, University of Manchester, gareth.clay@manchester.ac.uk
Claire Belcher, Exeter University
Stefan Doerr, Swansea University
Andy Elliott, WildfireTaC
Rob Gazzard, Forestry Commission
Mark Hardiman, Portsmouth University
Nicholas Kettridge, Birmingham University
Julia McMorrow, Manchester University
Gail Milin-Chalabi, Manchester University
James Morison, Forest Research
Cristina Santin, Swansea University
Thomas Smith, London School of Economics

Abstract

In the years between April 2009 and March 2017 over 250,000 wildfire incidents were dealt with by the Fire and Rescue Services (FRS) in England alone. Individual events have been spatially extensive, challenging to fight (e.g. Saddleworth Moor, 2018), costly and have threatened property, transport and other infrastructure, especially in the rural-urban interface (e.g. Swinley Forest, 2011). The response to these events combined with continued policy concern over wildfires (e.g. Climate Change Risk Assessment) evidence the need for appropriate fundamental scientific understanding, as well as systems to manage and mitigate the current and future UK wildfire threat.

Wildfire Danger Rating Systems (WFDRS) are designed to assess the fuel and weather to provide estimates of flammability and likely fire behaviour under those conditions. These danger ratings can inform management decisions for land managers, direct resourcing plans for FRS teams, and feed into strategic planning for local and national governments. However, the UK does not yet have a WFDRS and we lack the fundamental scientific and end-user understanding to effectively predict the likelihood, behaviour and impact of wildfire incidents in the UK at present and under future climate and land use scenarios.

This poster will present the outline and structure of a new NERC-funded, multi-institution, 4-year project that will develop the underpinning knowledge and tools to develop a UK WFDRS. We are very keen to hear from the whole wildfire community about ways in which this work could help you with your activities.

Key words:

fuels, fuel moisture, flammability, fire behaviour, assets at risk

Does managing fuel always reduce the risk?

Andrew Coupar, Scottish Natural Heritage, andrew.coupar@nature.scot
Graham Sullivan, Scottish Natural Heritage
Duncan Blake, Scottish Natural Heritage
Karen Frake, Scottish Natural Heritage

Abstract

Reducing fuel loads through burning, cutting, or grazing is often seen as the principal, or even sole, way in which land management can help reduce wildfire risk. We consider that this perspective is too narrow, and indeed sometimes mistaken. For example, in north and west Scotland, burning favours the dominance and spread of purple moor grass (Molinia caerula), a species that creates a high load of dead, flammable fuel each year, with consequences for fire occurrence, spread, severity and frequency.

Using mapping created using remotely-sensed and field-based work, we give examples from Scotland of some of these consequences, including wildfire repeatedly affecting the same area over a ten-year period, with some parts burning three times with a fire return interval as short as one year.

We contend that while reducing fuel loads and creating firebreaks have a role in reducing the risk of wildfire, they need to be considered strategically and tactically ("smart" fuel management) rather as a panacea. They need to be placed in the context of creating wildfire-resistant and wildfire-resilient landscapes through diversifying and restoring habitats, alongside taking greater account of wildfire risk in land use decision-making, including woodland and forest design, and with an acceptance that there are multiple legitimate land uses, including some which by their very nature will entail the creation of high fuel loads.

Key words:

wildfire, wildfire mapping, fuel loads, managing fuels, resilient landscapes, Scotland

Key Statistics on Wildfires in England

David Cross, Forestry Commission, david.f.cross@forestrycommission.gov.uk
Cathy Manley, Forestry Commission

Abstract

In this presentation the authors from the Forestry Commission summarise key statistics on the sizes, types and locations of wildfire incidents attended by the Fire and Rescue Services in England since 2009 and using the most up-to-date geospatial data available.

This is based on authoritative geospatial data from the Home Office's Incident Recording System (IRS).

The presentation shows statistics for a) wildfires in total, b) woodland fires and c) non-woodland fires.

Disaggregation is shown for sub-categories of woodland, such as broadleaf and conifer (and others), using Forest Research's National Forest Inventory classification.

There is also disaggregation by separate land cover classes, such as mountain, heath & bog and built-up areas and gardens, using the Centre for Ecology and Hydrology's Land Cover Map classification.

The authors clearly depict i) the numbers of wildfire incidents, ii) the areas of land burnt, and iii) the durations of the incidents.

They summarise the prevalence of wildfire incidents by UK Vegetation Fire Standard fire sizes, and for key environmental designations such Sites of Special Scientific Interest and National Parks.

