Pastoralism and the Landscape:

A lower Lachlan Survey

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Abstract

A combination of field, documentary and analytic techniques were used to explore the historical archaeology of the lower Lachlan region of New South Wales. The core of the study concerns the transformation of the landscape by the settlement of the area by European pastoralists and the subsequent instabilities that these transformations engendered. Special emphasis was placed on the dominant economic activity, that is, wool growing. Archaeological techniques were used to record the surviving standing structures from this phase of pastoralism. Various station records and Government reports provided graphic evidence for the crises produced by European pastoralism.
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Preface

The nineteenth century saw the establishment of a system of land use in the lower Lachlan region that was radically different from that which had preceded it. The new system of exploitation, the associated technology and the changes to the landscape which were soon to follow are the focus of this thesis.

The thesis is organized to present the region and its history as a logical unfolding of events and processes. It draws on concepts from a range of disciplines and uses information from various areas including ecology, history and mathematics. The chapters are arranged in chronological order.

In Chapter 1 the theoretical framework and the research methods, both field and archival will be discussed. The concept of a region as an arbitrary unit and the idea of an ecosystem as a complex of factors acting over time are central to the approach and are taken to include human history as well as physical change.

Chapter 2 presents the study region by exploring its physical resources and the evidence that is available from archival sources regarding the initial landscape which was encountered by the pastoralists when they arrived with their herds of hoofed animals in a landscape already shaped by a long history of human occupation and manipulation.

Chapter 3 describes the process of settlement first in the colony as a whole and then in the study area. The dynamics of experiment and adaptation to the strange environment are explored in the context of the role of people in transforming the landscape. However, this is not just a one-way study of human effect on the environment but an exploration of how strategies are adapted and modified with experience.

The first experimental land use, a large-scale pastoralism, is discussed in Chapter 4. The economic and technological basis of the system is examined and local practice is traced where possible.

Chapter 5 presents the local woolsheds. These large and beautiful structures were the industrial focus of pastoralism for the time that it dominated the area and even now are the most visible buildings in the rural landscape. The homesteads and the associated complex of buildings which formed a basis for the social and work life of the pastoral leases are discussed in Chapter 6.

In Chapter 7 the drought of the 1890's is shown to be the first major challenge to the pastoral system and the sudden encounter with the ecological thresholds that it precipitated is explored through the station records of an important local station. The mathematical theory of singularities, catastrophe theory, is introduced as a formal method of describing the stability of systems using the local material as a case study.

The aftermath of the drought, with the attendant modification of land use, is the basis of Chapter 8. Changes to land tenure and closer settlement schemes encouraged new technology and diversification but the human relationship to
the environment remains experimental.

Chapter 9 serves as a summary and draws together several important themes arising from the analysis of the data collected by the survey.

The field work on which the analysis is based is included as a series of short site reports in Appendix B. The scale of the region is large and the number of recorders was small so that a thorough photographic record of the increasingly more fragile sites was the first priority of the field record.
Note on Terminology

Modern names are used throughout, but, where suitable, older names are included. For example, Shire boundaries are those in current use on the 1:50,000 topographical maps of the CMA of NSW, but older units are sometimes mentioned in archival material.

Names of properties have been very fluid throughout the period of settlement. The name in present use is used where possible, but older and alternative forms and spellings are included where necessary for clarity.

In site reports and figures, structures and features are given their local names, for example "the men's huts". However sexist this may seem, the station workers of the time were mostly male and the buildings as well as their names reflect this aspect of their history.

Note on Measurement

In general, metric units of measurement are used, but some quotations include the old imperial units and these have not been changed. In particular, the monetary units of pounds, shillings and pence are often mentioned in old station reports and a mathematical conversion would give no indication of their worth in the nineteenth century.

List of Abbreviations

<table>
<thead>
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<th>Description</th>
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<tr>
<td>AONSW</td>
<td>Archives Office of New South Wales</td>
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<tr>
<td>ANU/ABL</td>
<td>Australian National University, Archives of Business and Labour</td>
</tr>
<tr>
<td>AWU</td>
<td>Australian Workers Union</td>
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<tr>
<td>CMA</td>
<td>Central Mapping Authority of New South Wales</td>
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<tr>
<td>CWA</td>
<td>Country Women's Association</td>
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<tr>
<td>HRA</td>
<td>Historical Records of Australia</td>
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<tr>
<td>NSWGG</td>
<td>New South Wales Government Gazette</td>
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<td>WLC</td>
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CHAPTER 1

A Lower Lachlan Survey

1.1 General Introduction

The lower Lachlan region of New South Wales is an area of climatic extremes and internal contrasts which has been much changed since it was settled by European pastoralists during the wave of expansion that spread from the settled districts of the eastern seaboard and reached the lower Lachlan sometime in the late 1830's and the early 1840's.

