ASPECTS OF FIRE ECOLOGY: A SHORT COMMUNICATION

PREPARED FOR MANJIMUP SHIRE COUNCIL

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Introduction

Fire ecology is complex, many faceted and imprecisely understood. However, many studies have been conducted nationally, internationally and locally. In Western Australia, fire ecology studies have been conducted by scientists from a number of organisations including CALM, CSIRO and the Tertiary institutions.

CALM has maintained an active committment to monitoring and researching fire effects in the Manjimup District since 1972. This has been seen as essential if we are to to use fire as a management tool without causing environmental degradation.

The following research is a brief summary of findings of relevance to issues raised by Council.

Preamble

- It is necessary to appreciate that fire has a long assbciation with the south west, dating back many thousands of years. Regular summer droughts, flammable vegetation and ignition sources such as lightning and aborigines meant that smoke on the horizon was commonplace.

- As a result of this long association, our local flora and fauna have evolved in a fire environment and display a range of fire adaptations and dependencies. For example, a high proportion of local flora will re-sprout following fire. Many plants require fire for seedling germination (e.g. wattles). In the absence of fire, there is little or no seedling germination in our forests.

Fire Effects on Flora

Discussing the effect of fire on plants, must be in terms of fire regime. A fire regime is the historical pattern of season of burning, the frequency of burning, the intensity of fire and the size of the fire. Our local flora have evolved to survive a wide range of fire regimes. However, the response to a fire regime will vary according to the life form or the regenerative strategy of the plant or community of plants.

Broadly speaking, we can classify plants as either fire re-sprouters, fire seeders or hard seeders. Fire re-sprouters have below ground organs (rootstocks etc.) from which the plant re-sprouts, even though

the above ground part of the plant is killed. Such plants are generally very resilient. Our studies have shown that regardless of season of burn, re-sprouters will survive even after 7 burns in 15 years, or a burn every 2 years. Normally, such plants reach flowering age 2 - 3 years after burning. The time to reach maturity is important as this is an indicator of the minimum fire interval necessary for the long term survival of a plant species. That is, if an area was to be burnt every 2 years, then eventually, only those plants which mature and flower in less than 2 years, will survive. This is one reason for the invasion of exotic grasses in reserves such as Kings Park.

Fire seeders are those plants which are induced to flower or seed by fire and includes such plants as blackboys, some Hakeas, some Banksias and some Eucalypts. Again, it is important that the interval between fires is longer than the time it takes for these plants to reach maturity. Season of the fire may be important especially in drier climates with little or no summer rainfall. Spring burning may favour or disfavour various species in this group. For example, a spring fire may initiate flowering and seed set. By the time the seed is ready to fall, it will be approaching the cool moist winter months and the seedling will have a better chance of survival. On the other hand, seeds which fall onto the ground following a spring fire may germinate early, and in dry climates, may wilt off and die over the summer months. The same seeds induced to germinate in autumn have the moist winter months to become established.

Locally, it is not very critical either way. There is a large store of seed in the soil, which is available to germinate at a later date. In the Manjimup District, we often experience some summer rain, so the problem of poor regeneration following a spring burn is not as great as it might be in drier climates. Also, our dry summer period is relatively short.

Hard seed species are the wattles etc. These plants are killed outright by fire and rely on very durable seeds stored in the soil for regeneration. The importance of spring or autumn burning on this group of plants depends largely on the quantity of seed stored in the soil and the interval between fires. Ideally, the seeds of these plants prefer heat treatment to stimulate germination. It does not matter at what time of year the heat is applied, in terms of heat treating the seed. Spring fires are normally conducted under moist fuel and soil conditions so the degree of soil heating, therefore proportion of seeds treated, is usually less than a fire which burns under dry conditions. This is why we often see dense thickets of wattles or coral vines following a wildfire.

While spring fires may not stimulate the same amount of germination, this is not necessarily a problem as the seed is still present in the soil. Ideally, an autumn burn every now and then (say every 3rd or 4th rotation) would be desirable. Studies near Manjimup have shown that even after 7 spring burns in 15 years, no species loss was incurred.

In Summary

1. Locally, many plants are re-sprouters, so will not be adversely affected by either spring or autumn fire.

2. The interval between burning is very important. Locally, it should not be less than 3 - 4 years on a sustained basis.

3. Continuous, frequent spring burning may not favour some hard seeders in the long term. This can be rectified by introducing an autumn burn from time to time and perhaps extending the time between burning, especially in drier climates.

Effect of Fire on the Atmosphere

. Bushfires have burned over much of the earths surface for many thousands of years. Smoke from these fires has and will continue to enter the atmosphere as it has done from early times.

  Research into the nature and properties of bushfire smoke has been carried out in the USA and Australia.

. The particulate composition of bushfire smoke varies, but on average is as follows: tar, 55%, soot, 25%, ash 20% (Vines 1976). Gaseous composition is as follows: CO, 0.5 - 2 ppm, CO_2 about 150 ppm above clean air, O_3 (ozone) 0.02 - 0.03 ppm. Dangerous concentrations of gaseous pollutants such as NH_3, SO_2 and oxides of nitrogen were not detected (Vines).

. The quantities of the above substances released during a fire or prescribed burn, will depend on the quantity of litter and vegetation burnt and the size of the fire.

. If we did not undertake regular fuel reduction burning (therebye slowly releasing the above substances over a longer period of time) we run the risk of massive, short term releases of the same chemicals as a result of wildfires, such as Ash Wednesday. Such massive releases over a short period are less likely to be diluted and broken down by natural processes and probably constitute a greater pollutant. Studies needs to be done on this.

Bushfires (whether prescribed or wild) are a source of CO_2 a gas which is contributing to global warming.

Vines (1977) stated the following: "Robinson and Robins (1968) suggest that the CO_2 produced by fires throughout the world is much less than that resulting from other sources. Nevertheless, if we include the global use of wood for fuel and effects produced by deforestation (especially tropical rainforests) and the decomposition

of peat, humus etc., the annual contribution of CO_2 to the atmosphere is certainly of the same order as that arising from the burning of fossil fuels. It is well known that the CO_2 content of the atmosphere is increasing rapidly and that, if the trend continues, climatic changes could result".

Further studies on this source of CO_2 are needed.

Conclusion

As our understanding of the effects of fire increases through research, we are able to continually refine and improve our use of fire as a management tool. There are no indications that past burning practices have caused irreversable environmental damage.

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