A tropical Queensland perspective

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My perspective has developed from that of a grass-roots field operator, through that of minor research effort to senior administrator. These days my role is one of active field work once again. I will confine myself to the most pertinent observations of the last ten years of my career.

In tropical Queensland we are dealing with climatic zones changing from the arid to the super-wet, but I will largely confine my comments to the plus 1500 mm per annum zone of north-east Queensland, ie Cape York Peninsula and the wet tropics.

In the plus 1500 mm rainfall zone, massive habitat changes, largely related to decreasing fire incidence, have taken place in the last 100 years, with demonstrable widespread and massive change in the last 30 years. Grasslands have mostly disappeared under shrubs and trees, and open sclerophyll communities have changed to closed forest. It is the rate of change that is of concern here, not change itself, and management actions are directed at stabilising the situation to preserve future options. Of prime importance is to reintroduce fire to those systems that will still carry it.

These changes are leading to loss of biodiversity. Sclerophyll habitats are disappearing and, at least in the short term, simple closed forest systems are often replacing more species rich sclerophyll ones. Studies on two prominent bird species are indicating that they are likely to be disadvantaged by these changes, and no doubt there are other species facing similar problems. The palm cockatoo is losing the open nesting habitat it requires, and the cassowary utilises some sclerophyll habitats at critical times of the year.

Another significant change in the wetter belt, which is peculiar to northern Cape York Peninsula, and again the result of decreased fire incidence, is the invasion of sclerophyll forest by dense stands of cypress pine which often pave the way for a later expansion of rainforest.

The most difficult of all habitats to manage in northeastern Queensland are Melaleuca communities of all structural types and species composition, and grasslands. Melaleuca habitats provide particular problems in relation to understanding their complex ecology. They can behave as a fire-sensitive community or an invasive woody weed. Melaleuca swamps can burn much earlier in the season than surrounding drier communities, and even large trees can be killed by fires that burn when the ground is dry.

Most of the grasslands are under threat from shrub and tree invasion, and often the invaders are Melaleuca species. In Eubenangee Swamp, for example, the last remaining native grassland of the wet tropical coast is being progressively replaced by Melaleuca forest, and this process continues in spite of 14 years of active fire management. On the marine plains of Princess Charlotte Bay, and in many other places throughout the Peninsula, Melaleuca viridiflora woodlands are replacing grasslands at an enormous rate by a process of episodic invasion. Research has shown that this has severely disadvantaged the threatened golden-shouldered parrot.

At both Eubenangee Swamp and in the case of the golden-shouldered parrot, research and observation is indicating that the appropriate time to burn to halt this invasion is the early wet season. This, of course, is not a time of year we have favoured in the past, and creates logistic problems that we yet have to face. Certainly it is clear now that the golden-shouldered parrot requires these storm burns, in part, to provide access to seasonal food supplies.

It is possible to pass clear judgement now that throughout the 1500 mm plus rainfall belt our burning programs have generally been too early in the year and too mild to stabilise habitats against rapid change. To achieve stability this will require a change in style of operations to allow progressive burning throughout the remainder of the year after the wet season has finished, and there will have to be the determination to deal with the public relations problems that late season burning operations can bring.

Interestingly, research and observations indicate that the significant benefit of fires late in the year does not come from the heat they generate. Indeed they are likely to be very destructive of tree cover without influencing the progress of shrub invasion if they are carried out at low soil moisture levels. Their habitat effects are likely to come from the way they change the competitive balance between grass and sedges, and shrubs.

The complexity of the Melaleuca-grassland problem is highlighted by observations in the wet tropical ecosystems of Eubenangee Swamp National Park. There, the Hemarthria-dominated grassland community suffers large patch deaths after about three years without fires. These seem to be caused by a fungal disease that builds up in large accumulations of dead grass. The dead patches are then replaced by clumps of sedge, largely Cyperus lucidus, which develops to maturity with much bare ground between the clumps. This, plus the fact that the sedgeland is more difficult to burn, facilitates the invasion of Melaleuca quinquenervia.

The problems of the grasslands and Melaleuca invasion have highlighted that the key element in using fire to achieve habitat management aims is flexibility of operations. Rigid systems that prescribe time of year and style of operations must give way to those that give room for rapid decision and actions to take advantage of varying seasonal conditions.

This is particularly so in the wet tropics where any month can vary from very wet to very dry. Even in the drier part of the region where seasonal conditions are more predictable there needs to be room for much more late season burning than we have practised in the past. This can only occur if security is guaranteed by a mosaic of burn patterns built up progressively during the year.

Flexibility also means avoiding, where possible, reliance upon firebreaks and firelines. These can, apart from their relationship to rigid prescriptive burning, be very destructive to soil and habitat values. Indeed our monitoring of two large parks with similar habitats has shown that the less structured approach to fire management has had the same end result in terms of frequency of burn and the establishment of a mosaic as the more expensive, relatively highly structured approach based on extensive firebreaks and roadside burns. The extent and control of wildfire on both parks have had a similar history.

The demands of flexibility will also mean that, where it is not possible to have access to a helicopter or aeroplane at short notice, then reliance on an aerial incendiary program for the bulk of our operations will have to be avoided.

Our easiest habitats to manage with fire are the heaths and spinifex grasslands. Both tend to behave in similar ways but as our experience with spinifex is limited, and there is little of it in the north-eastern tropics, I will confine my attention to heath. Unlike some of its neighbouring communities in the high rainfall belt, heath does not appear to change irreversibly with time, so the determination of a minimum frequency of burning, related to its regenerative capacity, is the most important long-term consideration. Except in relationship to controlling the extent of any one burn, it is pointless to worry too much about the severity of any particular fire. In terms of species regeneration, the cooler burns are likely to be inimical to diversity, and experience has shown that even in the severest wildfire events a relatively small scale patchwork with significant unburnt areas will result.