The area is predominantly one of plains and river flats. An intermittent range of low hills runs parallel to the course of the river but is too eroded to much affect conditions. The climate is hot and dry with short but cold winters that produce heavy frosts but no snow. The variation in rainfall from year to year can be high and this is particularly significant in this area on the margins of aridity. The Lachlan River flows slowly through the plains providing an oasis of green and water in even the hottest, driest part of summer. The river, and its associated group of lakes, is the focus of life in the area. The Lachlan acts as both a link along and across its course and as a divide that marks contrasts of land and climate.

The river system has provided a rich habitat for humans over many millennia. Both river and lakes support many kinds of aquatic and bird life and attract land animals seeking water. Edible plants also flourish in the vicinity.

There is much evidence that the climate of Australia changed quite substantially when drier conditions developed at the end of the Pleistocene, so that the remaining sources of water became even more important to the inhabitants and life concentrated near reliable supplies. The environmental impact of such occupation arises through the differential survival of favoured species and, most importantly, the use of fire. The Aboriginal people used fire to hunt and to manipulate the vegetation as well as for cooking and comfort. The open grasslands were largely the product of this fire regime, a controlled management tool, developed over a long period of living directly from the resources of the land.

When the European pastoralists arrived in this environment they had no understanding of the processes that underlay the surface resources of grasses and herbs that made it such an attractive environment for their flocks and herds. Few of these settlers had any experience of the harsh and uncertain conditions of the inland of Australia. Many of them came almost directly from Europe, sometimes following a brief stay in the eastern coastal areas. Others
came from the coast or the areas first settled during the expansion of the colony. With such a background, it is not surprising that their initial perception of the environment was at odds with the reality.

The pastoralists had selected a complex ecosystem where dry conditions were the norm rather than the exception and where the lush perennial grasses so useful for fattening stock depended on the low densities of grazing that had pertained under Aboriginal occupation. Moreover, the perspective that they brought was that of post-industrial revolution market exploitation. The object of land use was not a comfortable subsistence but the production of commodities for trade on the voracious world market. In a single wave of change the old patterns of land management were broken and a new system of industrial technology imposed on the landscape.

The transformation of the area following the arrival of the settlers was far more widespread than the clusters of buildings that form the main body of surface remains from the settlement period might suggest. The entire landscape was affected by the process, not just the areas where structures were built. Often the changes were most obvious in the less built-upon places. For instance, most of the early houses and woolsheds were sited as near to water as possible, but some of the most dramatic effects of the new land use regime occurred in the more marginal areas away from the river where the impact of overgrazing and soil degradation was most severe.

Landscape change has long been studied by geographers. In Australia, there has been particular interest in the impact of European settlement and works such as Jeans, Powell, and Williams have concentrated on this theme. More recently, studies with a specifically ecological perspective, such as Lines, have appeared. It has been argued by Crumley that while such studies have been successful in relating economic factors to the landscape, they do not include other cultural elements that are often available in a particular region. In the case of the lower Lachlan, there are still available to the researcher both oral and material evidence which can add detail to the record and help in the interpretation of the regional pattern of change over time.

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Archaeology has always utilized written sources wherever they were available, whether in the distant past as in the studies of Babylon, Greece and Rome, or in more recent periods. It is, therefore, only appropriate that such records be included in any investigation for which they are present. While there are few documents that relate to the early settlement period, explorers' comments and the later station records add precision and the sense of a particular place.

The artifacts which are the subject of study reflect the diversity and contrasts of the region itself. They range from hand-made nails to huge woolsheds and include the lines of communication to metropolitan trading centres. All these elements are part of the landscape of the area which itself can be considered an artifact. Connah has remarked that "... the Australian landscape is like a drawing to which each generation has added a few lines, whilst erasing a few others ..." and these traces form important evidence of past activities. This survey of the lower Lachlan region is an exploration of the interactions between the settlers and the environment which have shaped the visible landscape.

The record of behavior which is contained in the landscape can be read by an interdisciplinary approach which combines the established repertoire of archaeological methods, including field survey and archival research, with a range of other disciplines including agronomy, economics, geography and ecology. Dynamic models of systems of land use have been developed which describe, in broad terms, how such a system operates under different regimes of land use. The concept of energy flow is central to the model and facilitates the study of change.

The area concerned is particularly well suited to this type of approach as it is a large and isolated one, little studied by archaeologists, where rapid change continues as a result of economic and social pressures. There are still present, often still standing, many of the first structures that were erected by the settlers. These buildings are at increasing risk from the dissolution of time and the activities of the human and animal occupants of the land.

There is also a wealth of oral history available among the older residents who have directly participated in the transformation of the region and who retain vivid memories of the struggle to establish closer settlement in the area. Many also have recollections of the conditions pertaining when parents and grandparents worked on the early pastoral runs as stockmen and contractors.

