AN ECOLOGICAL HISTORY OF AUSTRALIA'S FORESTS AND FAUNA (1770-2010)

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Summary

The often intense modern debates about the management of Australia's forests and their fauna have their roots in the attitudes of the early settlers. To understand the origins of these conflicts, and provide a sounder basis for forest management, it becomes necessary to work across the disciplines of history, forestry and zoology, with an ecological perspective. Australia's historical records are poor with respect to its early natural history, and forestry and fauna have been treated as separate subjects by government and society. This disconnect underpins current environmental debates about

forest fauna management and conservation. In this chapter, we explore some of what is known of Australia's forest history and how this has translated into today's management dilemmas, and give some examples of how our ecologically-focused historical research can inform current wildlife management policy. Specifically, we examine three case studies of forests through the eyes of foresters from Western Australia (Lane-Poole), Victoria (Francis Moulds) and Tasmania. These are tenure-bound studies within State Forests, i.e. Crown forests with commercial logging. We then examine two fauna species, Koalas and Grey-headed Flying-foxes, which are dependent on forests, and have declined to threatened status as their forest habitat, irrespective of tenure, has been cleared, fragmented and degraded since British settlement in 1788. In fact, we start our ecological history with the views of botanist Joseph Banks, who was on Cook's voyage of discovery of the east coast of Australia in 1770, then review the status of forests in the first-ever national statistician's account in 1908, then again in 2008 with the current national status. We concur with David Lindenmayer's conclusion that there is a complementarity between species-based research and research with an ecosystem focus, such as the effect of fire and logging on the structure of forest stands, landscape variation and long-term changes. The case is presented here that an ecological approach to forest fauna history is a new, cross-disciplinary synthesis for Australia.

1. Introduction

To anyone involved in the debates over the management and future of forests in Australia, any suggestion that there has not been intense conflict, at least since 1975, would be met with amazement. Human conflict draws historians to the subject, yet the subset of that conflict which examines the fauna is yet to come into focus. There are reasons why the subject is not yet within view, the most important of these being the difficulty of working across the disciplines of history, forestry and zoology with an ecological perspective. Nevertheless, there have been some excellent starts. The formation of the Australian Forest History Society in 1988 is the clearest example. Its first president, John Dargavel, was a forester by training and this has given forests, foresters, forest workers and silvicultural practices the dominant position in the agenda. Nevertheless, as zoologists working on forest fauna with an ecological outlook, we have appreciated the opportunity to present ideas on forest fauna history within the society. It is a subject that is yet to take hold, but it is one that will expand the principles of forest management and present new opportunities in dealing with the debates over forest management and forest tenure.

In the intense political debates in the 1970s and 1980s over whether rainforests in State Forests, particularly in New South Wales (NSW) and Queensland, should be logged, or have their tenure changed to National Parks, the political resolution was largely in favor of change. Those rainforests are now World Heritage Areas. Similarly, the decision in NSW in 2005 to transfer much of the tenure of the Pilliga forests in the north-west of NSW to National Park or conservation reserve, and the decision in 2010 to convert much of the River Red Gum forests along the Murray River to National Park, were more localized conflicts, i.e. within NSW, but nonetheless so intense that they made the national news. In contrast, woodchipping of eucalypts for export since 1970 from Tasmania, Western Australia and NSW for paper manufacture has arguably generated the bitterest and most enduring debate in the environmental history of Australia, despite the considerable contribution of the Regional Forest Agreement Process in the late

1990s to resolving the matter. The contest in the political arena has largely been one of conversion of tenure from commercial forests, managed by a State agency, to the non-production tenure of National Parks. In the 2010 meeting in Queensland of the National Forest Working Group on wildlife and silviculture, some interstate members were shocked to hear that the Queensland government had now opted out of native forest management, with about 60% of the forests being transferred to reserves, and the remaining 40% to be logged, with all trees over 30 cm diameter to be logged, then transferred to reserves. Timber will be either imported or be obtained from private native forests, of which there are about 1.9 million ha in Queensland. The titanic battles that surround all these changes are the stuff of environmental history, let alone the disciplines of politics, government and planning. How, one might ask, does forest fauna history contribute to this debate?

