Comments on Wildfire Management, Rural Residential and Vegetation Distribution in SE Australia

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Summary: Over the 2019/20 hot summer, widespread wildfires in SE Australia followed a devastating drought and received unprecedented media coverage. A long term view suggests that two factors have placed society in a higher fire risk situation. First, expansion of rural residential occupation has increased markedly since the 1960s. Second, most of the pre-European mesophyll (rainforest) vegetation that did not burn or retarded wildfires spreading has been disturbed, fragmented or cleared and no longer functions as fire breaks. A focus on restoring natural fire breaks of mesophyll plants is important as a fuel reduction measure. An examination of these factors is required as part of preparing future wildfire and land use planning strategies. This is outline below.

1. **Media Coverage.**

Table on P6 Australian 12 Nov 2019 claims a gradual increase in the number of fatalities and homes lost in wildfires since 1926. This is despite improving fire management and suppression, transport and access roads, weather forecasting and communications. In these latest fires (2019/2020) property losses have increased to over 2000 but lives lost has been significantly less; possibly owing to evacuation orders. Such statistic have not been correlated with hectares of non-reserve lands burnt.

Media coverage has been intense with photographs and commentary on a range of potential contributors and management measures. There has been an unbalance focus in some media that insufficient fuel reduction measures in public reserves have been a major contributor, along with drought conditions, to the 2019/20 wildfires. This overlooks numerous photos and situations showing hot fires burning across open grazed grasslands and flaring up when reaching fuels around buildings; and burning with slower rates of advancement while consuming fuels in dense forests.

A major focus on fuel reduction burning in reserves throughout SE Australia is likely to gradually alter the structural, floristic and faunal characteristic on those reserves where it is practiced. This will increase the exposure and drying out of soil litter, reduction of mesophyll species (rainforest species, vines, ferns) in under-growth and may not significantly reduce the carriage of fires in extreme fire weather and during droughts.

Here, wildfires are discussed in relation to the distribution of mesophyll (rainforest species) vegetation and past and present land uses.

2. **Flood Management in Brisbane.**

I recall a comment by **Moss Cass**, the then Minister for Environment after the Brisbane 1974 floods along the lines "if you build in flood ways expect to be flooded''.

These comments are applicable to today's fires.

The Wivenhoe Dam was built for flood mitigation and Brisbane City Council brought in a planning restriction that residential develop not be below the 1974 flood level. Brisbane's rapidly growing population used the dam for water supply and by 2011 its primary purpose was compromised by

drought and the need to meet this demand. During the 2011 Brisbane flood I observed flats build recently at Indooroopilly and Chelmer where water went over the first and second levels, respectively. This flood was lower than the 1974 flood level.

Something is wrong with our land use planning or is making a quick buck what planning is all about. Is this beginning to also apply to wildfire planning and management?

There are loud voices in the media expressing interests in exploiting nature reserves for eco-resorts, grazing, logging, wood chipping, plantations, farming, and residential use, and repealing vegetation management laws to permit further clearing. They all claim this would solve the wildfire problem, but it is these very activities that have fragmented bushlands, increased fuel loads and destroyed the natural rainforest and mesophyll vegetation corridors that were barriers to fires spreading.

3. Bushfires, Wildfires or Rural fires?

Are we calling bushfires by wrong name?

Many fires start and end on private lands, including open grazing land and private semi-cleared lands. This is where damage to buildings, livestock and persons occurs. Why? Rural residential and housing estates backing into bushlands, and rural residential subdivisions have increased since 1960. With more people in the bush, there is increased risks of fires starting and more structures to lose. It is incorrect to blame the losses on the existence and management of forests and national parks – these areas don't have homes within them.

Placing the wildfire planning focus on the management of public bushland and not on the increasing human occupation of urban fringes and bush blocks is misguided. The attention given to fuel reduction in national parks is not an elixir for saving homes, it is removing the focus away from doing it on private lands. Virtually all fires that have destroyed homes have raced across private bush and open farm lands.