The scale of the survey has been restricted to the area dominated by the early pastoral leases centred on the aquatic system formed by the lower Lachlan River and the associated group of lakes of which Lake Cargelligo is the largest, as shown on the map in Fig. A2. The area is a complex one being both a unit centred on a river-lake system and a border zone separating areas of climatic

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contrast as well as administrative jurisdictions. The choice of boundaries will be discussed in the following section.

There are few parallel regional studies. Much work in historical archaeology has concentrated on the coastal area for it is there that most threat is perceived to operate. Surveys such as those by Bairstow,7 Hutton8 and Winston-Gregson9 all study areas that are relatively accessible and near the seaboard. Some work has been carried out in very remote and challenging regions, such as that of Holmes at Arltunga,10 Jack in the Palmer River area11 and Pearson at Tibooburra.12 All these studies have concentrated on a particular site or industry, rather than on the interaction of humans and the environment on a regional basis. It is the wider reading of the landscape that is the focal point of the lower Lachlan survey.

1.2 Research Methods and Techniques

1.2.1 Sources

While there is not a rich body of early local records, there is a sizeable archive of station reports documenting the daily life, the work practices, the economic and legal framework of the industry as well as the environmental conditions which occurred before and during the drought of the 1890's. The most extensive station records are those of Hunthawang, especially those which cover the period after it was acquired by the AML&F Company and run jointly with Willandra during the drought of the 1890's.13 Some papers also document conditions at Wooyeo for the later period following the drought when the station

was bought by the Goldsborough Mort Company.\textsuperscript{14}

Station reports held in Government archives, including the Western Lands Commission in Sydney, also hold much useful and practical information about conditions on the stations. They have been used with appropriate caution because of the possible biases involved in reports and requests from hard-pressed owners seeking exemptions and extensions of time to fulfill lease conditions.

Particularly comprehensive in scope and detail is the Report of The Western Lands Commission for the period of crisis just before its publication in 1901.\textsuperscript{15} This document collects comments and reports from a geographically and financially diverse group of people including inspectors, agents, contractors, townspeople and stockmen as well as owners. An analysis and report from the Commission is included. While it relates only to the land on the north side of the Lachlan, much of the commentary applies to the zone adjoining.

Local newspapers also supply detail of the social and economic conditions from the period after the discovery of gold. The Lake News and The Lachlander were especially useful. The Sydney Morning Herald included many useful reports on conditions and economic matters. Background information was also found in the specialized industry journals, such as The Pastoralists Review and The Town and Country Journal. These periodicals regularly included reports and comments of the inspectors and local staff of the agents and wool companies operating in the region as well as market reports and technical advice.

The preoccupations expressed in these sources were useful in suggesting additional details, and in providing some complete inventories at the time of transfer or sale of properties. They also furnished much information about the context in which the settlement of an isolated region took place, and the conditions of marketing and finance in which it operated.

A local journal, written in retirement early this century by William Budd,\textsuperscript{16} was also a useful source of specific observations about environmen-

\textsuperscript{14} ANU/ABL, Goldsborough Mort Papers, Deposit 2/562/1–2. Documents relating to the sale of Wooyeo in 1911, including a Balance Sheet, an inventory and a return of wages due.


\textsuperscript{16} Budd, William. Journal. A personal account of life on the Lachlan by a local resident. William Budd, 1849–1926, was born on Hyandra station. Following education in Melbourne, he returned to the district and spent the rest of his life there. Among his activities were mail contracts and extensive stock work. The journals were first written during Budd’s retirement during the 1914–1917 war. They were destroyed in a house fire and then re-written. The Journal is held by the Lake Cargelligo Historical Society, which published
tal change. In addition, it treats local management practices from the days of first settlement.

Pictorial records were scanty in the area until the later periods when the population of the area increased. Some useful material from the settlement period, however, was available as the holdings of the Australian National Library in Canberra include many early photographs of the types of activities involved in clearing and working the land. Many of these were examined for clues as to practices of management during the early stages of occupation. Some of these photographs are included here as they provide useful background information.

All these sources were used interactively before, during and after the field recording because a multi-stranded study of the region which combines field survey, oral history and archival research with environmental analysis is a powerful vector for capturing the remaining evidence.

1.2.2 The Field Survey

The research was a multi-stage process with considerable overlap between different phases of the work, especially as field seasons were limited to the two university vacation periods of the year. Archival and background investigations were continued in the intervals as new questions constantly arose from the survey.

The first step was background research into the history, geography and economic base of the area. This was followed with a preliminary surface survey of known sites in the area as a means of assessing the feasibility of a large scale survey.