Key words:

Wildfire, forestry, land cover, IRS, maps

Risk of sustained ignition mapping for the Peak District National Park

Sam Dixon, Moors for the Future, sam.dixon@peakdistrict.gov.uk

Abstract

The Peak District Fire Operations Group currently use an ignition risk map produced by McMorrow and Lindley (2006) to guide their work. Since its publication, a more complete and up to date wildfire database has been collated by the Moors For the Future Partnership (MFFP). Furthermore, significant changes in land cover have occurred following MFFP's peatland restoration work. Therefore, it is timely to produce an up to date ignition risk map. Two methodologies were utilised, Multi-Criteria Evaluation (as used by McMorrow and Lindley (2006)) and Logistic Regression. Both techniques utilised MFFP's wildfire database, which includes fires recorded by fire services, national park rangers and landowners. Predictor datasets available to the model include habitat, roads, public rights of way, paths, settlements, lay-by's and car parks.

Key findings from the work are:
• Wildfire distribution has changed through time. Distribution of wildfires from 2009 onwards show clear differences to wildfires from 1976-2008.
• High ignition risk is now concentrated around the moorland fringe, particularly in easily accessible areas close to population centres.
• Habitat has minimal influence on ignition risk compared with anthropogenic factors.

Key words:

Logistic Regression, Ignition Risk, Mapping

Leverhulme Centre for Wildfires, Environment and Society: towards a new frontier in global wildfire research

Adriana Ford, Department of Life Sciences, Imperial College London, UK, a.ford@imperial.ac.uk
Colin Prentice, Department of Life Sciences, Imperial College London, UK
Apostolos Voulgarakis,Department of Physics, Imperial College London, UK
David Demeritt,Department of Geography, School of Global Affairs, King's College London, UK
Martin Wooster, Department of Geography, School of Global Affairs, King's College London, UK
Jay Mistry, Department of Geography, Royal Holloway University of London
Sandy Harrison, Department of Geography and Environmental Science, University of Reading

Abstract

Wildfire is a critical, poorly understood, and politically contested component of the Earth system. Wildfire sustains fire-dependent ecosystems, while threatening others; supports some local livelihoods, while endangering others; and contributes to deforestation, poor air quality, and emissions of carbon dioxide. Moreover, the frequency and intensity of wildfires are now changing in ways that no one anticipated or understands. There is no accepted theory to explain the coupled dynamics of wildfire, environment and human activities. Wildfire has defied scientific understanding because it 'falls between the cracks' of so many disciplines, including physics, engineering, ecology, anthropology, geography, history, and economics. The Leverhulme Centre for Wildfires, Environment and Society is a new, ten-year research centre, a collaboration between four universities, that aims to address the multi-scaled challenges of wildfire in a comprehensive, global, transdisciplinary context. Integrating approaches from the social and natural sciences, it will create a new field of research in which understanding of the human, physical and ecological dimensions of wildfire will advance together. The Centre aims to develop deep theoretical understanding and advanced wildfire prediction capabilities, quantify wildfire impacts on societies and economies, and to initiate a process leading to better ways for people, ecosystems and wildfire to coexist.

Key words:

integrated science, global systems, interdisciplinary, modelling, socio-economics, earth observations

Haldon Landscape Scale Wildfire Management Plan

Rob Gazzard, Forestry Commission, rob.gazzard@forestrycommission.gov
Ben Robinson, Forestry Commission, ben.robinson@forestryengland.gov.uk

Abstract

This poster will present the Haldon Landscape Scale Wildfire Management Plan as an example of how these type of plans can be undertaken and presented at the landscape scale by land owners.

In this presentation, the Haldon forest will be briefly described, as well as the wildfire risk assessment that was carried out in 2016 by Planning Forester Ben Robinson in West of England Forest District to examine and address the wildfire concern in a large forest block.

Habitats include; Coniferous and broadleaves forestry, grassland and lowland heath. Sectors covered; forestry, recreation, leisure, landscape, infrastructure and conservation.

We will also report the main results and lessons learnt from this exercise, such as:

1. Wildfire Management Plans can be used to help communicate land management decisions to build resilience to stakeholders such as the local community, foresters and the emergency services, especially where they highlight opportunities or flag up early possible conflict with national or local interests.
2. Wildfire Management Plans can help reasonable and proportionately target wildfire mitigation and adaptation within the landscape, to ensure normal business and land management work can be undertaken.
3. How to analyse and display evidence gathered as part of the Wildfire Management Plan process.