For example, I observed a bare paddock at Wee Jasper, NSW that after 3 years of drought with continuous sheep and goat grazing, burn on a very hot day. The fire came through and burnt the bare ground and fence posts 300m from the nearest gully that had scattered shrubs. Could we achieve this low level of fuel through prescribed burning in reserves – no way? This fire eventually burnt the western outskirts of Canberra.

Who is to blame for the dangerous fire situation at the residential – bushland interface? Developers maximising yields and lowering costs; Councils seeking rates or failing to adopt and enforce effective wildfire planning measures, or is it the dreams of tree changers and farmers who argue that they know best how to manage their land and this is their inherited right, or just complacency.

4. The Residential Bushland Interface

In travelling around eastern Australia I notice a zone of 15-30km around every city and large town with rural residential housing on 3 – 40ha blocks. These are often on the less fertile land, often sandy ridges supporting fire prone shrub and tree growth, subdivided off by farmers and speculators. In the coastal hinterlands rural residential growth is contagious throughout all vegetation types. The growth in 'escapees from suburbia' would be one of the major contributors to the increasing losses from wildfires and a headache for the rural fire service.

Recently, I went to one large housing estate on Sunshine Coast where it was recommended in its bushfire management plan that a single lane one-way street (less costly) be constructed to separate houses on one side opposite conservation bushland to provide an effective break and fire control access. This advice was not accepted and now houses back into the bushland; a common practice on Sunshine Coast where sometimes a narrow strip is cleared into the conservation zone providing an unreliable 4WD access and fire break. Perhaps it's a matter of "tick the box" approvals but I wonder what further audits would discover.

There are many examples of fires starting on private lands and moving quickly through open grazing country and destroying life and structures. Examples are grazing land fires at Omeo plateau; fires NW of the Otway Ranges, and the recent Upper Murray - Dunns Road fires. I don't see how grazing or fuel reduction burns in conservation areas could reduce fuel loads to that in cleared, heavily grazed farmlands. Many recently prescribed burn areas carried hot fires during the 2019/20 event. Previous grazing in the past in alpine areas lead to cattlemen lighting fires to 'keep the country open', but this increased the density of serrated tussock, bracken and blackberry that contribute to fuel loads and reduced fire-retardant mesophyll shrubs and herbs along drainage ways.

A few years back the Qld government entered a voluntary buyout of some 300 small farms between Gladstone and Mt Larcom for port industrial expansion. This is an area with a mixture of open grasslands and patches of light shrubs and woodland trees on flats surrounding Mt Larcom, a large reserve. Over one 3mouth period in the winter dry season, there were 31 wildfires. There were no thunderstorms, two started from careless garbage burning, one was deliberate, and the rest unknown. None started in the reserve.

A few years ago I reviewed all the wildfire management literature and applied it to environmental and <u>bushfire management plans</u> for large (500-1000+ blocks) <u>urban estates</u> in Qld. Important components are:

(a) Assessing local and regional factors contributing to wildfire risks, including evidence of past fires on-site and in surrounds;
(b) Planning the layout of estates to protect against fire entering and spreading from adjoining areas, including providing fire-fighting access and escape;
(c) Building envelope siting, building design and materials, grounds management, and water supplies;
(d) Community organisation and advice to residents and councils.

Two additional areas of public advice are needed for improved planning for rural residential development. These need to be prepared via consultation between experienced authorities.

1. Practical measures to manage fire risks in <u>rural residential</u> and small farm sub-divisions:
   (a) Restrictions on sub-division and building in fire risks landforms and vegetation; and not allowing it adjacent to reserves,
   (b) Limits on minimum rural residential block size and retention of large farms by not allowing existing cadastral portions to be sold off,
   (c) Ensuring that fire-fighting friendly transport access and retreat infrastructure is in place at the district and local levels before approving rural residential subdivision and building,
   (d) Mandating the fire standard criteria (building envelope, design, materials, water supplies and grounds maintenance) to rural buildings, including 'best fit' application to existing rural buildings,

(e) Zoning fire breaks of existing mesophyll vegetation or re-establishing it in corridors along drainage ways and basaltic soils.

