An Australian's Impression of North American Attitudes to Fire

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With the help of the Tall Timbers Research Station and the Tasmanian Forestry Commission I was able to spend 4 weeks visiting various fire research organizations in the United States and Canada.

It is of course impossible to discover in 4 weeks all that is being done in fire research in North America. Instead, an attempt was made to discover the reasons or "frames of reference" which decided the attack on current problems. To stimulate the greatest response I adopted a questioning approach rather than that of an attentive tourist. This approach helped to high-light short-comings in fire research but did not give enough coverage to important research findings.

It was especially interesting to meet face to face the authors of so many papers I had previously read in Australia and to see in the field something of the environment for which these papers were written.

FUEL ACCUMULATIONS

Perhaps the most striking feature of that environment was the presence of annual fuels throughout the pine and hardwood forests.

This is a relatively unusual situation in the eucalypt forests where there is a "fuel-free period" after fire of 2–3 years in most places and up to 100 years or so in a few of the wetter sites.

The combination of this annual fuel and a very high frequency of lightning fires indicates a fire environment at least the equal of Australia's. Even if past natural fires were smaller in North America than in Australia, the larger number of fires would have little difficulty in covering the whole forest estate as enough fuel accumulated to carry them.

Recently there was much fear expressed (and dispelled) about the San Andreas Fault. Nothing has been said of the far greater threat that exists above the ground in the Berkeley area. Here there is the "ideal" fire situation: a combination of topography, climate, vegetation and houses buried in the vegetation. There is apparently no fear of fire in spite of past fire records; in spite of fuel accumulations under the eucalypts, up their stems, in their crowns (a continuity of fuel not seen in the same species in Tasmania); in spite of the "perfect" intermixing of openings with tall dry grass surrounded by heavy forest fuels (both pine and eucalypts).

Very little imagination is required to foresee a catastrophe in this area far worse than the Hobart fires of 1967. Just how big a catastrophe depends on how soon the public can be made aware of the fuel situation. Without this education it is possible that 500 to 1,000 people will die in a single afternoon within the next five years.

FUEL PROTECTION OR FOREST PROTECTION?

One remarkable difference between Australia and North America occurs after a fire disaster. In Australia there is public recognition of fuel accumulations and public pressure for the use of controlled fire to reduce these accumulations. In California there appears to be public condemnation of the fire-fighting organizations for not controlling the fire, and pressure for ever bigger and better fire brigades. The general public is apparently unaware of the significance of the fuel factor. There appears to be no public pressure for building regulations to outlaw such hazards as shingle roofs or houses set on steep, chaparral-covered, slopes. It is apparently over-looked that the very

efficiency of the fire brigades guarantees fuel accumulations that will one day produce a holocaust. The whole system seems to be dedicated to disaster. The underlying public assumption or frame of reference must be that mechanized man is superior to wildfire. How can this frame of reference have developed in the most flammable part of the continent, where winter rains produce a spring flush, where summer drought turns this growth into fuel and prevents its rapid decomposition, where fuels accumulate over the years, and where lightning fires occur? Why is there no public pressure for fuel reduction?

OUR EUROPEAN FORESTRY HERITAGE

This extraordinary situation appears to be the result of the imposition of European attitudes to fire on a non-European vegetation. What appears to be lacking is a native "frame of reference" based on a careful study of the vegetation itself and its natural fire environment. This study of the natural fire environment has, until recently, been lacking throughout most of North America and Australia and quite probably the rest of the world. Fortunately there are many individuals from a broad spectrum of sciences who are concerned about this lack and the Tall Timbers Research Station deserves great credit for drawing together these people at its annual Fire Ecology Conference and for publishing their views in the conference proceedings.

That fire is an integral part of the natural environment of North American forests was not denied by most of the people I met. The surprising feature is that fire is not studied in this context. Instead it is treated either as a catastrophe or a tool. This compartmentation of fire on one hand and the rest of the environment on the other seems to stem from the Clementian concepts of succession and climax in which fire was regarded as a disturbance that sets back the succession to square one. Clements in turn appears to have been very much influenced by European forestry, as most of us still are.