Lessons learnt:

Speak to your neighbouring landowners
Consider your message to the public
Be bold, decisive and willing to sacrifice land
Don't forget the Fire and Rescue Service.

Key words:

grassland, heath, England, wildfire risk assessment

Wildfire research in the Brecon Beacons National Park: fuels, recovery rates and management implications

Ashleigh Harper, Department of Geography Swansea University, 632109@swansea.ac.uk
Stefan Doerr, Department of Geography Swansea University
Cristina Santin, Departments of Geography and Biosciences Swansea University
Cynthia Froyd, Department of Biosciences, Swansea University

Abstract

The impacts of wildfires are diverse and highly variable dependent on location, habitat type, site conditions and fire severity. Wildfire impact research is however, limited across large areas of the UK presenting an issue for the creation of effective site-specific management planning in a number of areas and habitat types. To address this issue in the Brecon Beacons National Park, research was conducted assessing post-fire vegetation and soil recovery in dry heathland habitats, chemical characterization of wildfire ash and their implications for fuel management strategies. The primary conclusions from this research suggests vegetation community composition in dry heathlands can recover towards control conditions relatively quickly (7-10 years) following wildfire events. This is likely due to the species-poor pre-fire condition of the assessed sites, posing important questions around the remediation potential of such areas to prevent continued low diversity, heather (Calluna vulgaris) dominated habitats with high accumulated fuel loads. Wider environmental concern was also raised by the remarkably high metallic (e.g. Fe, Mn, Pb, Zn and As) and polycyclic aromatic hydrocarbon (PAH) content of the ash produced in this area and the mechanisms by which fire can produce and mobilize these elements from the available fuel. This contribution will provide an overview of the key findings of this body of research with specific focus on their implications for land management.

Key words:

Ecology, soil properties, nutrients, recovery rates, metals and PAHs

Fire Effects on the Carbon Cycle at Ranging Timescales

Matthew W. Jones, University of East Anglia, matthew.w.jones@uea.ac.uk
Cristina Santín, Swansea University
Stefan H. Doerr, Swansea University

Abstract

As in many regions of the world, fires are projected to become more prevalent in the UK as temperatures rise and droughts become more frequent. This presentation will reflect on the multifaceted role that fires play in the carbon (C) cycle. We will focus on the effects of fire on three timescales: immediate; decadal; and centennial to millennial.

The major immediate effect of fire is the emission of CO2 to the atmosphere. In the past decade, global fire emissions (~2.2 Pg C year-1) have exceeded those from road, rail, shipping and air transport combined. On decadal timescales, the regrowth of vegetation in burned areas drives the re-sequestration of most of this carbon.

A secondary impact of fire, which is widely neglected by models, is the production of pyrogenic C (PyC). We recently quantified this flux by adapting the global fire emissions database (GFED4s)[1], finding that it is equivalent to ~12% of C emissions from fire (~0.3 Pg C year-1). Although PyC is produced in the immediate term, its effects extend over centennial to millennial timescales because PyC decomposes slowly in the environment.

PyC production results in a gross sink for atmospheric CO2 that is countered by the gross source of atmospheric CO2 from decomposing legacy stocks of PyC. A net sink for atmospheric CO2 occurs only when the gross PyC production and gross PyC decomposition fluxes are shifted into disequilibrium. We will emphasise periods in which such disequilibria may have occurred or may in future occur.

Finally, it will be argued that there is a pressing need to integrate the PyC cycle into an array of Earth System models and to evaluate how changes in climate and fire regime impact on net fluxes of C between PyC stocks and the atmosphere. Data from field studies will be pivotal to achieving these goals, since models must ultimately be trained with, and validated by, observations.

1. Jones, M. W., Santín, C., van der Werf, G. R. & Doerr, S. H. Global fire emissions buffered by the production of pyrogenic carbon. Nat. Geosci. (2019).

Key words:

Carbon Emissions, Pyrogenic Carbon, Carbon Cycle, Fire Models

Pyrogenic carbon formation and degradation in UK peatland catchments

Oscar Kennedy-Blundell, University of Manchester, oscar.kennedy-blundell@manchester.ac.uk
Gareth D. Clay, University of Manchester
James J. Rothwell, University of Manchester
Emma L. Shuttle, University of Manchester

Abstract

UK peatlands are affected by both prescribed burns and wildfires. Whilst such fires have received attention for their impacts on soil carbon stocks and long-term ecosystem stability, relatively little research has looked at the continuum of charred matter (pyrogenic carbon, PyC) that is produced during fires. PyC is of interest due to its high carbon content and stability relative to other forms of organic matter, as well as its interaction with ecosystem processes. However, research on PyC in peatland settings is limited and whilst PyC is often described as being highly recalcitrant, information on the degradation of PyC is limited. This is important as research has shown that PyC is mobilised from burn scars and experiences losses of carbon at greater rates than previously thought, meaning that fluxes of carbon into the wider environment may be significantly underestimated.

