Burning the Mountains

Fire as a tool for bush regeneration.

Bruce Teakle, Mt Glorious, 1993

Introduction

For a long time, I found the only way I could react to the seas of lantana which carpet our forests, was to try to ignore them. My own experience bashing away at the lantana on our place with a brush hook and a mattock taught me that it was invincible, except in small patches. It seemed the invasion of our high rainfall areas by this exotic weed was just another of the tragic mistakes of European settlement in Australia. Even pushing the stuff away with a bulldozer, which works beautifully in some situations, was obviously unsuitable for most of the forests, due to steepness, soil damage, damage to existing plants and cost. Anyway, in the long term it was clearly not viable to maintain a constant and expensive battle with the lantana.

As I learnt more about forests and forestry, I found myself taking an interest in the opinions of my neighbour Rod Nicklin, who has spent most of a lifetime working in the forests around here, and who frequently argued that what the forests needed was more "beneficial fire". The idea that fire could be beneficial took some time for me to get a grip on.

The turning point in my own perspective occurred when I was taken one day by Rod to see an area of wet sclerophyl forest on Harland Rd Mt Glorious, which had been burnt in summer about a year before. The richness of the native understorey, replacing well established lantana, was remarkable, and was something I had never before seen under local eucalypt forest. Clearly fire could be “beneficial”.

In the last year a group of Mt Nebo and Mt Glorious people have been meeting informally to consider this idea of beneficial fire, and I have been very excited by what we have seen, especially out in the forests themselves. My understanding of the problem has been somewhat broadened. Not only is the presence of lantana a problem, but as important is the absence of many more native species. The exciting thing for me has been to find that there is a tool powerful enough to be used in the rehabilitation of much of the degraded forest in this area, which will not only remove the lantana, but will also stimulate the growth of a whole system of plants, many of which will not regenerate after removal of lantana by mattock or bulldozer.

The idea of using fire as a tool of regeneration is not original. Foresters, biologists, timberworkers, are familiar with the idea of summer fire to stimulate regeneration, or remove lantana. It is hard to find someone familiar with eucalypt forests to disagree with the idea. So why isn't this knowledge put into practice? Well, it is sometimes, but mostly it hides in the form of folk knowledge or in science's impenetrable libraries.

While I believe the principles of fire use are likely to be fairly widely applicable in areas of the same climate, this booklet will focus on the forests of the D'Aguilar Range, where we live. The D'Aguilar Range runs from Brisbane roughly north-west, with the most accessible stretch running from The Gap, through Mt Nebo to Mt Glorious. It is a favourite area for Brisbane people to drive to on weekends, to enjoy the environment of forests and mountains.

In many communities fire is a source of great conflict and emotion. Often this is due to real differences in goals, such as one neighbour wanting to grow trees, the other wanting to grow grass. The winter fire regime which advantages the grass will kill the young trees. The winter burnt forest

may never accumulate adequate fuel for the tree grower to light his regeneration fire. Some people may want to exclude fire altogether, and find this difficult. Farmers tire of the complaints of their non-farming neighbours.

This sort of conflict has led to some hardening of positions which could prove unproductive. Fire has great potential as a tool for rehabilitation in the Australian environment. In particular, in forests suffering from invasion by exotic weeds, fire may offer a tool powerful enough to tip the balance back toward native species.

This is by no means a scientific paper, with a water tight backup for every opinion and a fat bibliography. We haven't access to the resources to research and experiment until every point is conclusive. The members of our local group have found the argument convincing, and hopefully it may provide preliminary evidence to encourage the sceptical or well funded to undertake a more thorough investigation.

The Problem

Most of the eucalypt forests of the D'Aguilar Range are in a serious state of ecological decline, due to poor or zero regeneration of native plant species. In the wetter areas this decline comes in the form of massive lantana infestation of the forest, in other areas it is simply the poor regeneration of native plant species.

Goals

Put simply, our ambitious goal is the restoration of the forests of this area to a condition that mimics as much as practicable their condition before European arrival. This is in terms especially of diversity, sustainable regeneration, and ecological and economic productivity.

It is sometimes proposed that forests should be managed, or allowed to manage themselves in a condition that comes as close as possible to what the environment was before the interference of people. It is easy to forget that there have been many tens of thousands of years of human manipulation of the Australian environment, which, with dramatic climate change, have made the Australian natural environment absolutely unlike what it was before Homo sapiens invaded (don't forget that the aborigines walked to Tasmania). The last 200 years of white occupation have also seen the introduction of thousands of exotic species which also interfere with natural ecological processes. We are thus no more ambitious than to hope for forests of a quality nearly as good as what were here at the time of European settlement, in similar areas. This requires an attitude of racial non-discrimination towards our native species. In other words, we don't see rainforest species as more desirable than eucalypts or Acacias, and their companions.

The recent explosion in interest in rainforests has led some people to favour that forest type over others. This is understandable- the eucalypt forest is dry, scratchy, unpredictable, the rainforest is cool, embracing, stable. These personal feelings, however, should not be translated into a desire to propagate one at the expense of the others. Rainforests are actually relatively secure in this area, especially in comparison to the wetter types of eucalypt forest.