Unfortunately forestry first developed in Europe after thousands of years of disturbance by man. It started as a direct result of wood shortages, i.e. after most of the forests and the forest fuel had disappeared. Once re-established, the forests were intensively managed

and little fuel was allowed to accumulate. Fires were almost entirely man-made. This is one of our most important frames of reference, our European forestry heritage. Others that are very important in both Australian and American forestry are the agriculture and gardening frames of reference. From these influences we have come to assume that loss of N and organic material is axiomatically detrimental to growth. As fire removes both, it is concluded that fire must be bad. This conclusion can completely over-ride observational evidence to the contrary or produce a kind of schizophrenia which says "although we know fires cause damage to the soil and loss of N and organic matter, we don't know of a more economic way of preparing a seedbed for Douglas fir (or *Eucalyptus regnans*, etc.)." We become apologetic, even secretive about our use of fire. We go to great lengths to replace fire with machines or chemicals without really understanding what fire does. Our unnatural alternatives aggravate soil erosion and cause pollution of land, water and air far in excess of the most destructive wildfires.

FIRE, EROSION AND POLLUTION

Although a few experts know the difference, we have failed to educate the public to discriminate between geological erosion and man-aggravated erosion; between woodsmoke and gasoline exhaust fumes; between wood ash and the chlorinated hydro-carbons. In these cases our frames of reference are too narrow, they recognise erosion and pollution but fail to separate the man-made from the natural. I was told that anti-pollution authorities are about to ban forest burning in Oregon; this in spite of general recognition by most foresters that fire is an integral part of the local forest environment. However, this recognition has apparently not been strong enough to allow a vigorous compaign of public education on the need for forest fires. Perhaps if the complete role of fire in the environment had been understood, foresters would be less apologetic and more outspoken about their use of fire.

The recent mud slides in California are erosion on a massive scale. I understand that the television coverage implied that they were all the direct result of burning. It was apparently overlooked that they

occurred in a geologically unstable area where the vegetation can only act as a temporary check. Perhaps the mud was released by burning but the point overlooked, and possibly deliberately concealed, is that the two alternatives in this area are continuous small-scale erosion or massive periodic erosion. Permanent stability is *not* an alternative. If massive periodic erosion is undesirable and if burning helps to prevent a build-up of material above the angle of repose, the cure is not less burning but more.

FIRE FOR WASTE DISPOSAL

Perhaps one aspect of fire that requires most study is its role in destruction, removal and recycling of forest products, especially the dead components of the vegetation. Again we run up against a frame of reference that makes progress difficult. This is the tacit assumption that plants do not produce waste materials, i.e. organic by-products that hinder growth. The closest recognition comes in the concepts of the need for "mineralization" to maintain the "nutrient cycle." Seldom is it recognized that minerals make up only 1–9 percent of plant debris and that "mineralization" must mean 91–99 percent destruction. Of course the C, H and O lost are recycled through the atmosphere but so also is N. Too often the concept of nutrient cycling omits atmospheric exchanges. Another concept that comes close to recognizing the importance of plant waste is that of "unavailability" of certain elements in the soil—especially N. That the unavailability is a product of growth, an organic compound *that has been discarded by the living organism* is never mentioned.

There have been some extraordinary studies of heather burning on Scottish peat "soils" where the authors measure N input in rain but get concerned about N losses due to burning; this in spite of the readily available knowledge that heather unburnt for 30 years disappears from the site and that there is 5000 kgs./ha of N in the first 15 cms. of "soil." Moreover the "soil" is a recent accumulation only 1000–4000 years old. In other words N is accumulating faster than it is disappearing in spite of very frequent fires. This "unavailable" N is obviously part of the waste products of heather.

In terms of plant wastes and waste disposal it is not necessary to

be apologetic or secretive about the use of fire. Fuel reduction burning fits in as part of the natural role of fire. Nutrient recycling, patently not fully achieved by biological agencies in forests where fuels accumulate, is more efficiently carried out by the combination of storage in durable debris and periodic processing by fire. Biological agencies are just not capable of breaking down some of the complex polyphenols and terpenes.

Waste disposal is only one of the possible functions of fire in the environment; no doubt other functions could be discovered if more time were spent developing a native ecology that included fire. This means a long-term study, in the field, of the complex interactions of the vegetation and its environment, including the discontinuous factors such as lightning, flood and fire. These interactions are discovered only by continuous reshaping of hypotheses against field observations.

THE ACADEMIC APPROACH

Places of learning which boast an "ecology lab" obviously do not speak the same language as I do. Complex interactions of natural environments are not present in a laboratory and many are overlooked in short-term studies.

The laboratory approach is very useful indeed if it tests hypotheses developed through long-term field observations. It is misleading if it merely tests some theoretical hypothesis. At Macon and Missoula I argued strongly against the use of crib and excelsior fires to model fire behaviour. It is all very well to separate the variables and then construct models and scaling laws that re-synthesize the behaviour of large fires—IF WE KNOW ALL THE INPUT FACTORS. The apparent assumption is that we do—which I doubt. Why go to this trouble of unnatural separation and unnatural re-synthesis? Why not start with field trials where nature has already done the compiling? From theoretical grounds the possible interactions of just a few factors become so numerous as to daunt the investigator. In nature the important interactions have already been selected.