The answer to that is less sharp than the public contest over tenure, with its barrage of argument and counter argument and its final resolution at the level of State and/or Commonwealth governments. Forest fauna history falls largely in the area of ecological history, i.e., using historical information and ideas to deal with ecological questions about changes in the numbers and distribution of species. It also goes to the question of whether our forests of the future will still hold their full complement of fauna. That matter is still open, but the body of professional opinion would say that we are still deficient in our knowledge of what species occur in the forest, our ecological knowledge of the animals and how forest management decisions affect their long-term future. There is also little consensus as to whether state agencies managing forests being logged can effectively address the issues and accommodate the new ideas from skilled staff in this field. This topic includes the difficult topic of long-term monitoring. The subject of the ecology and conservation of our forest fauna is relatively new, almost all of the research having been produced in the last 40 years, and that research is critical of past and current practices, such as logging old growth trees and aspects of fire management. As any intelligent public servant knows, criticisms of established policies and practices are rarely welcome, especially if they are published. We argue that better investment in studies of fauna ecology in forests, with a long-term perspective, is essential. Long-term monitoring, to be effective, needs champions, besides good experimental design, good field skills and an ability to store data effectively and write up the work for refereed books and journals. Foresters do appreciate that trees take centuries to grow and mature, that professional foresters are needed to stay the course in planning and managing the forests, and that one generation of foresters will not necessarily see the benefits of their work, or the scale of their failures. The role of the forest fauna ecologist has yet to be seen to fit within that paradigm. While there are some effective fauna ecologists working within state forest agencies, and related government departments, as well as universities across Australia, the subject is yet to be seen by governments as a critical part of assessing Ecologically Sustainable Forest Management (ESFM), a requirement that has risen to the forefront in the last 20 years. The contention here is that if fauna fades as the forest is managed predominantly for timber, then ESFM will not be satisfied because of this new principle of management. It is a point understood in a broad sense within forestry practices, i.e. sustainable forests for timber, but ESFM elevates fauna to be as sustainable as timber. ESFM, in our opinion, is yet to be achieved in Australia's commercial forests, both old native forests and in private native forests, because of insufficient attention to fauna. One example

will suffice to illustrate this view. For the southern coastal forests of NSW, Forests NSW produced, in 2005, a clear statement of ESFM principles and many details of how this was going to be given effect. Biodiversity was addressed. However, a careful reading of the text shows that it is written at a higher level than can be applied to any particular species of native fauna, for example the Agile Antechinus *Antechinus agilis* or Gould's Long-eared Bat *Nyctophilus gouldi*. Thus, how this document would conserve any given species can only be speculated upon. This means that although achieving ESFM in these forests has become an acknowledged aim, it is yet to be given the concrete program needed to be implemented, monitored and audited. Given this conclusion, what can an ecological history of forest fauna contribute to achieving ESFM? The answer to that question is the subject of this chapter. It is tackled by covering ecological principles, old paradigms, new methods, examples of long-term changes in forest fauna, practices within state forest agencies, including case studies, and the perspectives of key players. It starts with examining the early history of the European settlement, or invasion depending upon one's standpoint, for any links of forests and their fauna.