It is worth remembering the history of white man’s attempts to completely exclude fire from the Australian environment. These are widely documented and generally accepted as failing, i.e. it is impossible to keep fire out of the Australian bush, regardless of whether it is desirable.

We also accept that harvesting of timber is part of the land use in this area. This will influence discussion of timber species regeneration.

The Theory

Poor fire management has done much more damage to the forests of the D'Aguilar Range than logging, roading and tourism put together. We consider that only by the appropriate use of fire can we re-establish a diverse and regenerating forest.

Eucalypts, and their myriad of associates, require fire for regeneration (in their natural situation), and thus for existence. Particular forest types are adapted to different fire regimes, and although change in forest is generally very slow, a forest will suffer under the wrong regime. This can be due to the encouragement of exotic species undesirable in that area, loss of opportunities for regeneration, and perhaps interruption to nutrient cycles.

In the D'Aguilar Range, and most likely many other areas in S.E. Qld, Queensland Forest Service (Q.F.S.) policy has prescribed cool winter burns or none at all in large areas of sclerophyll forest, which has resulted in serious degradation. This degradation takes the form of poor regeneration, infestation by lantana and other weeds, and poor health of trees. This leads to loss of food plants for animal and bird species, restriction of travel for many animal species, and loss of timber production.

Our proposal is that burning for regeneration should be done in summer, after rain, at times chosen by experienced foresters as being best for regeneration and weed control.

Summer temperatures are high enough to allow burning of lantana, with a high kill rate. Eucalypts are more resistant to damage from fire during summer, and eucalypt seed is more available at that time for regeneration. As mulch and soil are damp after rain, there is less damage to soil, humus, and fire adapted seed from the fire. Regeneration of native species is thus encouraged, and the balance of natives to weeds pushed towards the native's favour.

The use of summer fires appears to be the only method available to re-establish healthy forests in this area.

The Situation Now

Degraded areas

In the D'Aguilar Range, North West of Brisbane, there are about 20 000 ha of State Forest. Most of this has been logged more than once over the last 70 years. Many areas have been logged only once due to either poor regeneration not producing a second crop, or Forestry policies which have taken large areas out of timber production for largely conservation reasons. There are areas which have never been logged for various reasons, mostly aesthetic. About 17 500 ha out of the 20 000, (88%) is eucalypt forest of various types. Of the wetter areas, which have the highest potential ecological and economic productivity, most are suffering from what we are referring to here as degradation, meaning failure to regenerate, and loss of diversity, usually due to heavy infestation by lantana.

Fire

Fire is used by the QFS for hazard reduction, and to a lesser extent for regeneration. Current practice allows fire only in winter months, because of a perception that "Summer Burns" are dangerous. The danger is not to the forests, which have seen everything before as far as fire goes, but to human habitation in and around the forests.

Until 1990 Forestry policy was to burn large blocks of up to 5 000 ha, by aerial ignition, every 3 years if possible. After 1990 policy was changed to allow smaller areas, about 200 to 1 000 ha, to be burnt less often, at about 7 year intervals. The aim is to generate a large scale mosaic of forest patches at different stages of the fire cycle. The result of keeping part of the forest always recently burnt, and thus with a reduced fuel load, is that large wildfires are less likely, more controllable, and cause less damage to the forest.

In drier areas, especially the warmer, dryer, north facing slopes, the winter fires are successful in burning the area, and do achieve some regeneration, especially of large seeded species

such as spotted gum and brush box. Some spotted gum forest seems to cope quite well with the current regime. In other areas the regeneration of brush box is dense, which is seen as undesirable by foresters. In other areas, especially cooler and wetter south facing slopes, fire is unable to sustain itself in winter, and large areas have not been burnt since they were first logged, often 40 or 50 years ago. Many of these areas have had almost zero regeneration of native trees in this time, due to complete ground cover by impenetrably dense lantana.

Eucalypts

Although out of fashion at the moment, over 600 species of eucalypts dominate most of Australia's forests. A few dozen species dominate the range, along with their many floral sidekicks: acacias, small legumes, grasses, apples (Angophoras), rainforest pioneers, and a host of other species. The different species form associations appropriate for different situations according to environmental factors such as soil, solar aspect, topography, water, and fire history. Although not as attractive to many Australians as rainforests, eucalypt forests are the homes of many of their favourite cuddly creatures, including koalas, possums, various gliders, and other marsupials, as well as being the habitat of many birds, insects and countless creatures adapted to this forest type.

In nature, eucalypts are completely dependent on fire for their existence. Thus their dependents - koalas etc. - are too. Individual animals and plants will always be killed in fires, but in the long term their species depend on it.

As adults, most eucalypts are resistant to fire, although many from wetter areas are susceptible to intense fire. Not only are eucalypts characterised by their resistance to fire, but by their creation of conditions which encourage fire. Their open crowns allow ample growth of ground covers, which eventually become available as fuel. Eucalypts also drop large quantities of highly flammable biomass- discarded branches and bark, and leaves which contain volatile oils. The high level of sunlight penetrating the canopy, especially in dry weather when the trees are inclined to drop some of their leaves, allows this generous collection of fuel to be dried out, making it easily ignitable.