The recording process was motivated in the first instance by the threat posed to many old structures by the expansion of farming operations during the wheat boom of the 1970's. Having spent much time in the area, it became increasingly obvious to me at that time that the architectural heritage of the district was shrinking and disintegrating. The structures being lost were the visible traces of the early pastoral industry in an area which had been dominated by that industry since it was first settled. As these structures provided a unique record of recent human activity in the region, a survey was planned to locate and record as much as possible before the sweep of a new technology removed it completely. The imminence of the threat is borne out by the subsequent destruction of two major woolsheds (North Whoey and Uabba) and of the only slab structure (Euabalong) as well as many smaller service structures.

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Once the decision was made to record all standing structures which dated to the early pastoral period of land use, the task of delineating the study region became pressing. For such a region as this, it seemed pointless to seek a strict geographical or administrative boundary. Therefore, a functional definition was sought.

Through a process of examining old maps and records as well as discussing the issue with local people, a working definition of the region was developed. The main objective was to specify a flexible yet clear boundary which reflected the history and functionality of what might be loosely called a local unit. Because of the large scale of the area, and the rapid change to which it has been subject, it was recognised from the start that the boundaries may well vary over time and according to the level of analysis.

Therefore, it was decided not to draw a rigid line of demarcation around the area now centred on the township of Lake Cargelligo but to seek a more flexible geographical limit. Nor were present administrative boundaries accepted as a priori indicators of past conditions. Such boundaries change over time and could be more a reflection of the present realities than of the conditions last century.

The strategy adopted was to accept as a working hypothesis the idea that a local territorial unit had been centred on the river and the associated lake system. This made it convenient to base the operational definition of the study region on the area included in the first leases recorded for the land lying along the Lachlan River from the crossing at Euabalong to the present town of Hillston. This reflects the local functional boundary as areas to the east of Euabalong look to Condobolin for market and other services, while the character of the river changes to the west of Hillston where a network of dry creeks fan out from the river as it narrows and begins its sweep across the plains to the swamps where it dies out. Moreover, by making the river the geographical centre of the study, the sequence of land settlement was maintained, which ensured that there was a high probability of identifying most of the early sites.

The extent of country to be included spreading to the north and south of the river was less clear as early boundaries were very vague and often only an ambit claim on a map rather than a reflection of a functional reality. Bearing this in mind, the extent of those first leases was retained only as a guiding principle of exploration in the field and archive. Using the information from all the early records of leases in the area as the benchmark, later maps and records were examined to identify the present location of the original boundaries of leases and any associated developments which were mentioned in records or maps of any period.

Using my own local knowledge of the area as the basis for discussions with many local residents and members of the Lake Cargelligo Historical Society, a list of structures which were known to have existed in living memory was
drawn up. Any information about location, condition and history was noted and, where possible, owners were contacted to ascertain the current condition of the structures. Priorities were then assigned on the basis of perceived threat.

The final pre-survey task was to obtain permission to record the sites from the owners of the land on which the structures stand and begin the programme of site visits.

The sites identified fell into three main categories: woolsheds, homesteads, often with an associated complex of utilitarian structures, and activity centres such as sheep dips and mines. A pragmatic concept of a site was adopted, so as to include any place where there was surface evidence, or archival identification, of the presence of structures or other traces of human activity.

The main series of site visits was made over a period of two years with subsequent returns to large sites and visits to several additional sites in later years. The scope of these recording seasons was strictly limited by the time available in the study region during 1981 and 1982 and by the small size of the recording team which was usually limited to myself as recorder with one other to help measure and photograph the sites. At times, other members of the family volunteered to assist with extensive sites but no trained recorders were available. The original goal of recording as many of the extant structures as possible is reflected in the series of site reports which is included in Appendix B. In form, they are summaries of the standing structures and traces of former buildings found at the site, together with oral and written information that was useful in understanding them.

Each site visit started with the location of the structure or groups of structures by grid reference on the 1:50,000 topographic map. This was then used as a basis of discussion with the owner or manager of the property. All the structures are on private land, so the permission and co-operation of the owner of the site was vital. Most of the owners had extensive background knowledge of the area and the particular buildings on their land and were generous with their time in sharing their knowledge and often in accompanying the recorders throughout the process of measuring, recording and photographing the site.

Only surface recording was attempted. Indications such as post holes, depressions and disturbances were noted but left undisturbed. The measurements are as accurate as circumstances allowed. Access was often difficult because many of the structures are still in use, while others have been largely obscured by later accretions and additions. Some were surrounded with hazardous materials which could not be readily moved and yet others housed collections of discarded technology too dense to penetrate.

In the light of discussions with owners and other residents, detailed study of the interiors of inhabited homesteads was not attempted. Access was granted to record general features, materials and broad phases of construction change and these have been included in the reports.
Presentation of the material is based on the details recorded during the site visit as well as archival and oral reports. An integrative approach has been taken to the available information and so there is considerable variation among the sites according to the particular balance of information which was found. Moreover, there is considerable variation between sites which range from single structures (Euabalong), to huge complexes of many buildings (Hunthawang, Merri Merrigal).