Large tracts of forests are the usual focus of concern about forests, whether woodchipping, rainforest logging or more recently, River Red Gums, or managing private native forests. However, cleared, largely cleared, or partially cleared forest is just as important, and more so in many locations, such as on the coastal strip where the human population is high and growing rapidly or on farmland where crops, such as wheat, or stock, such as cattle, are the dominant agricultural pursuits. Much of this forested, or formerly forested, land is now either private property or land in trust, such as with local government or in various State government departments or instrumentalities other than National Parks or State Forests. For example, Travelling Stock Routes traverse much of the rural landscape, and their dedication early in the British settlement of Australia means that they hold some original vegetation patterns, large trees, and unusual fauna. Thus State Forests or National Parks protect and manage much of the remaining large tracts of forest, but there is still much extant forest on productive farm land, and within encroaching towns, especially on the forested coastal strip of south-eastern Australia with its burgeoning population. While State Forests and National Parks may be the central point of attention to understanding, managing and restoring forest fauna, the role of private land, and land in trust, will be pivotal to the survival of all our fauna. State Forests or National Parks are simply not enough on their own to conserve our all forest fauna. This is likely to be even more the case as climate change shifts the distribution of species of both trees and animals, and not necessarily in concert, so that all the fauna now in a forest will remain with available habitat. Consequently, this chapter examines both private property and Crown land with forest, as well as private land where forests once stood. This leads to two separate strands in the account. The first deals with forests that are managed as forests. The second deals with populations of forest fauna, irrespective of tenure boundaries. But now, it is back to the beginning of European settlement of Australia.

2. The Attitudes of Settlers

From the moment Europeans arrived in Australia they adopted a Eurocentric attitude to Australia's landscapes, flora and fauna, climate and land-use. They called their new settlement New South Wales, imported garden and food plant species, established

agriculture in the English style, and introduced European animals while attempting to exterminate the local species that were seen as pests. Further, except for a few dedicated naturalists, they made few records of what they found as they settled the new land, preferring to document their own achievements as colonizers, and this situation has largely persisted until modern times. Hence, attempts to reconstruct the history of Australia's flora and fauna sometimes resemble detective work rather than science, and must be based on fragments of reliable information, educated inferences, and anecdotal records which are often contradictory or skewed by the European attitudes of the writers.

The attitudes of the first European settlers in Australia in 1788 pervade the history of wildlife and of forest management in Australia, and forestry and fauna have been treated as separate subjects by government and society for most of this period. This disconnect underpins current environmental debates about forest fauna management, particularly the tough conservation debates that arose in the 1970s, and most of the players in these often-bitter disputes have known no other period of the relationship of forests to wildlife management. The story of the Koala *Phascolarctos cinereus* reflects major elements of these changes. Today the Koala is an iconic species with its own national conservation and management strategy, as well as state management plans or recovery plans. Yet up to 1927 it was hunted for the fur trade, with the numbers shot in Queensland, the last State to ban shooting, running into the millions in the first decades of last century. At the same time, forests were being cleared for farms, and the best lands for agriculture were the fertile lands, especially those near rivers and their tributaries. The Koala is an animal that depends on the leaves of a limited range of species of eucalypts, the most pervasive of Australia's forest trees, which grow on the more fertile, well-watered soils. The decline of Australia's Koala populations is thus linked to the conversion of forests to farms and the impact of associated human habitation, from dogs to cars, all of which reflect the now fragmented nature of Australia's forests. There is a suite of species that can be assembled to tell a similar story, although there are striking differences among the species and the stories. However, collectively they identify that there is a close ecological link between forests and their fauna and, as the species accounts accumulate, the richness of that association grows, and general management prescriptions can be derived to assist in conserving our forest fauna. Almost all of these accounts are modern, and are the result of research since 1970. The historical perspective helps to explain some of today's attitudes of rage against those who give priority to conservation over logging, and the converse, and why the matter causes so much political tension. It also helps to explain why so much effort has to be devoted to catching up with such problems as restoration, fragmentation, planning, accountability, and even such seemingly vague concepts as intergenerational equity and the precautionary principle.