Plants associated with eucalypts generally have their own methods of adapting to fire, and respond vigorously to appropriate fire. Many, such as the Acacias, have fire tolerant seeds with thick seed coats, and are stimulated to germinate by heat. Most eucalypts from this area have small, delicate seeds, and are fire adapted in a different way. After ripening of fruits, seed is held inside the fruit often for several months, waiting for final drying to open the valves and drop the seed. If ripe fruit is present, the heat of a fire will stimulate the fruits to drop seed over the following days. Eucalypt seed is only able to germinate in ash bed or otherwise bared soil, thus not only is the fire useful to open the fruit, but essential to prepare the ground. Within a short time after a fire, ground covers take advantage of the new opportunities and grow, quickly covering the ground. This makes it important that eucalypts have ripe fruit at the time of the fire, as seed dropped later will be unable to compete with the other plants, seed dropped earlier will be burnt.

The majority of local eucalypts are adapted to spring or summer fire as shown by this table:

Species	**Common Names**	**Seed collection months**
Eucalyptus acmenoides	White Mahogany or Yellow Stringybark	Dec.- Feb.

E. cloeziana	Gympie Messmate	Nov.- Feb.
E. grandis	Flooded Gum	Jan.- April
E. gummifera	Red Bloodwood	Jun.- Mar.
E. maculata	Spotted Gum	Jan.- May
E. microcorys	Tallowwood	Sept.- Feb.?
E. phaeotricha	White Stringybark	Jan.- May
E. pilularis	Blackbutt	Dec.- Feb.
E. propinqua	Small-fruited Grey Gum	Dec.- Feb.
E. resinifera	Red Mahogany or Red Stringybark	Aug.- Sept.?
E. saligna	Sydney Bluegum	Nov.- Mar.
E. sideroxylon	Mugga	Aug.- Feb.
E. tereticornis	Blue Gum or Forest Red Gum	Jan.- Mar.
E. tesselaris	Moreton Bay Ash	Dec.- Feb.

Timber workers talk of the "sap running" in trees, at particular times of the year, making the bark easier to remove. In eucalypts, this is said to happen in winter. This seems to correspond to a greater susceptibility to damage by fire, making young trees more likely to be killed by winter fires than in summer.

In the long term, eucalypts require fire for survival. Certainly not every year, as this will kill seedlings before they are big enough to resist fire, but at some interval allowing adequate regeneration of young trees. In some ways the smaller plants associated with the eucalypts are even more dependant on fire, as their lives are so much shorter, and the seed bank in the soil dwindles with time.

Rainforest

Rainforests too are defined by fire. Rainforests (often called "scrub") are made of plants which are intolerant of fire, and which create conditions that discourage fire. The rainforest canopy is securely closed, which keeps low temperatures and high humidity underneath, and discourages heavy growth of ground covers. The litter dropped by rainforest trees is less in quantity, less flammable and more easily decomposed than that of eucalypts, and breaks down quickly in the dark and humid conditions, leading to little buildup of fuel. Little wind penetrates the rainforest to fan flames, and overall the forest is surprisingly hard to burn. Usually only a very hot fire in an extreme drought will penetrate more than a short way into a rainforest.

Many species considered to be rainforest plants grow outside the rainforest. Many are happy to colonise eucalypt forest, but will be killed in fire. In "Wet Sclerophyll" forest, eucalypts grow in conditions wet enough to support vigorous rainforest growth as an understory. This understory tends to suppress fire, and thus prevent regeneration of eucalypts or their usual companions. In time, without the intrusion of fire, the eucalypts will die out and leave pure rainforest. In a drought, with the right winds and a hot wildfire, the rainforest understorey may be incinerated, and the next generation of eucalypts germinated. This dynamic relationship makes a beautiful and diverse forest, which is becoming less common in this area now, because lantana follows the eucalypts and, once established, leaves no opportunity for rainforest species to penetrate, or eucalypts to regenerate.

Some rainforest pioneer species take advantage of disasters such as fire, flood or cyclone which create large spaces for regeneration. Some of these perform poorly in the usual small gap closure situations in rainforest, where a large tree falls down and rainforest trees grow to fill the gap.

Many of these species have few chances of colonising eucalypt forest, which is a common source of large gap opportunity, due to the presence of lantana.

Brush Box

Brush Box (Lophostemon confertus) is common in this area. In good conditions it forms a large tree with a good timber, however it is unpopular with foresters and timberworkers.

Box is a very adaptable species, and grows in many forest types. Good quality sawlogs are generally found in wetter areas, frequently on the margins of rainforest or in damp gullies. On drier slopes it forms a scrawny but tenacious specimen.

Brush box has poor resistance to summer fire, both as a seedling and as a tree. Infrequent fire allows box to germinate and grow, winter fire will not easily kill young box. Once established, the box form underground "lignotubers", woody lumps which will send up suckers should the main stem be killed in a summer fire.