2. How to prepare and defend homes, especially isolated ones, during fires events:-
   (a) Identifying surrounding flare-up fuel hazards and treatment if practical,
   (b) Re-locating flammables (gas, oils, paint, cars) to safe areas away from structures,
   (c) Ensuring fire-fighting equipment and water supplies are fire proofed and adequate,
   (d) Protecting ones-self while defending (clothing, radiation, noxious gases, retreat options),
   (f) Assessing what situations, conditions and structures are un-defendable, and
   (g) Assessing how, where, when evacuation is a sensible option and safe routes.

Guidelines for observing, treating and recovery of wildlife and native plants could be useful.

A strategy for management of fuel reduction in reserves must include multiple objectives such as long term vegetation and wildlife habitat conditions. For example, in certain areas excluding fires can allow mesophyll under growth to re-grow into effective fire barriers. The strategy must also understand the fuel impacts of the extensive reduction in area, fragmentation and structural changes in all vegetation communities caused by human exploitation. Most animals require minimum areas to support a viable population over the long term (as found via studies of island populations) and several Australian biota are already considered to be endangered by a shortage of suitable large patches of habitat.

5. **Fire History and Aboriginals** (Australian First Nations People)

Recent claims in the media are that Aboriginals have been practicing sound ecological fire management for 60,000 years. These claims and Aboriginal's objectives for that management are difficult to substantiate owing to lack of written records by Aboriginals or other historic evidence. The main records of fires and Aboriginal burning come from ad hoc observations by early European settlers and recent conversations with Aboriginals, mainly from northern and arid Australia. No one knows what fire practices were 500 or more years ago and only guesses can be made from existing vegetation as to what long term ecological changes may have resulted.

If Aboriginal fires were left to burn themselves out, then there would have been a gradual reduction in the extent of mesophyll plant communities in some regions. However, this process has also been attributed by authorities to plant adaptations to lower rainfall as the continent has been drying for millennia owing to its drift into a cool, dry latitudinal zone. There are existing plants within wet and dry rainforests with morphologies that could assist gradual adaptation to dry and fire conditions such as hard covered dry seeds (fire resistance), cauliflory (epicormic buds) and rhizomes (lignotubers).

Old growth forests and woodlands (with over mature trees, many 100s of years old) were widespread over the ranges, slopes and river plains according to earlier European explorers, settlers and loggers. A structural condition better explained by infrequent burning than regular managed burning regimes which trend to gradually remove over-mature trees via fires catching into basal scares and hollow branches.

The spread of wildfires in SE, NE and Nth Australia during Aboriginal times would have been confined to primarily lowland flats by extensive areas of rainforest and other mesic vegetation (that does not burn) existing at the time Europeans arrived (Attachment 1 list of some these extensive regions).

Much of the comment on Aboriginal burning comes from practices across monsoonal northern and arid Australia where dry season burning aims for small patch burns associated with hunting, keeping camp sites open, and travel, rather than the protection of homes. The break-down of vegetation litter in monsoonal and arid lands is primarily by termites and other invertebrates adapted to dry soil conditions whereas that in southern temperate zones it is by fungi and soil microbes adapted to moist soil conditions. The transfer of fire practices from northern Australia to southern plant communities may not be ecologically appropriate, and certainly not in SE mountain forests.

The comments about Aboriginal burning needs to be put into its ecological context. Most populations lived in lowlands near water while visiting mountains. Certain lowlands and river plains which have fertile clay and alluvial soils were found by early European settlers to have open understories and large mature trees, initially most attractive to sheep and cattle squatters. This openness on fertile clay soils is from my observations due to mature trees dominating the vegetation, the shrubs gradually thinning out with age (shrubs live about 15-30 years) from shading and competition from trees and being prevented from re-establishing by dense grasses. I find it difficult to see how managed burning by Aboriginal people could have produced these extensive conditions without gradually reducing the density of over-mature trees which gradually burn down as fires catch into basal scares. I have spotlighted in mid-height forests (with tree species of low timber value) over extensive undulating lands that contained no old trees with hollows or possums. These forests have been subjected to fuel reduction burns for past 100 years to protect adjoining hardwood forests.