In terms of on the ground operations a quite unstructured approach can be used to create a mosaic pattern in heathland. Strong winds can be taken advantage of to drive fires to produce almost linear breaks, and variations in fire intensity in relation to varying wind patterns, topography and diurnal changes are very productive of complex mosaic patterns of fuel.

The difficult side of burning heath communities is the political one, particularly in more settled areas. Heath fires can burn intermittently for a long time, and invariably result in a lot of smoke and total canopy scorch if not reduction of the community to bare ground and sticks. It is generally difficult to convince the community that they should accept such events with calmness.

Continuing on this vein I have come to the conclusion that the most desirable fire events from all aspects of management are those which are lit with the minimum of fuss, and then proceed to trickle around for days, or even weeks. I would qualify this by saying, however, that it presupposes an existing mosaic of fuel types, without large areas of heavy fuel load and an environment where weather patterns are unlikely to change significantly during the course of the burn. Such pre-conditions regularly exist in north-east Queensland where a humid easterly air-flow is predictable. I doubt, however, that it would be an option in southern Australia. Most particularly in rugged country, such fires can produce an extraordinarily complex mosaic of burn patterns influenced by changing time of day, topography and wind. I should also hasten to add that it assumes that all questions of possible threat to life and property have been dealt with.

The wet sclerophyll forests of the wet tropics of Queensland provide a fire management problem that is shared by equivalent communities throughout Queensland. It is a problem that many will deny the existence of, and to which we have no answers. I have not placed it in the same category of difficulty as the Melaleuca communities, because the options for its management are not as complex. It can be described as a narrow belt of very tall forest, usually dominated by Eucalyptus grandis, and fringing the rainforest. It demands the same soil as rainforest does, and in the absence of fire will eventually be replaced by it. Except where it has a grassy understorey, fire is not a regular feature of it, yet without fire it will not regenerate. A problem arises in that most of this community is in a condition where fire will only penetrate it under the most severe climatic circumstances. We cannot therefore easily conceive the circumstances in which the deliberate introduction of fire might be politically possible. This ecological community is vital to the survival of some species of arboreal mammal, and understanding its management requirements is perhaps Queensland's most urgent fire research problem. The passage of time, as it changes ecosystems irreversibly, is rapidly leaving us bereft of options in this community.

Where rainforest has a direct interface with dry sclerophyll forest, without a wet sclerophyll buffer, we began our fire management by assuming that we had a sensitive interface that needed particular care. We then, considering the huge length of such interfaces in the region, began the daunting task of guaranteeing their safety by lighting all our early burns along their margin and late in the day. Fortunately experience has proven that such care is not necessary as only the severest wildfires will penetrate the rainforest margin to destroy it. Most of our early fires are not effective in preventing an expansion of that margin at the expense of open forest where soil conditions are right.

Leaving the wetter country, it has been interesting to observe in the 600–800 mm annual rainfall areas that some Acacia communities are as sensitive to wildfire as rainforest, and that management to protect them from wildfire, preferably by intensive fire management of the intervening areas, is essential. The Acacia communities most at risk from wildfire are brigalow (Acacia harpophylla) and lancewood (Acacia shirleyi).

In most of the parks of north-east Queensland, the use of fire has been an essential tool, and sometimes the only option available to us, to control or eradicate a range of exotic weeds. In every case success has depended in part or whole on the absence of grazing pressure. In that regard it has been interesting to observe how the area occupied by some weeds has stabilised or regressed upon the removal of grazing pressure alone.

Rubber vine, arguably tropical Australia's worst weed, is gradually succumbing on Lakefield National Park where it has been possible to get enough fuel build-up after destocking to carry a hot late season fire. With regular fire management of an increasingly healthy ground cover since the removal of stock in that park, rubber vine has not occupied new areas in the last 10 years, and has actually shrunk in total range in that time. It remains, however, an intractable problem where fire cannot penetrate, such as large gaps in the margins of gallery forests.

The worst weed of the wet tropics is pond apple, a species of Annona from southern USA which is invading lowland Melaleuca forest. It develops as a heavy understorey and prevents the regeneration of the Melaleuca species as well as destroying many ground cover species. The fact that it is much more sensitive to fire than the Melaleuca species is used to control it. The timing and intensity of the fire is critical. In the presence of this weed, long exclusion of fire from Melaleuca forests to the stage where all ground cover species have been shaded out and fire will no longer carry through them, is their death knell.

The ubiquitous weed, lantana, will eventually dominate the understorey in many of the higher rainfall forests of coastal Queensland. Once there it eliminates other species and appears to change the soil environment in some quite radical ways. Once it dominates it will only burn under severe weather conditions and with an intensity that is very destructive to habitat. At earlier stages of invasion, however, while it is confined to scattered clumps, it can be removed by repetitive fire. Where this weed is prone to invade, the maintenance of a fire regime in the sclerophyll communities is essential.

Very little that I have mentioned to this point, it will possibly be noted, is drawn from the experiences of traditional burning practices. This is not because I do not value such practices, but because of the peculiar circumstance of high-rainfall north-east Queensland. The long withdrawal of traditional burning practices has allowed radical changes to occur in the structure and the floristics of large areas of habitat. The re-establishment of traditional practices is no longer possible. Even where fire can be reintroduced to the system it will not

revert to an earlier state because of the loss of a majority of ground cover species in particular. It will change to something different again, but in an unpredictable manner.

Its evolution will also be influenced by the presence of exotic animals and plants. Their presence, in fact, will make the long-term continuation of traditional practices impossible, even where the habitat has retained much of its pre-European structure and diversity.

To travel the habitat management pathways of the future will require the best of both traditional knowledge and modern methods of scientific enquiry.