In many areas the box produces a thicket of small trees, 50 - 150 mm in diameter which seem to freeze in growth at about that size. In these areas, regeneration of eucalypts or rainforest species is largely prevented by the box, due to heavy leaf mulch on the soil, and heavy nutrient use. Health and growth rates of residual eucalypts in these areas are severely retarded. These box thickets are similar to those formed by this species in drier areas, and have been encouraged by recent fire regimes.

In the absence of fire, the box are not thinned by the natural fire process, so neither they nor any other species in the area are able to achieve any size. These box thickets do not appear to sustain significant regeneration of rainforest species, nor are they easily able to revert to the wet sclerophyl forest type which generally precedes them. In fact, change of fire regime offers only restricted opportunity for reversion as the box create an environment unconducive to fire hot enough to kill them, and killed stems are replaced by suckers. This leaves an area offering little in the way of ecological or economic resources.

Lantana

Lantana is a key character in this story. A typical scene along the range, especially in the wetter areas, is of large, old eucalypts protruding from a sea of heavy lantana, with only the odd young tree, often a rainforest species such as a celerywood, showing any evidence of native plant regeneration. Large areas of these wet sclerophyll forests, once the most productive in the range, have had almost no regeneration for up to 50 years. Absence of fire in wet sclerophyl forests might have in the past resulted in a transition to some type of rainforest, but now generally results in blanket lantana dominating the forest.

Lantana infestation of much of these forests displaces native ground covers, removing food plants from wildlife, and making travel on the forest floor impossible or difficult for larger marsupials such as wallabies and koalas.

This lantana does not generally allow any regeneration to penetrate its many heavy layers, as the rainfall is high enough to produce the blanket type of lantana which achieves complete ground cover. This is in contrast to the type of lantana growth seen on drier or poorer sites, which grows in discrete clumps, allowing some spaces for other plants to regenerate in between. Some people even consider the clumping form of lantana helpful in regeneration of dry rainforest (or vine scrub), with species like hoop pine.

Heavy lantana also invades the rainforest on sites where human or natural disturbance has occurred, such as roads. It will not intrude seriously under the canopy of established rainforest. Lantana is so vigorous in wet areas that it would appear that the only way rainforest species can recolonise in damaged rainforest is by physical removal of the lantana by hard working humans.

Lantana is spread mainly by seed. The small black fruits are available most of the year round, and are eaten by birds. This enables its spread to anywhere adequate light is available, which includes most eucalypt forest without a heavy understorey. Thus lantana is spread beyond the bounds of direct human interference, into unlogged areas, national parks, etc.. Once established, the lantana is able to

consolidate its hold on an area by growth of multiple stems, and rooting from stems in contact with the ground.

Lantana and fire are a temperamental couple. On a shady southern slope, lush lantana may be almost impossible to ignite, sometimes even in summer. With the right conditions, however, the same patch may burn with a ferocity hard to match in the vegetation of these forests.

Winter fires are rarely a problem for lantana. When burnt in winter, most of the branches are blackened and killed, but the base of the plant survives. Within weeks of the fire the stump has resprouted and by the end of the season it is hard to tell there was a fire. Heavy lantana is quite difficult to burn, especially in winter.

In hot summer conditions it will burn, in the right conditions, and is commonly accepted as responding quite differently compared to a winter burn. Even a cool burn in the right part of the summer will usually achieve a high rate of kill. A hot fire will often leave hardly a stick to show the lantana was there at all.

Possibly lantana is adapted to an environment in which it is likely to be frosted or eaten by hungry browsers during winter. In preparation it stores its energy in its roots, ready for loss of its top. When fire destroys the stems, adequate energy is available to regrow the top. In summer, perhaps these reserves are spent on growth, and too little energy is reserved to resprout. Simple temperature of the fire does not appear to be the cause of the difference, as lantana which has suffered a cool fire in summer has been observed to die. Whatever the cause, the fact that lantana is susceptible to summer fire is crucial to the rehabilitation of invaded areas.

Although Lantana camara has been privileged to receive a long history of experiments in biological control, none of its introduced enemies has been up to the task in this area.

Logging

It is important to make a clear distinction between logging and clearing. This distinction is somewhat blurred by the practise of clear felling, which is a logging technique used in plantations and some native forest types. Clear felling, which has attracted some unfavourable attention recently, involves the cutting down of all or nearly all the trees in an area, and regenerating an even aged stand. Logging means cutting trees down to get their timber, and may involve encouraging regeneration. Selective logging is the cutting of trees for timber, but only cutting some of the trees in an area. Clearing is a quite distinct process where forest is permanently removed so the land can be used for something else, usually agriculture, perhaps plantation forestry.