The reports on individual structures are only of a preliminary nature to record their presence, fabric, function and condition. Materials are described by surface appearance as no invasive techniques were used. There are no multi-dimensional matrices of the standing structures such as the structural sequence matrix developed later by Martin Davies.17 To produce such detailed records of the many structures covered in this survey was well beyond the scope of the research design which emphasised the preliminary identification and basic recording of the type, condition and function of as many of the remaining buildings as possible.

The spatial relationships within and between buildings were primary concerns. The forms of domestic architecture in the hot and dusty isolation of the area were of particular interest as was the relationship of the homestead to the associated complex. The location of all structures, especially homesteads and woolsheds, was recognised as being important in identifying settlement patterns and so landscape details are included in the reports.

A thorough photographic record was a high priority at all times because of the fragility of many of the structures and the threats posed to all of them by the rigors of a harsh environment. The photographs taken at that time form a useful record of structures now lost.

Each site report includes all the archival references to the site that were found to be useful, together with local oral reports of the background and history associated with it where available. There is a report of the site visit itself, extensive photographic material, a location map and some field sketches that reflect the limited time available and the aim of identification rather than full architectural analysis. The emphasis is on the range of structures present and on the strategies and techniques adopted by the settlers in the circumstances of limited materials, chronic labour shortages and great isolation.

1.2.3 Reading the Landscape

Analysis of the material that had been recorded on the site visits included further documentary searches to fill out the record where possible. This had

mixed success as many cross-references turned out to be empty of content. Oral sources were also pursued for detail with some success, as local people became used to the idea of the survey and volunteered information. The quality of the oral record varied greatly and many fond memories of family history found no role in the survey. However, because of a network of personal contacts I was able to tap a rich seam of local tradition relating to the social, economic and technological history of the region.

The site survey had focused on a series of isolated sites. These fell into three main groups:
(a) homesteads, often with an associated complex of functional buildings. These were the focus of settlement, work and social life;
(b) woolsheds, the industrial heart of a pastoral property where the result of a year's work was turned into a marketable commodity;
(c) activity sites, varying from sheep dips to mines. Often seasonal in usage, these places provided a support network to the major industry.

It soon became clear that behind the style and technology of these structures and works were a set of more general forces and behaviors shaping not only the surviving pastoral buildings but the whole landscape. The recording process had exposed patterns of local adaptations and ingenuity in coming to terms with a harsh and capricious region. It had also found internal contrasts and gaps in the material record. The more complex research questions that emerged from these trends could only be approached through the formulation of a broad research strategy that encompassed both the cultural and physical basis of the regional dynamic.

Much research in historical archaeology has been based on the complex interplay of the physical remains and the historical record. However, the record is uneven and this isolated and climatically challenging region has little in the way of written documentation of its settlement period. The extensive station records which are available for several of the large properties relate only to the later period of the 1890's and beyond when financial institutions had taken over the properties following drought and depression. They do not provide any information about the early occupation, but present an already established pastoral economy. For the vital phase of settlement, there is a long silent period following the brief descriptions given by the surveyors Oxley,\(^\text{18}\) in 1817, and Mitchell,\(^\text{19}\) in 1836, during their passage through the area. Only with the discovery of gold beside Lake Cargelligo in 1873 does the pace of record keeping

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pick up, and even then they are very limited in terms of scale and subject. The available material is piecemeal and disjointed, shedding only limited light on scattered centres of activity. The proven paradigm of attempting to reconcile the physical remains with the written record does not apply here on a regional scale, but only in the most general and vague terms until quite late in the settlement process.

Especially in an area of low population density, the absence of features is often as informative about past behaviors and technology as their presence. The choice of location for a house or work site reflects the resource perception of the builder and is part of the cultural landscape of a region. However, the settlement pattern includes the whole of the space and the interrelationships of all elements. On the lower Lachlan, where the vast open spaces between the scattered clusters of human structures dominate the scene, more insight can be gained by widening the perspective from the occupied sites to the landscape as the subject of investigation.

Landscape archaeology has been described by Crumley and Marquardt as “The spatial manifestation of the relations between humans and their environment.” The framework offered by this perspective makes it possible to consider the process of change on a regional basis. While the two hundred year time scale of the study is small, the rate of change was rapid and the scale of the changes was vast. The regional scale of the study, not being limited to single sites and occupation places, is sufficiently large to show the traces of the patterns of change and the strategies and adaptations which were made by the settlers.