As part of a series of integrated experiments, this paper presents findings from a field degradation experiment. Litter bags of PyC created under known formation conditions were left out on a peatland in January 2019 and subsequently recovered at 1 week and 1, 3 and 6 month intervals. Samples were analysed for their chemical and physical characteristics using elemental, surface area and molecular techniques. Results suggest that, at least in the initial 3 months, there is no significant change in bulk elemental composition, but FTIR analysis suggests a more complex interplay between PyC and peatland organic matter. Subsequent experiments are looking at how this field-exposed material then degrades in the fluvial system.

Key words:

Carbon cycling, UK peatlands, Charcoal

Burning trash for science: using waste to monitor wildfire energies

Anna Losiak, WildFire Lab, University of Exeter, a.i.losiak@exeter.ac.uk
Amber Avery, WildFire Lab, University of Exeter
Claire Belcher, WildFire Lab, University of Exeter

Abstract

Properties of the wildfires are hard to precisely and accurately measure during the event. This limits our ability to estimate effects of the event on the environment (e.g., how quickly will the area be able to recover, and what will be the long-term carbon storage in an ecosystem Hurteau and Brooks, 2011). Currently used methods of estimating of the 'fire severity' (the amount of vegetation and carbon loss from an ecosystem following a fire) are either subjective (fire severity scales Ryan and Noste 1985), time consuming (charcoal reflectance Belcher et al. 2019) or expensive (thermocouples with data-loggers).

Here we present results of our proof of concept tests of a new approach that may allow ecologists to monitor fire severity and the energy distribution across a burned area by looking at the effects of the fire on litter such as tin cans, bottles and plastic items, that are often revealed following wildfire events. The approach is based on the fact that different types of packages and materials are known to decompose at different temperatures. We will present results from: 1) experimental heating of a range of typical litter based elements in the wildFIRE Lab, using it's state-of-the-art fire testing equipment; 2) field observations and collect litter that has weathered in a moorland environment for further test burns and 3) compare these to litter elements collected from a moorland fire in Lough Bray Upper Lake, Republic of Ireland that took place in 2018.

Key words:

fire severity, fire monitoring

Historical evolution of NDVI and recurrence of large forest fires in SE Spain

Esther Peña Molina, Universidad de Castilla-La Mancha, Esther.Pena@uclm.es

Abstract

Currently, the use of Remote Sensing and Geographic Information Systems (GIS) are very useful tools for detecting changes in the large-scale land surface. The use of these tools for forest fire analysis has grown significantly in recent decades, with a wide variety of sensors and analysis techniques. In this work we study the evolution of the vegetation response according to the Normalized Difference Vegetation Index (NDVI) for a 25-year time series (period from 1994 to 2019) is approached through the use of satellite scenes from Landsat sensor for the southwest of the province of Albacete (Castilla-la Mancha, Spain). After detection of the large wildfires (>500 ha burned), the perimeter is defined according to the difference Normalized Burn Ratio (dNBR). After delimitation, we evaluated the fire recurrence and recorded surface burned once or more times. According to the fire severity and recurrence, implementing two burn severity classes (low and high) related to recurrence (0,1, 2 or more fires), we evaluated the natural recovery of vegetation related to the NDVI timeseries for each area. The current proposal is a preliminary work included in the VIS4FIRE project to assess the comprehensive forest vulnerability of forest to fire, including resilience and losses of ecosystemic services.

Key words:

Burn area, Change detection, Fire, GIS, Remote sensing

Assessment of post-fire erosion mitigation tools: impact on carbon stocks and soil quality

Sergio Prats, UA-CESAM (Portugal), sergio.alegre@ua.pt
JM De La Rosa, IRNAS, CSIC
A Merino, University of Santiago de Compostela
F Verheijen, University of Aveiro
J Keizer, University of Aveiro
JJ Gonzalez-Perez, IRNAS, CSIC

Abstract

During the last decades, wildfires have become a major environmental disturbance in Mediterranean countries. Wildfires are often followed by strong runoff and erosion and may cause a drastic alteration of soil organic matter (SOM) which is the soils' most functional fraction and key attribute of soil quality, and also carbon cycling and balance.