Selective logging is practised on about 8 900 ha, or 45% of State Forest on the range. No logging is done in rainforest areas, creek zones, beauty spots or scientific areas. Logging is done on a cycle of about 40 years. The process of selective logging starts with marking of trees by a state forester, who works to an extensive set of criteria, requiring the retention of habitat trees, felling of trees in a direction causing the least damage to remaining vegetation, and some removal of trees of poor commercial form. Private contractors (employed by the mill) then cut marked trees, which are then generally snigged to loading areas by bulldozer, and loaded onto trucks for transport to the sawmill. Due to low productivity, and use of selective logging, only 5-10 m3/ha of timber is generally cut in production areas. Logging activities cause soil disturbance where machinery has worked, and leaves large amounts of dead wood in the form of tree heads, uncommercial logs, and disturbed vegetation. This material creates an environment unconducive to regeneration, but favourable to lantana. Forest Service policy allows logged areas to be burnt for the disposal of this fuel, sometimes in summer.

Areas which were logged, and not burnt afterwards, are now often covered in the most lantana. This seems to be especially the case in those areas which were more fertile and moist, and most productive. Often the only regeneration in these areas is where there was mechanical soil disturbance by logging equipment.

Although in logged areas there are small areas of destruction where trees have landed, the proportion of the forest affected is very small, and the overall effect is minimal, except for encouragement of lantana, if appropriate post-harvest management is not carried out.

It is tempting to suggest that logging is responsible for the introduction of lantana. However, the evidence in this area is that unlogged eucalypt areas are in basically the same state as the logged. There is an area across the road from the Wivenhoe lookout which has never been logged. This has been known to foresters as the "icecream block", a delicious meal waiting to be consumed, and is in the same state as other adjacent blocks. It also has a 40 year break in the age profile, a sea of lantana, and old trees starting to look a bit ragged. Under pre lantana conditions, this might be now well on the transition to rainforest. However, under the conditions it has experienced, the lantana has thrived at the expense of the eucalypts, ground covers, and the rainforest transitional species.

Fire and Climate

The climate in south- east Qld generally has a dry winter, with frequent gusty westerly winds, a stormy humid spring breaking the drought, and a main rainy season with winds from the south east in the late summer and autumn.

This is thoroughly different from the climate in South Eastern Australia, where the legends of Black Friday and Ash Wednesday come from.

In the South, most of the rain falls in winter, and summer is their dry season. High fire dangers, and consequently all the famous great fires of the past, occur in dry summers, when hot, dry North Easterlies blast out of the inland desert. The closest we get to this in Queensland is in spring, when we have usually had a long dry winter, and we sometimes get hot dry North Westerlies. This is when our greatest fire hazard occurs.

Current controlled burns are carried out in winter. This time is chosen because of the cooler conditions and shorter days, which reduce some wildfire hazard and cause less alarm to the population. Gusty westerlies sometimes spoil these plans, sending smoke over Brisbane and making fires harder to control.

Pre - Colonial Burning

Although the rules of the ecological game have changed somewhat with the the introduction of exotic species, it seems reasonable to imagine that native species will be given the best competitive situation in the environment in which they have evolved. Although the situation as white people found it on first arrival in Australia was already profoundly changed by the aborigines, the system as it was then had sustained itself for at least 40 000 years, a fairly convincing experiment.

It is clear that the aboriginal inhabitants of the country had a big impact on their environment, mostly through the propagation of fire. It would be unfair to presume that burning of country was merely the accidental consequence of camp and hunting fires, as it is clear that the aborigines had a disciplined approach to interacting with their environment, and a deep understanding of how it worked. Both of these attributes would be imperative to people who lived in such an intimate relationship with their environment, especially when using fire.

Many early accounts describe not only that aborigines used fire freely and frequently, but that they were very aware of which fire was beneficial to their interests, and which was not. This included the employment of fire control techniques in certain areas, such as burning breaks around special forest areas, or beating out fires threatening yam growing areas at the wrong time. Evidently fire was used to modify the environment to what suited them, even to the extent of well recorded attempts to drive early European explorers back into the sea from which they came with wild grass fires.

Frequent fire could encourage the proliferation of grasses, at the expense of woody ground covers, and thus support greater numbers of wallabies and kangaroos, offering better hunting prospects. Along the routes of frequent travelling, fire could transform a scratchy struggle through thickets of sticks, to a comfortable stroll over the lawn. This is not a frivolous matter for people in bare legs and feet, with a concern about stepping on snakes. On the other hand, a fire at the wrong time could incinerate the family, or leave your territory a wallaby- less black desert for several months while waiting for rain to bring regeneration of grass. Many of the ridgetops in this area, the best routes for foot travel, showed the evidence of frequent burning within living memory, with open forest and very little understory but kangaroo grass.

It would make sense that when the aborigines burnt the larger areas, that they would do it at such a time that the grasses they were trying to stimulate would make as quick and vigorous a recovery as possible, and that the ground covers which would have provided various bush tuckers should have the best chances of regeneration. A winter burn could leave the forest black for months waiting for the spring rains, and would produce a poorer regeneration of useful small plants. It would make sense for aborigines to make broadscale burns in summer, when quickest recovery would have been achieved, although along walking routes perhaps more frequent fires would have been used. Some more historical research may prove useful here.

It may be more relevant to look much further back in history than the aborigines, through an ice age or two, to when the eucalypts and other native species were evolving. In the absence of fire-happy humans, the only common source of ignition would have been lightning, which is still occasionally responsible for wildfire.