This chapter traces ideas about Australia's fauna and Australia's forests, and comments when these two subjects are treated separately, and when they are linked. Since the linking was rare until the 1970s, special mention is made when the two are intertwined before then. This approach has the odd demand that one has to be a forest historian on one hand, and a fauna historian on the other. Natural history has a long tradition that predates the settlement of Australia, but the focus is on the animals, with words and ideas such as habitat, population trends and the impact of changes to the landscape absent from such texts. Forests and their products were of keen interest to the British

from first settlement. The ships of the First Fleet were built of timber, and the need for appropriate timbers was well known. However, neither the fauna of Australia, particularly the mammals, nor the timber from Australian trees, particularly the eucalypts, were familiar to the British settlers. Thus it is not surprising that as the first settlers occupied Sydney Harbour, then spread steadily along the coast, then over the ranges to the western plains and the rich inland forests (although they were also called woodlands because the tree cover was not as dense as in the coastal forests), there was little discussion of how the location and management of one of them was at all linked to the other. In that sense, the historian of forests and their fauna is a very modern one and, not surprisingly, the modern forest fauna historian has been captivated by the intense conflicts over how the forests should be managed, and how the fauna fits into that mix. At a forest history society meeting, it is odd being the only soul talking about fauna, but at a mammal society or an ecological society meeting the association is understood, although ecological history has yet to be a noticeable theme in these meetings, whereas that is a standard theme in the forest history meetings. This chapter is one contribution to interdisciplinary scholarship on the history of Australia's forest fauna, a nascent discipline in need of scholars.

3. The Approach Adopted in this Chapter

The historical decline in the forest fauna of Australia will not be arrested without ecological research into the species which inhabit forests, and the ecosystem changes from land clearing (the greatest threat to conserving biodiversity), habitat degradation, such as from logging and altered fire patterns, alien invasive species, and now climate change. However, one strand of ecological research that has yet to gain more prominence is ecological history, i.e. using the tools of history to interpret ecological change over the long term. Modern ecologists recognize the importance of monitoring and long-term studies, yet most data sets are short by comparison with the 222 years since European settlement in Australia. For example, from 1980 to 1985, a group of us studied the effects of logging for woodchips (for paper manufacture) on wildlife in Mumbulla State Forest, near Bega in the Eden region in south-east NSW. However, the forest's logging history long predated the woodchip industry, which did not start in this region (Eden) until 1968. A study of the changes in this forest since first settlement in 1830 showed that it had been logged since the mid to late 19th century, and by the time the high intensity woodchip operation arrived in this forest in 1978, change was well underway. The detailed history of the forest from a variety of sources, including the wonderful 50-year memory of the retired forest foreman, helped us to re-imagine the original forest to gain a sense of change. Originally, our studies were to assess the impact of fire, logging and drought on the forest as it then stood in 1980, but we knew that we were looking at an already depleted fauna. The base year really should be 1830, not 1980. To gain some knowledge of changes since 1830 to the forest fauna of the whole Bega district in the Eden region, in which Mumbulla State Forest is situated, a detailed historical study turned up four mammal species that are now locally extinct, and others that were common but are now locally rare. The Spotted-tailed Quoll *Dasyurus maculatus* was seen by many as a local pest less than 100 years ago, now it is a nationally-listed threatened species. The Koala is now locally rare, but at the end of the 19th century there were two local Koala-skinning factories. Tracking these changes, and looking for causes of the changes, is where the fascination in the scholarship lies,

but the results are of great importance for any recovery program. The case for conducting such studies grows stronger, but the interdisciplinary demands look too daunting for most potential entrants to the field.

The guiding principles in this chapter have been those of a zoologist with an ecological outlook and a specialist interest in mammals, and one who gives much weight to long-term studies and the political and media dimensions of the issues, as well as recognizing that the historical context can add far more to contemporary discussions, management plans and political decisions than has hitherto been acknowledged. This chapter is partly a sifting and compilation of historical writings, and deals generally with the history of Australian forests and their fauna, rather than just one forest. As NSW research ecologists, some detailed examples are from this eastern State, which was also the first to be colonized. However, there are outstandingly good accounts from other States, and they are drawn upon in this history. For those charged with the responsibility of understanding and conserving Australia's fauna and their habitats, the value of historical ecological knowledge is in its application to the conservation and management of wildlife, particularly in relation to the adverse effects of encroachment by humans and their land use activities on habitats. We are hamstrung and frustrated by the poor historical record. Similarly, the knowledge of the Australian forest landscape and its fauna, gathered over tens of thousands of years of occupation by Aboriginal people, has either been lost or not utilized in any meaningful way by Europeans. This chapter looks at the early records and the attitudes that underpinned Australia's early relationship with its forests and their fauna, the state of knowledge in 1908 after about a century of settlement (many regions were not colonized until the early 19th century), then after two centuries, which takes us to modern times.