Post-fire mulching is a very effective measure to mitigate soil erosion and has been found to improve the physical structure of soils. However, mulch materials and application rates may vary greatly, reducing its effectiveness to control soil erosion and organic matter losses. Some mulch materials such as straw, have been widely used, but novel materials such as biochar (pyrolised biomass) has never been tested in burned areas despite their potential to mitigate soil losses and improve soil quality. This study will show the effects of traditional and novel mulching treatments on burned areas of 2018 in southern Spain and Portugal not only in relation to erosion rates but also to soil quality and carbon stabilisation. Preliminary results showed that straw mulch at a rate of 1 Mg ha-1 reduced soil erosion by 71%, while straw+biochar mulch application at a rate of 1+15 Mg ha-1 reduced erosion by 64%, compared with untreated plots. Both Thermogravimetric and Total Organic Carbon analysis revealed that straw+biochar enriched the organic fraction of sediments. Ongoing research is being designed to study the carbon pools of burned and treated soils, as well as to identify the the fate of carbon forms in soils via analytical pyrolysis and nuclear magnetic resonance.

Key words:

Wildfire, mulching, post-fire erosion, soil quality

PyroLife: 15 PhD's on integrated fire management

Cathelijne Stoof, Wageningen University, The Netherlands, cathelijne.stoof@wur.nl

Abstract

2018 was a glimpse of the future: deadly mega-fires in Mediterranean and numerous wildfires in temperate and boreal regions. Traditional mono-disciplinary attitudes cannot solve this challenge: there is a critical need to change management paradigms from fire resistance to landscape resilience: Living with Fire. The key to Living with Fire is embracing diversity in all its aspects, to prevent people from reinventing the wheel and instead allow learning from others through collaboration: across disciplines, sectors and geographies, and including social diversity. The new Innovative Training Network PyroLife will train 15 PhD candidates to becoming our new experts in integrated fire management. PyroLife brings together knowledge from different countries, scientific disciplines and practices. Southern European leadership in fire expertise will be used to understand and predict wildfires in Northern Europe, whilst Northern European lessons learned in the prevention of floods will be applied in Southern Europe. PhD candidates are recruited in November 2019 to start their studies at 10 leading European universities and institutes. All PhD candidates will receive training of 21 international partners, including governments, fire services, business and non-profit agencies. By making our interdisciplinary training activities open to all, we hope that this first doctoral training programme on integrated fire management worldwide will build capacity beyond the core consortium that is currently involved.

Key words:

PyroLife consortium, Innovative Training Network, PhD studentships, mega-fires

Managing vegetation with remote control mower

Katy Thorpe, Moors for the Future Partnership, Katy.Thorpe@peakdistrict.gov.uk

Abstract

Moors for the Future Partnership purchased a remote control mower- the Green Climber. This was purchased as part of MoorLife 2020 European Life funded project.

The Green Climber is used to cut moorland vegetation on blanket bog such as heather and molinia where it is dominating as a single species. Cutting the vegetation frees up space for other species such as sphagnum moss to either regenerate or be planted into the sward, this will lead to a healthier, wetter blanket bog.

Land managers around the Peak District and South Pennines are able to hire the Green Climber free of charge to manage vegetation on their land. This may include using the machine as a substitute for traditional heather/grass burning on areas of blanket bog where burnning is prohibited or difficult.

Key words:

Cutting, molinia, heather, blanket bog

The influence of people on wildfire occurrence in an area in South Wales with a high proportion of human ignitions.

Rosie Watts, Department of Geography Swansea University, 872822@swansea.ac.uk

Abstract

Vegetation fires occurring across the UK are increasingly putting pressure on both emergency services and the land. Yet there remains gaps in the literature detailing patterns in their overall UK occurrence, in examining the local scale issues, and in gaining a deeper understanding of the influence of people on fires. This poster reports from an ongoing project in an area of South Wales, a key location in the UK because of the extremely high number of fires and the major role of arson. Therefore, the project is studying the broad environmental influences – looking at both the human and physical factors – on fire occurrence in the Rhondda Valleys. Taking inspiration from geo-sociology and environmental criminology, it is both collating and synthesising data records relating to the issue; this includes obtaining and evaluating records of vegetation fire incidents, and identifying the influencing factors. Alongside this data collection the study is utilising the perspectives from stakeholders in the local community to compile explanations for the patterns identified. The study is considering both the physical and human environment, both relevant to the issue, but is focusing on social aspects of the phenomenon in order to understand why there are so many, and why they occur where they do.

Key words:

Vegetation fires, South Wales, human environment, spatial expression, arson