The average year sees one or two dry lightning ignitions along the range which foresters extinguish. Without roads, fire breaks and fire fighters, these fires could burn large areas before being halted by natural breaks.

It is bold to make assumptions about the climate long in the past, but usually lightning storms are concentrated in spring and early summer. Presumably this has some part to play in the evolution of local plant species, especially in their seeding times. This history would have produced a whole ecosystem adapted to predominantly summer fires.

Farm Fires

Although a bit of a diversion, it is interesting to consider the use of fire by pastoralists. Quite a bit of grazing in SE Qld is done on forested or partly timbered slopes, on largely native pastures. Farmers often use fire to 'clean up the rubbish', to burn off the weathered dead grass and encourage a flush of fresh growth. This is commonly done on an annual basis, which brings a secondary benefit of preventing eucalypt regrowth, as seedlings are killed before they are big enough to survive a fire. Around August is the traditional time for these fires, when the grass has dried off enough to burn, and spring promises a spurt of growth. This tradition may have some basis in the minimal regeneration of eucalypts it will cause, due to the principles outlined above.

Examples of this type of practice may be found in State Forest around residential areas. Common technique is to make two parallel breaks around the area to be protected, between which, if possible, winter fires are made annually to reduce fuel to a minimum. This zone is sacrificed from the aspect of regrowth, to protect the houses.

Thus we have a situation where much forest which looks attractive enough at first glance has an age break of decades, with practically no regeneration of trees. Frequently sawlogs have been taken out in the past for milling, and trees left are only those considered too poor in quality for the mill. The result is consistent with the motives of the farmer, who is interested in grass for his stock, but is important when considering the quality of our forests.

Farm fires can also create problems for landowners attempting to stimulate regeneration and grow timber, who may have to create and burn fire breaks in order to use their preferred fire regime rather than that of their neighbours.

Forest or Just Trees

Probably the most important point to make in this discussion is that there is a difference between a healthy forest and an area of trees. While I won't presume to define what a forest is, it is clear that a large proportion of our land with trees on it is not at all healthy, despite being pleasant to look at. These areas are failing to regenerate at a sustainable rate, and/or are not supporting the diversity of flora and fauna that they once did.

The other important conclusion I have come to is that the natural systems are surprisingly robust. They are adapted to recover quickly from what we see as natural disasters, as long as those influences fall within their expectations. Occasional selective harvsting of timber, drought, cyclone or severe fire may produce a terrible scene, but the forest recovers in a short time.

What the forest cannot cope with is the more insidious long term change to its circumstances. Feral predators eating holes in the food chain, prevention of regeneration over long periods by weeds or inappropriate fire regime, long term overharvesting or other persistent interference with the basic needs of the system seem to have the worst effects.

What We Propose

Our proposal is not so much a definite, restrictive prescription to replace the current system of reducing hazard to human habitation, but we propose a general change to a policy of using fire as a tool to encourage and allow forest regeneration. This task goes far beyond the responsibility of forest managers, and especially requires much more serious consideration of the consequences of development in or near native forest.

It is worthwhile, however, giving a description of the type of fire we consider to be especially desirable, and which has been almost absent from the forests for a long time. This is regenerative summer burning.

A Possible Model Fire

In a typical year, thunderstorms break the winter dry in October or November, wetting the ground and invigorating the spring growth spurt which is greening the forest. Prevailing winds settle into the southeast, and humidity and temperatures are high. When the eucalypts have mature fruit in their crowns, the time is ripe for a burn.

Planning for the burn will have been made by the forester beforehand, with preparation of fire breaks. A bulldozed fire trail is inadequate to contain a summer fire, especially in the event of an undesirable change of weather, such as changed or increased wind. To expand these breaks to an adequate size, the edges might have been burnt in winter. In some conditions this can be done without the labour of hand chipping a second fire break, by letting the fire be extinguished by vegetation of poor flammability in winter temperatures, especially late in the day.

In some conditions borders with rainforest patches may need special attention, by burning out from the edge, to avoid a hot fire coming uphill and scorching the forest. Burning late in the day, or even at night are useful techniques in some situations. Often this will be unnecessary as frequently rainforest is in the dampness of a creek gully, into which a fire would have to burn downhill. In this situation the fire will generally be extinguished by the rainforest conditions.

Choice of the right day to burn is of paramount importance. If lantana destruction is the chief purpose, most people seem to believe January is the best time. For other goals there may be better times.

As well as local knowledge, other tools such as the Drought Index are available to indicate likely fire danger. These, along with weather readings and predictions, help to reduce the ever-present chance of an accidental fire escape.

The way in which a fire is lit is important in determining its controllability. Burning downhill and across hill is useful in extending fire breaks, as the fire is cool(relatively) and slow. Once these are established, then the main fire may be lit from the bottom. This uphill fire will be hotter and faster, and best able to penetrate and kill areas of lantana, which will be the initial task after any adoption of summer burning.