6. Fire History and Early Europeans

The numerous land colonisation activities of European settlers are well described. It is sufficient here that fire was a tool used by them to assist in burning fallen timber and to remove shrub and unpalatable herbaceous growth with the aim of improving pastures. Selective logging of forests started early, as did ring-barking and clearing of woodland trees. In addition grazing and browsing by livestock and plagues of exotic mammals (rats, rabbits, goats, pigs) followed. All these activities lead to major changes in the landscape including vegetation and fire fuel levels (increased woody shrubs, tussock grasses, bracken and losses of moist soft herbs, grasses and shrubs). Some changes desirable for farming and some unpredicted.

As you travel around eastern Australia you read about many examples of houses, hotels and saw mills burning down in 1800s and early 1900s due to both wildfires and human accidents. The documentation of wildfires has improved, suggesting the frequency of severe wildfire has increased during the 19th century. Reasons are debated, but it cannot be denied that with more people living in the bush concerns about wildfires are increasing.

7. Conditions in Old Growth Forests and Woodlands

Tall wet sclerophyll forests such as mountain ash and blackbutts, where unburnt for long periods, develop mesophyll undergrowth (especially along gullies) which reduces the likely hood of carrying fires in normal seasons. Silvicultural practices have shown that the seeds of certain tall eucalyptus species germinate prolifically following heavy logging and burning. However, this is not the only way these long-lived individuals are replaced over a 500 year life span and the undisturbed forest maintained its maturity.

Recent observations in tall forests suggests frequent combinations of hot wildfires and prescribed burns deplete seed stock trees and regrowth before trees reach flowering age (30-50 years) and seed stocks are not replenished. Dense shrubs with short reproductive cycles become prominent. Likewise, repeated fuel reduction burns and wildfires in all treed communities gradually remove trees with basal scares and hollow branches, leaving young to mature trees with few or no hollows – with consequences for hollow nesting birds and mammals. Silvicultural practices often removed old trees of poor timber form or species to increase growth of young timber producing trees, a practice once common under re-employment schemes especially during the 1930s.

It is hard to find any patches of forest or woodland that do not have a long (100+yrs) exclusion from fires or disturbances caused by humans. When found there is either open understory in woodlands and dry forests, especially on clay soils or moist mesophyll under shrubs in tall forests, especially along drainage ways and on fertile soils in high rainfall zones. In both communities, the trees include a majority of over-mature trees with hollows.

A natural occurrence where a tree-falls, is the colonization of the gap by pioneer shrubs, vines and trees. This response is extensive following all types of logging, resulting in the integrity of the forest and woodlands being altered and the fire fuel loads increasing. This has been a major contributor in the recent extensive spreading of mountain forest fires. Likewise, extensive areas of previously ring-barked and selectively logged private lands used for grazing have since 1950s become uneconomic to be maintained as grazing lands. Here, shrub and regrowth, especially on lighter soils, has proliferated increasing fire fuel loads. Many of these areas are now occupied by rural residents and some added to reserves, augmenting what were previously vacant crown lands dedicated as nuclei for reserves, and considered to be useless for other land uses.

8. Distribution of Natural Fire Breaks

To understand the historic and present day spread of wildfires, the natural (pre-European) distribution of vegetation is a major consideration. There are certain plant communities dominated by mesospheric plants (those that have board evergreen leaves) that do not burn and or retard wildfires. These primarily include all rainforests communities and wet sclerophyll eucalyptus forests with mesospheric undergrowth. Some extensive wetlands (prior to drainage) along major coastal rivers may have also retarded the spread of fires.

Throughout the moister areas of eastern Australian there are vegetation communities that in their natural undisturbed condition would have been barriers to wildfires or would have retarded wildfires during all but prolonged droughts. In the pre-European past these areas would have acted as natural fire barriers, preventing wide spread movement of fires. Some of these vegetation types and the vast regions they were found are listed in Attachment 1. It is noted that most of these communities are now cleared and occupied by farms, rural residents and pine plantations. These areas now carry destructive wildfires.