1.2.4 Using Ecological Concepts

Traditional methods of archival and archaeological investigation were used to establish the physical resources of the area and the methods of land use imposed on it by the settlers. However, the dynamic of landscape change over time demanded the use of a different perspective and this was provided by the concept of the ecosystem.

In recent years geographers and ecologists have developed sophisticated dynamic models of the patterns of land use which have been imposed on different regions of the earth. One of the basic characteristics of the approach is the concept of energy flow as the dynamic of interaction between parts of a system.


A thorough and wide ranging study of this approach has been made by Simmons whose interest is in the impact of humans on the environment from the earliest phase of the species. In his book, Simmons uses a formal definition of an ecosystem, which was developed by Odum:

"Any unit that includes all of the organisms in a given area interacting with the physical environment so that a flow of energy leads to ... exchange of materials between living and non-living parts within the ecosystem ... is an ecosystem."\(^{21}\)

This formulation has the advantage of including human activities in the complex of factors acting within the system. It also allows the use of any scale that is convenient. Therefore, an area of interest can be delineated and considered as a unit for the purpose of the study. While there will be overlap and interaction with adjoining areas, much can be learned about the zone at the centre of the study. In this case it implies that the lower Lachlan may be identified as an ecosystem and the changing patterns observed as they evolve over time.

The concept of the flow of energy within a system has been central in modelling the response of ecosystems to different regimes of human use. Most such energy comes from the sun, and methods have been developed to study the efficiency with which different systems take up and use the available energy by the process of photosynthesis. The green plants so formed are the basis of most ecosystems and provide the energy for the exchange of materials within the system. Energy stored in various ways, such as in fossil fuels, can also flow in or out of a system and change its status. Anything which alters the established flows of energy and disrupts the internal feedback loops can bring about temporary instability and/or permanent change.

Humans are only one such agent of change, but the scale and power of the pressures which they exert, both incidentally and deliberately, are huge. Some of the patterns of energy flow which are characteristic of different types of human occupation of the land have been identified, so that the impact of such human activities can be traced on the landscape. The response of ecosystems to change is a complex matter that is still the subject of research but already some patterns have been found and some of the mechanics of change have been recognized. Processes such as the modification of habitats by fire and the domestication of plant and animal species have led to the simplification of some ecosystems, while the introduction of new species has increased diversity in others. Such diversity can be less than welcome as has been the case with the accidental spread of noxious weeds imported in cereal grains, or the spread of rabbits in Australia.

For most of their history, humans have been hunters and gatherers. That is, they collected the food available in their habitat with only fire as a direct energy source. In some areas, such as the Middle East and Europe, this occupation was replaced by the spread of agriculture some time after 10,000 BP. However, in Australia, a predominantly hunter-gatherer pattern persisted until the colonization by Europeans in the eighteenth century AD.

Geographically, the continent consisted of a wide range of different environments. The hunter-gatherer peoples were able to utilize the resources which were available in different habitats, especially the seasonal and subsidiary food sources. As they utilized the recently stored energy of the sun in the organic matter of plants and animals, these groups had to balance their energy costs in obtaining their food against its nutritive value. These costs included the location of sources, gathering and transporting food and the risk of unsuccessful hunting trips. Regular movement of the groups is a characteristic feature as is a low density of population, which may relate to the pattern of movement as well as the fluctuations of food supply.

Even a low level of population, however, has an ecological impact. Selective hunting results in concentrations of species and often in an altered age structure within species when some groups are particularly prized. Extinctions of key species which are over utilized can also occur as, for instance, happened with the Moa bird in New Zealand, which is thought to have been over hunted by local groups. Selective gathering of plants has similar impacts on the vegetation. Most powerful of all is the impact of fire which was used for hunting and other human purposes. Clearing of some areas and the selective survival of certain fire resistant species have resulted.

The lower Lachlan area with a permanent river and a large lake supporting a varied permanent population of mammals and attracting migratory birds from a wide area is a rich and varied ecosystem that has a long history of human occupation. The environment into which the European settlers came was not a tabula rasa but the highly managed product of millennia of use by human inhabitants. Using the constructs of the energy flow model developed by Simmons,\textsuperscript{22} there is a brief examination in Chapter 2 of the way the ecosystem would have operated under the patterns known to have been used by the original aboriginal inhabitants of the area. There is no attempt to examine the culture of these people as such a study is far outside the scope of this thesis. Rather, the energy flow of the system under a nomadic hunter/gatherer regime will be explored for its implications on landscape patterns. The use of fire in particular will be noted and its characteristic traces expanded.

The descriptions by the explorers Oxley and Mitchell are the first written accounts of the state of the region before the huge changes set in train by European colonization and the imposition of a market economy. Some of the

\textsuperscript{22} Simmons, op cit.
comments they made are quoted to provide a benchmark of the system before those processes started.