Once the fire is lit, the main job is to keep an eye out for any spot fires which may be started by windborne embers, which can usually be quickly dealt with if caught early. For dealing with possible escapes, a crew of firefighters equipped with proper gear is always on hand at controlled burns.

What Next?

Once a wet sclerophyll area has been burnt, the regeneration will determine the follow up treatment. Even a hot fire will usually leave patches of unburnt forest, including lantana. Follow up patch burning may be used to finish off these weed remnants and allow best possible regeneration.

If native species regeneration has been unsuccessful, due to poor follow up rain, or inadequate seed fall, another try may be made two or three seasons later, once adequate fuel has accumulated to sustain another fire.

Often it is desired to regenerate forest on land which has been completely cleared in the past, and which is lacking seed trees and stored seed in the soil. Sometimes patches lacking in natural seed sources will be found in the forest. In these situations it may be desirable to manually seed with tree seed and maybe even other forest plant seed. One forester I spoke to described how he sometimes carries a salt and pepper shaker full of mixed eucalypt seed, which he sprinkles on bare patches in areas short of seed trees, after fire. This is most likely to be successful when rain is imminent.

Once successful regeneration has been initiated, there may be little or no need for fire for some years, maybe decades. In timber production areas, fire is sometimes used for thinning timber species, as smaller and less vigorous seedlings will be killed by a fire that better quality trees would survive. This might be done at around the seventh year, after which no fire may be desirable for a long time.

At this stage it becomes obvious how little we understand about the forest, especially in relation to fire. There is obviously a great deal of research and experimentation to be done in the formulation of an accessible body of knowledge about fire in forestry. Unfortunately at the moment this is the sort of work being cut out of institutions like the DPI.

To conduct such forest management in a way adequate to regain and maintain forest health and productivity, requires a sufficient resource of experienced and available labour. With forest health a political non- issue, it appears doubtful to me that the resources are being made available to do the job. Proper forest management may require more money than what these forests earn.

Problems

In my research on this subject, I have found little dissent from foresters, or forest ecologists, that summer fire is desirable for regeneration in eucalypt forest. There is a perception that summer fire has a potential for disaster not possible in winter. Some have claimed that this is due to the percolation north of ideas from the south eastern parts of Australia, where there is good reason to be scared of summer fire, in a thoroughly different climate.

The situation in QLD is quite different from that further south. Most years will offer a window of opportunity when windspeeds drop and humidity rises, in which the danger will have reduced to an acceptable level.

The idea of natural disaster is a human one. Even if a fire, purposely lit or wild, accidentally becomes hot enough to kill the mature trees of a section of forest, the forest has its own ways of recovering. Nature has seen it all many times before.

On the fringes of our cities, it has become fashionable for people to build their houses in the forest, imagining that they can somehow make their houses, cars, computers, pianos, part of the forest. They are not prepared, understandably, to make these precious things part of the natural cycle of destruction and creation needed for the perpetuation of the forests they are inside. Nor do they appreciate ash falling on their washing, nor understand the meaning of the smouldering black disaster the burnt forest appears.

Thus these areas are withdrawn from the natural system, and natural regeneration curtailed. Our low density suburban sprawls take huge areas of forest away from nature, preventing fire, restricting the movement of and killing wildlife, inhibiting regeneration. Open spaces are filled with exotic plants, and forest remnants are invaded by carnivorous pets which exterminate local fauna. All rather similar to the invasion of a giant weed.

These direct effects of the human population are bad enough, worse is the effect they have on the forests around their settlement. Too often forest management in these forests is severely inhibited by the nearby populations. Fire, one of the foresters most important tools, becomes very difficult to use anywhere near suburban habitation. "Natural", or unplanned fires are a greater real risk to the suburbs, and policies designed to reduce the risk of these will also compromise the health of the forests.

For the future of these forests, their fires must be taken into account in the design of our cities and houses. Unfortunately, most of the time this will require a physical separation of forest and

suburb, to allow the forest to be managed without having to worry so much about real and perceived threats to housing. This is a reason to make residential suburbia more dense, and to be more cautious about allowing continued subdivision in areas with natural vegetation.

As usual, it gets back to education of the community about the environment around them. This is something sorely lacking in the area of fire.

Conclusion

Large areas of forest are dying, or simply not living at their full potential, due to lack of summer fires, or other inappropriate fire regimes. This is a gradual process, made less obvious by the abundance of old trees in most areas. It has already had a severe impact on many native plant species, in particular ground covers, and animal species.

To improve the health of these forests, fire policy on public and private lands must change from a regime intended to reduce hazard to property, to one carefully designed to encourage and protect regeneration of native plant species.

For regeneration to become the primary goal of Forestry fire policy, many attitudes will have to change. The people who make the day to day decisions about our forests cannot be expected to be conservation pioneers, and take risky decisions. They work in a large machine with its own massive inertia, which takes its orders from parliament house. Their job is to keep things running smoothly, not to fuss about gradual changes to the forests which may or may not be happening. It is important not to presume that everything has been taken care of.

This booklet has been written in the hope that it will help generate community support to change the fire practices in our forests. It is only by public pressure that things can improve.