In the time between 1770, when Captain James Cook charted the east coast of Australia for the British, and the present, there are known trends in both forests and fauna, but the two are rarely linked. The public mindset for most of the period of the European occupation of Australia since 1788 had not grasped that fauna conservation was an exercise in habitat conservation. That link in NSW was made clear legislatively for the first time with the passage of the *Fauna Protection Act 1948*. It added the selection and dedication of Faunal Reserves, now known as Nature Reserves, to the task of protecting the State's fauna. In 1948, 'fauna' was limited to birds and mammals. The passing of the NSW *National Parks and Wildlife Act 1974* repealed the *Fauna Protection Act 1948* and absorbed its provisions, and added reptiles to the taxa classed as fauna to be protected. Frogs were added in 1992. The invertebrates, except for a few endangered species, lie outside the legal definition of fauna in NSW. The link between fauna conservation and habitat conservation was maintained, with the concept that National Parks and Nature Reserves provide essential habitat as the surrounding land becomes increasingly modified by human settlements, agricultural lands and commercial forests. In fact, the selection of reserves, be they National Parks, Nature Reserves, Marine Reserves or some similarly protected areas, became a major science in the 1990s, and Australia made original international contributions to such studies. The concept of a 'Comprehensive, Adequate and Representative' reserve system is now well entrenched in public policy and is simply referred to as a CAR reserve system. While it remains an aspiration, there is no-one seriously arguing on scientific grounds that we have enough reserves to conserve all our fauna into the future. We rely on good management of other

Crown (State-owned) lands, such as State Forests, council reserves, lands held in trust, and Travelling Stock Routes, to complement the formal reserve system.

Also critical to the outcome for fauna is conservation on private lands. For formerly forested landscapes that are now in private ownership, this usually equates to the better-watered lands (known as frontages, with the backblocks being those away from the rivers) with the richest soils, and which held the forest types least well conserved in our National Parks and Nature Reserves. This selection by farmers of the well-watered river frontages, and the lands with the fertile soils, has left a visible and repeating shape to the landscape. Along the east coast, it has been the valleys that have been cleared and farmed. It has been the ridge country, the non-arable lands, that remain as forest. In fact, most of the fierce contests about the use and management of today's forests are about those on the least fertile ground, because that is the bulk of what forest remains. It is this context that has led one forest researcher, Wayne Braithwaite, to argue that our conservation focus should be on the remnant forest on the fertile soils, and researcher Bob Pressey has made it plain that the forest types on the fertile soils are the ones under-represented in our reserve system. Since most of the forests on the fertile lands were felled and cleared in the 19th century, up until about World War I, their faunal communities are largely imagined, but not studied because there are now crops and farms, or the towns that service these rural communities, where these valley forests stood. However, the extant remnants are most valuable indeed. While every remnant should be considered for reservation, or rehabilitation, the need to manage the fauna in the forests on the steeper, less fertile soils is where the current emphasis has been focused. This is just one element of the considerable case for dedicating and managing National Parks and Nature Reserves, but it is not the focus of this historical account. If history were of little interest, the battle to prevent logging of old growth forest and see it conserved as parks or reserves, or wilderness, would be the focus. It has been the political focus since the mid 1970s, and it is where the huge public contests have been played out, but that struggle can distract those keen on conserving forest fauna across all tenures, including commercially-logged forests, or seeing the aim of conserving our forest fauna in an historical context.