These early accounts are limited by their nature and purpose, so a fuller presentation of the physical resources of the area is also given in Chapter 2. This provides some idea of the limits to the possible uses of the area and recognises the important role of the land itself in shaping the society which it supports. However, the “new functionalism” which has been identified by Netting 23 in much of the recent work in human ecology, has an implication of the direct environmental determinism of human activity. This philosophy is not adopted here as the two-way process of interaction between people and the environment is the focus of the study. The full range of adaptations and the different ways that humans have responded to the choices open to them in the particular cultural, economic and technological circumstances are not limited by examining that context. In fact, the vital role of context has been an important theme in the work of Hodder and his associates. 24 The effect of human activities on the landscape and the impact in terms of the expansion or contraction of the possibilities for human life are part of the central concern of the study.

1.2.5 A Mathematical Model

For one particular aspect of the analysis, that of investigating ecological thresholds, a qualitative model from catastrophe theory was applied. The background to this is developed in Chapter 7.


CHAPTER 2

The Landscape of the Region

2.1 The Ecosystem of the Hunter–Gatherers

A common view of the pre-European landscape is that it was pristine, a veritable garden of innocence. Typical of such opinions is the one expressed by Davidson that “when the European arrived in Australia in 1788 he found an environment which was only slightly affected by man. The Aboriginal was a hunter and fisherman, and apart from using fire as an aid to grazing, he had little effect on the landscape.”

Such an analysis fails to take account of the long term evolution of the landscape under the hunter-gatherer regime of use and totally ignores the selective development of species in response to human manipulation. It looks at the landscape as a fixed and solid aggregation of features, not as a dymanic and constantly evolving system.

There is not space here for a detailed discussion of the history and philosophy of ideas about the nature of the relationship of humans to environment. However, the concepts of either cultural or biological determinism, often implied in analyses of that relationship, are inadequate to deal with the complexities of the situation. Recent research in ecology has suggested that it is interesting to look at the interaction of humans and the environment as a dynamic and continuing process that is neither rigidly determined by the physical parameters of the environment, nor by the culture of the people who inhabit it: “there is a physical or ecological envelope, but within this, human technology and knowledge allow a variety of adjustments to the resources.”

This viewpoint maintains the traditional Western idea of a dualism between humans and nature in order to deal with the impact of humans on the environment. In the light of the power and scope of the role of the human species, this seems a reasonable working approach to a regional study of colonial settlement which involved the substitution of a market-oriented export system of land use for a long standing subsistence one.

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The concept of the ecosystem has been refined and developed in a way that allows the use of models of the energy flow within an ecosystem on any scale that is convenient, whether it be the planet as a whole, or a single pond. This makes it particularly suitable for studying part of a river system where the administrative boundaries are fluid over time and space. The Aboriginal use of the land was wide ranging and nomadic but the river–lake system was a focus of life. The early settlers claimed huge tracts of land with very fluid boundaries but again the role of the river and water was central to their occupancy. Later, with more people in the area and more formally defined internal boundaries together with a growing social and commercial network, access to a dependable water supply remained crucial.

The flow of energy from the sun is the basis of life, and has been used by ecologists as a basis for a framework to approach the study of ecosystems. It underlies the other concepts used in the analysis of the structure and function of a system, such as nutrient flow, population dynamics, productivity and biological diversity. A full account of this is given in Simmons.3

Using this framework, ecologists have been able to study the flow of energy in both observed and hypothetical systems and to model the impact of different types of climatic and biological variables. In particular, the different land use patterns of human societies can be modelled in terms of the way these energy flows are affected. This does not imply a simple linear determinism since feedback loops and interactions among the elements introduce a great deal of complexity.

The environment disturbed by the arrival of the European settlers in Australia was a complex mosaic of different ecosystems which had evolved during a long and, in terms of energy flow, constant pattern of exploitation. The tools which were used by the hunter–gatherer peoples were of a type that used only local energy sources, animals were not used for traction or transport, wind and water were not utilized as energy sources. Some water diversion is known to have been used in Victoria, but not as a direct means of supplying motive power in food production. It has been estimated that the total daily per capita energy use in a society of hunters would be 5 megacalories while an advanced agricultural society would use 26 and an industrial society 77 megacalories.4 In this situation, the visible signs of environmental modification were not readily apparent to the eye of the invading Europeans who were accustomed to more intensive manipulations of the landscape with animals, wind, water and fossil fuels. However, they were present and the failure of the newcomers to perceive them was more a matter of the cultural lens through which they viewed the landscape than a realistic appreciation of the environment.

3 Simmons, op cit.
4 Simmons, op cit, p. 24.
One of the characteristics of hunter-gatherers is that they utilize the recently fixed energy of the sun by eating plants or the animals that fed on the plants. There were few techniques for the long term preservation of food or the release of stored energy from fossil fuels. All depended on the activity of the members of the group and the tools at their disposal. One of the most powerful tools was fire. In general terms, this affected the biological productivity of the ecosystem through encouraging the growth of some species and the removal of others such as forests. Animals species were also affected by direct hunting and changes of habitat. The low population densities, however, ensured that these effects were local and did not threaten the stability of the system as a whole.