A local tour

As it is only reasonable (and highly desirable) for people to want to see things for themselves, here are some of the more easily accessed spots on the range which each have their own unique history, in which fire has played a special part.

The Christmas 1993 Fire, was the biggest fire event in many decades for Mt Glorious.

This was started accidentally by a truck carrying a load of poles up Lawton Rd(on the left going from Mt Glorious village to the summit). Some of the poles were extending over the cabin, and their bark was ignited by the exhaust. Sparks from the burning logs fell on both sides of the road and ignited leaf litter. As Lawton Rd is itself a fire break, this lit up two separate fire areas. Hot dry north westerly winds came up and helped the fire to jump two more breaks before fire fighters could back burn, and thus about 3200 Ha was burnt.

Luckily the mountain was blessed with almost perfect conditions following what was almost a model regeneration fire (except for its size). Regular rain germinated and sustained seedlings on large areas which had been lantana locked for decades.

The fire extended from Mt Nebo to the Wivenhoe lookout on the western side of the Nebo-Glorious road, only jumping the road in a small area between Harland Rd and the Mt Glorious village.

Some observations after the fire:

Many areas had prolific wheatfield regeneration of eucalypts immediately following the fire, but most of the seedlings were short lived, being swamped by weeds or dying in the following months. The most vigorous seedlings, where highest survival was achieved, germinated on soil which had been scorched by burning wood lying on the ground.

It was surprising what didn't burn e.g. rainforest was generally untouched, many patches of lantana survived, probably by meeting the fire at the wrong time of day for a good burn.

The hottest burning areas, with the most scorching of trees, were heavy patches of lantana.

Many Rainforest trees were surprisingly resistant to fire, but vines on rainforest margins were very susceptible.

Main Rd Mt Glorious, opposite Harland Rd and just towards Mt Nebo, is a small area which was burnt in January 1993, but was protected by firefighters from the December 1993 fires. Most of the January burn area burnt again in December. This summer burn trial was not followed by enough rain to keep young eucalypts alive, and thus the regeneration evident is other species.

Brown's Road, Mt Glorious, is an interesting example of a wet sclerophyll (eucalypt) forest in which rainforest is well established, perhaps for a long time to come. Folklore has it that fire came there in 1936 last, the ages of the eucalypts illustrating successive fires. Othe parts of Mt Glorious, including parts of Fahey Rd show evidence of the same fires, including some handsome Sydney Blue Gums.

Harland Road, Mt Glorious, past the end of the bitumen, is private land on the northern side- left hand side going out. This had a summer burn in 1992, and is a beautiful example of what a eucalypt forest can look like. There is a vigorous understorey of native species, including leguminous vines and bushes with eucalypt seedlings among them. This had previously been burnt in about 1983, and before the recent burn was vegetated with the usual mix of eucalypts and lantana .

Main Road, Mt Glorious, opposite the Mt Glorious Biological Centre, is an area that has been rainforest for a long time. Native vines seem to be assisting lantana in its degradation. This is perhaps due to the clearing for the road and private property opposite allowing the S.E. winds to progressively damage the trees from the roadside in. The vines and lantana seem to be blocking the usual gap closure mechanism by smothering seedlings and pulling down saplings.

Such a situation of rainforest directly abutting a clearing would have been very unusual in nature, as the normal boundary to rainforest is eucalypt forest. The presence of adjacent eucalypt forest might tend to work in favour of the trees and against the vines, by reducing the light at ground level.

This is a site which may not have seen fire for thousands of years, and would not be a site on which fire could be used to stimulate regeneration. Unfortunately the brush hook might be the only tool able to help here. In places along this roadside, patches of lantana and vine have been removed by bulldozer and brush hook and trees planted by the Community Association, and their progress will be interesting to watch.

Bullocky Hill Road, Mt Nebo, leaves Mt Nebo Rd at Bullocky Hill, which is the hill just after the turnoff to Jolly's Lookout on the way to Mt Nebo. It comes off on the southern (left hand) side of the main road, and after a locked gate, goes a long way in state forest. Along this road are various recently logged areas, which show various responses to logging and post logging burns. Some wetter areas which were not successfully burnt are now covered in blanket lantana, others which were given a summer burn after logging show good regeneration of eucalypts and associates.

In the area around the locked gate are several examples of what is considered by the timber workers to be box infestation. These areas are dominated by brush box saplings of 100 to 200mm diameter, which can sometimes be several decades old.

Mt Nebo Rd, between the Gap and Mt Nebo, shows several areas where burns have been made on a fairly narrow strip between the road and a bulldozed break within sight of the road. These

burns are annual, if possible, to create zones of minimal fuel as fire breaks. Areas treated this way have their own beauty, often spotted gums in kangaroo grass, with very few young trees or undergrowth.

Further reading

Burning Bush, A Fire History of Australia. by Stephen J. Pyne. 1991. Published by Allen & Unwin.

This book, by an American, gives a colourful overview of fire in Australia, from prehistory, through aboriginal use of fire, to the struggles of Europeans coming to terms with a fire adapted environment. Very broad, rather long, but worthwhile reading.