The recent destruction of Binna Burra lodge (SE Qld) has been mentioned in media as an example of rainforest burning under extreme drought conditions. At this locality fires only penetrated a few metres into dense rainforest from adjoining semi cleared land. The lodge is situated on a spur jutting into medium and tall eucalyptus forests (E. andrewsii). The spur has very steep slopes on

three sides and the forest is broken up by exposed rock layers supporting grasses and sclerophyll shrubs patches. It was these corridors that allow the fire to reach the undefended lodge.

Since European settlement there has been rapid degradation and fragmentation of the native timbered lands and this has included mesic vegetation in all regions, reducing or removing barriers to wildfires spreading.

This commenced with logging of riparian forests such as red cedars and other cabinet timbers from the major coastal river banks from Victoria to north Queensland. The clearing of fertile flats, including both lowland and plateau rainforests involved felling and burning patches for cropping and dairying. Open forests and woodlands with grassy undergrowth were rapidly occupied by grazers, but often this use along with introduced pests and burning soon increased shrub undergrowth. Gold mining brought widespread cutting of dry forest for mine props and fuels in some regions. Ring barking of trees over extensive areas with burning to clear flats and slopes for agriculture became widespread following the gold rush as men looked for work.

Soon, selective logging of trees transportable by drays commenced the fragmentation of the tall forest, and later by machine assisted logging and track construction. With establishment of State forest bodies to manage timber supplies, silvicultural treatments to remove less useful species and over-mature trees were applied to enhance timber production. This also involved clear felling and burning to encourage tree re-generation. During the 1980s in SE Qld, gully rainforest was reclassified as transition forest to avoid the stigma of logging rainforest resulting in the disturbance of another natural fire break. While in the upper Brisbane River catchment, borders of dry rainforest were retained as firebreaks surrounding hoop pine plantations. All these activities caused forest fragmentation, the opening of canopies, increased colonisation by sclerophyll shrub under-growth and the drying of forest micro-climates. This increased forest vulnerability to wildfires.

Since 1930 under the Federal – State Softwood Agreement, extensive clearing of native forests for pine and hardwood plantation establishment has progressed destroying many of the tall wet forests and dry rainforests. In SE NSW and Tasmania extensive areas of tall forests have been clear-felled for wood chipping, exposing vast areas to increased fire risk. Today, these forestry activities also involve both private and government organisations buying-out forested and semi-cleared private lands for plantations. In addition, especially following the use of aerial spreading of fertilizers and tax concessions, areas of tall forest on leasehold and freehold lands in cool, high rainfall zones have been cleared for grazing. The combinations of these land uses has fragmented treed communities that once contained mesophyll barriers to the spread of wildfire and created carriers of fire in extreme fire conditions.

The replacement of natural treed lands with grasses, crops and pines is considered by certain authorities to reduced transpiration. Consequentially it is claimed the long term stability of the regional terrestrial moisture cycle has been altered. This has reduced the actions of the 'biotic pump' sucking moisture from oceans and transferring moisture further inland with prevailing winds. The extensive losses of forests and woodlands along both sides of the Great Dividing Range, and shrub-lands further inland, could be responsible for less or unpredictable precipitation leading to reduced soil moisture retention in remnant treed lands and a more rapid drying out of fuel loads.

Attachment 1: A List of plant communities that provided natural fire breaks over extensive regions at time of European settlement. Notes on current condition in brackets.