A most unfortunate feature of the United States university system is the "publish or perish" syndrome. Because of the strong pressure on authors there is maximum emphasis on disjointed reporting of

facts, however narrow. The flood of papers, each representing a segmented study, only contributes to confusion. What is needed are fewer, deeper, long-term studies, synthesizing, not fragmenting knowledge.

THE NEED FOR LONG TERM STUDIES

Long-term ecological field studies do not show an immediate dollar return and I understand that University funds are generally not available for such studies. However, the lack of these studies can lead to such disastrous mis-management as the massive DDT spray programmes against spruce budworm, which in the long run cause more trouble than they cure.

The role of Forest Services in both North America and Australia could probably be summarized as one of maintenance and, if possible improvement of our forest assets. Perhaps they should finance ecological studies. This is not to say that the forests have not been studied already. On the contrary, works such as that by Pearson on Ponderosa pine are excellent descriptions of the forest and most U.S. forest trees are well covered in a recent silvicultural handbook. But if these works are re-examined two features are apparent. The first is that there is a mixture of observations with silvicultural treatments of European origin. The second is that fire is discussed as a destructive agency or as a tool but not as an integral part of the environment.

FIRE FOR REGENERATION AND HEIGHT GROWTH

In Australia light burns, that just remove the fine fuels, allow seedling establishment but do not promote good growth. For rapid growth we need intense fires which produce the typical "ash bed effect." Washington Douglas fir forests viewed from the air are a chequer-board of black and white; black for uncut, white for snow. Why is there so little grey? Where is the regeneration that should be above the snow? Are the seedlings growing too slowly? Do they have an "ashbed" response and require intense fire? Jack Lyon's studies seem to suggest a very marked "ash bed effect" for non-coniferous species. Is anybody studying the interactions of fire in-

tensity and subsequent growth of Douglas fir seedlings? or of any other species?

California is blessed with the tallest softwoods in the world; Tasmania with the tallest hardwoods. Both live in an area with winter rains and summer drought. Both live in a fire environment. The only other similar climate occurs in the wetter parts of the Mediterranean where there are now no native tall trees. It is no coincidence that man has been in America and Australia only a few thousand years and European man less than the lifetime of these giant trees.

Why is the Sierra Club so keen to preserve the redwoods but not the fire environment in which they developed? An ecological study would quickly expose the nonsense of this approach. It should be remembered that the organism that constructs a 2000-year-old redwood tree is not itself 2000 years old. It is up to 7 years old. Since the tree regenerated growth has been continuously upward—the straight spires show this. Unfortunately there are now signs that the coast redwoods growing on the slopes are already responding to a recent change in the environment and are retreating down their giant skeletons. This recent change is, in my opinion, fire protection—a breakdown in waste disposal by fire. There is no corresponding retreat to be found on trees growing on the plains where floods have washed away accumulated growth products and renewed the soil.

It is doubtful whether in the long run fire protection will succeed, and the redwoods will probably regenerate themselves after the next big fire.

But who wants 3-foot redwoods?

SUMMARY

It is of course impossible to study anything without some frame of reference and there is much to be said for those used in forestry today. However, most of the frames of reference listed below have noticeable shortcomings with regard to fire and have been superimposed on the native vegetations of America and Australia and most other parts of the world.

Frame of Reference	Noticeable Shortcomings
European Forestry Heritage	Unnatural forests, omission of fire as part of a natural environment.
Agriculture and Gardening	Deals with annuals or understorey species. Indiscriminate regard for N and organic material.
Plant Wastes and Nutrients Cycling	Tacit assumption that plants produce no wastes.
Erosion and Pollution	Indiscriminate condemnation.
Laboratory Approach	Strong regard for facts—however narrow. Disregards complex interactions or assumes that they can be simulated on a computer. Disregards long-term or discontinuous factors of the environment.
Publish or Perish	Favours segmentation, not synthesis.
Public Relations	Assumes only foresters can tell the difference between wildfire and controlled burning. Trained public to ignore fuel factor and to depend on fire fighting organizations (in some areas).
Mechanized Man and the Dollar Vs. Nature	Assumes Nature can be beaten. Fails to comprehend that man is inescapably part of Nature.
Ecological Approach	Not sufficiently studied with fire in mind.

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