As a consequence of the separate cultural strands of forests and fauna, or timber and native animals, this history explores these independent pathways, with the ultimate aim of intertwining them to arrive at a new synthesis for forest history and the management of forest fauna. Most of the sources are not about either forests or their fauna, so the gleaning of information required reading strings of quite unrelated accounts, such as local histories, and state of the nation reports.

To make the analysis plain, these sources are separately analyzed and presented here. Where possible, they are tied to other sources, or to independent statements within their accounts, such as a forester's appraisal of a forest. A child psychologist watching young infants play can observe them being next to each other but not interacting in their activities. This is called parallel play. It precedes the more mature version of interactive play. It is a good analogy for both forests and fauna for Australia for most of the period of European settlement. Thus this history documents the individual play, then watches the maturation of the players, the increasing use of technology and the deeper appreciation of the value of ecological history to this exercise.

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legacy of the British in Australia. Who owns an area matters, and its designation for logging or nature conservation, i.e. State Forest or National Park, has been centre focus of the bitter conservation battles in the Eden region. We found the old maps and plotted them to look at how tenure changed before, during and after the advent of woodchipping in 1970 and the Regional Forest Agreement Process of 1999.]

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Ratcliff, F. N. (1932). Notes on the Fruit Bats (Pteropus spp.) of Australia. *Journal of Animal Ecology* **1**, 32– 57. [This pioneering ecologist was decades ahead of his time in this research, and it is a remarkable document on this extraordinary genus of bats, as both a yardstick of change and how to manage this species.]

White, J. (1790). *Journal of a voyage to New South Wales*. Republished in 1962 by Angus and Robertson, Sydney, Australia. [John White was a surgeon on the First Fleet, and participated in the very first British exploration of the colony, at that time, around the settlement at Sydney Cove. His record is invaluable, and he has been called Australia's first resident naturalist.]

Woinarski J., Pavey C., Kerrigan R., Cowie I. & Ward S. (2007) *Lost from our landscape: threatened species of the Northern Territory*. Northern Territory Department of Natural Resources Environment and the Arts, Darwin. [John Woinarski is one of the leading lights in Australian ecological thinking about both species and landscapes. He works on the vast canvas on the forests of northern Australia, and the Northern Territory in particular, and his insights provide ideas that go far beyond his study area.] Year Book Australia, 2008. http: // www. abs . gov . au / ausstats / abs @ .nsf/7d12b0f6763c78caca257061001cc588 / 6567087ca4478f26ca2573d2001067 a0!OpenDocument, last accessed 9 May 2010. [Such formal documents of these are essential for those interested in the State of the Nation, as well as progress in seeing Australia ecologically.]

Biographical Sketches

Daniel Lunney is a senior principal research scientist with the Office of Environment and Heritage NSW, with a special interest in fauna, particularly forest mammals. The species that have captured his attention over the decades have been the small ground-dwelling forest mammals, bats, and Koalas. His interest in long-term studies extends from repeated visits to sites where he has been working for decades, to pursuing enquiries as to what changes had occurred since first settlement. This ranges from studies of urban wildlife to wildlife in the wilderness, and includes research on farmland and logged forests. The problems tackled range from the effects of forest fire, to intensive woodchip logging, to planning to conserve semi-urban koalas or koalas on farmland. To relax, he edits, with recent editions being on bats, the natural history of Sydney, and human-wildlife conflicts.

Chris Moon is a freelance environmental consultant who has been involved in wildlife research and management since 1981. In the 1980s Chris co-authored papers on the ecological history of a south coast forest, and on the history of flying-foxes and their camps on the NSW north coast. From 1990, he has specialized in Koala survey and management on the NSW mid north coast, and is a co-author of the Coffs Harbour Koala Management Plan, the first statutory shire-wide Koala plan to be adopted under SEPP 44 in NSW. Chris has also worked for many years on the issue of wildlife road mortality, studying fauna use of underpasses at Coffs Harbour, Raleigh, Taree and Herons Creek, and designing the wildlife protection measures for the Pacific Highway upgrades at Lindsays Cutting and Pine Creek.