1. Extensive areas of sub-tropical and temperate rainforest in the SE Qld/Nth NSW. These are or were effective barriers to wildfires and include:
(a). Kin Kin and Mary River lowlands (now cleared; all small farms and rural residential; several farm houses were lost in the 1936 Cootharaba fires following a 9 month drought. This would not have happened pre-clearing).
(b). McPherson NSW/Qld ranges (now foot hills cleared with small farms and rural residential, upper slopes and plateau in reserves; wildfire occurred in foothills in 2019/20).
(c). Richmond valley Big Scrub (now all cleared, all small farms and rural residential; carries increased fuels in dry seasons).
(d). Dorrigo plateau (now mostly cleared for small farms, coastal scarp in reserves).
(e). Carri and Comboyne plateaus west of Kempsey and Port Macquarie (now partially cleared farms and in logged state forests).
(f). Mt Royal and Liverpool Ranges basaltic caps and upper gullies (previously heavily logged, now caps in small reserves, slopes and gullies cleared for grazing; high fire risks in droughts).
(g). The Robertson plateau and Illawarra lowland bushes SW of Sydney (now cleared for small farms and rural residential; carried wildfires in 2019/20).
(h). Small patches of temperate rainforest such as on Mt Dromedary, basaltic caps and gullies (previously logged, now mostly in heavily logged forest reserves and grazing lands).
(i). Temperate rainforest in western Tasmania (now partially cleared, most in logged and wood-chipped forest or wilderness reserves).

2. The ribbons of sub-tropical and temperate rainforests (and mixtures thereof, frequently with adjoining emergent eucalypts) along all the levee banks of major rivers and banks of permanent creeks. It occurred throughout the lower and middle reaches in all coastal valleys and some inland rivers near ranges, from the Mary River south to eastern Victoria. These would have been effective barriers to wildfires in the lowlands and to most fires in the middle reaches of drainage systems. (Previously logged throughout range and now virtually all cleared and grazed in lowlands; effectiveness as fire barriers significantly reduced by logging).

3. Patches of dry rainforest in river valleys such as the Rosewood-Boonah lowlands in Brisbane valley (now cleared with dense rural residential) and in the upper Brisbane catchment around Jimna (now mostly converted to hoop pine plantations where Qld Forestry has retained strips for firebreaks, or cleared grazing land); as well as on some ridges in northern NSW (now heavily logged or cleared with some retained in reserves). These communities where extensive are or were effective barriers to wildfire; now fuel loads carry wildfires in extreme fire weather.

4. The tall wet sclerophyll forest with mesophyll undergrowth found on basaltic plateaus. These communities in undisturbed condition were or are effective barriers and retardants to most wildfires. This capacity is greatly reduced where shrubs and grasses in clearings have fragmented contiguous forests. Regions where found include:
(a). NSW/Qld Border ranges (now partially cleared for grazing and rural residential, balance in logged and managed forests).
(b). Coffs Harbour hinterland (now partially cleared grazing and rural residential, balance logged timber reserves).
(c). Nowendoc and Hanging Rock plateau (now cleared for grazing and remaining State forests currently being cleared for timber plantations).

(d). Tumbarumba highlands (now clear for grazing and orchards, balance of State and private forests being converted to soft wood plantations; experienced extensive wildfires in 2019/20).
(e). The Errinundra and other plateaus, NE Vic (now in managed and logged reserves; increased fuel loads owing to extensive logging).
(d). The Strzelecki Ranges SE Vic (now cleared, small farms and rural residential; increased fire risks).
(f). Yarra Ranges complex NE of Melbourne (now in water and timber reserves and elsewhere fragmented by rural residential; has carried several severe wildfires since European settlement).
(g). The Otway Ranges (now partially cleared, small dairy, cropping and grazing farms, balance in logged and managed forests and plantations).
(h) Much of western and SW Tasmania (now reserved or in logged and wood-chipped forests).

5. Tall wet forests with mesospheric undergrowth are extensive as riparian communities in the middle and upper catchments of all the eastern flowing and some western flowing drainage systems from SE Qld to Tasmania. In an undisturbed condition these are barriers or retardants to all but major wildfires, but this capacity is lost throughout most regions due to logging, clearing and fragmentation of forests adjoining gullies.

6. Wetlands behind levee banks on lowland plains of major coastal rivers and upper flood plains of some large inland rivers. These would have retarded local fires. Now these are mostly drained and farmed.