Nicholson quotes radiocarbon dates from Lake Mungo and the Willandra lakes region which show that “Aboriginal man was living well by the freshwater lakes on mussels, fish, birds, emu eggs and marsupials, and using fire about 40,000 years ago.” This accords well with the account given by Mitchell in April, 1836 when he travelled along the Lachlan and found “On first approaching the lake, we saw the natives in the midst of the water, gathering the muscles (unio).”

Mitchell also observed that “The tribe consisted of about a hundred,” but seems to base this solely on the number of people present at the lake during his visit. The figure does, however, support the idea that population density was low. Birdsell argued that population density was directly related to the biological resources of a region and the small numbers found at Lake Cargelligo, a reservoir of water in a dry region, by Mitchell at a time of severe drought suggest that the local people were living within the limits set by the cycles of the climate.

Beaglehole presents evidence that the use of fire by Aboriginal people has been observed and recorded since at least the time when Cook named Smoky Cape after seeing fires and smoke in the area in 1770. Later, colonists and explorers also described the practices that they encountered throughout the country, which included ritual and medical uses as well as controlled burns for hunting and keeping pathways open. As Nicholson says “The evidence that fire

7 Mitchell, op cit, p. 35.
was the indispensable agent by which Aboriginal man extracted many of his resources from the environment is irrefutable ... The effect of his fire regime ... is a matter of considerable debate."10 Opinions on the subject range from the extremes of denying any alteration (e.g. Cleland11 ) to claiming complete formation and maintenance (e.g. Hallam12 and Stewart13).

While the position in any particular region would vary according to a complex interplay of factors, it is certain that Aboriginal use of fire was a powerful force in shaping the environment which they inhabited. The changes in the fire regime which followed European settlement resulted in unexpected impacts on vegetation long adapted to the earlier practices.

Other changes included a contraction of the territory available to the original inhabitants and a consequent reduction in the resources available to them. Restrictions on patterns of seasonal movement also arose from land claims so that pressures on resources were concentrated. The introduction and spread of new materials and tools among Aboriginal people also changed the way that they related to the environment. Most of all, the increased flows of energy through the system resulted in a change in the nutrient patterns and biological diversity of the region, now geared to a market economy.

2.2 The Landscape Described by the Explorers

The first recorded impressions of the landscape around Lake Cargelligo are those entered by John Oxley, the Surveyor General of New South Wales, in his Journal for 25 July, 1817, when he wrote that he was "most agreeably surprised with the sight of a very fine lake" which he named Regent's Lake in honour of the Prince Regent.14

He noted that "the expanse of water was too large and winding to be seen in one point of view, but it broke in large sheets from east to west for upwards of

10 Nicholson, op cit, p. 70.
Six miles,"\(^{15}\) that "it was bounded six or seven miles from its eastern extremity by a low range of hills connected with Mount Byng, and from the dark broken woody appearance of the country on that direction, I felt assured that the stream came from a more northerly quarter."\(^{16}\) The source is in fact the Lachlan River where, eleven kilometers from the town, a weir and regulator now control the flow of water into the Lake via the two connected lakes, Sheet of Water and Curlew Lake. Originally, the Lake was fed by Lake Creek which now takes the outflow as controlled by a regulator.

Oxley further observed "To the westward was Goulburn's Range, distant about five or six miles; its bold rocky peaks of lofty elevation forming a striking contrast to the dead level of the country southerly,"\(^{17}\) while "to the north-north-east were extensive open flats."\(^{18}\)

As to the local features of the landscape, Oxley recorded that "to the south-east and round to the north-east the country was covered with dark foliage of the eucalyptus, intermixed with the cypress; whilst to the south-west, as far as the base of Goulburn's Range, it was more open, with gentle hills clothed with a few small cypresses. These hills were rocky and barren, the lower grounds a red loamy clay; but the intermingled light and shade formed by the different description of trees and shrubs, the hills, but above all, the noble lake before me, gave a character to the scenery highly picturesque and pleasing."\(^{19}\)

The next day, 26 July 1817, Oxley passed another lake, "a fine sheet of water,"\(^{20}\) with cypresses growing thick and strong nearby. The land was low and flooded but "the soil was also much better, having more the appearance of fertility than any we had seen for some time."\(^{21}\)

Oxley noted that "About one and a half or two miles from the river a thick cypress brush bordered the low lands, and was of course free from floods. The small dwarf box-tree still, however, continued to be the prevailing wood, and covered, as usual, the more wet and boggy portions of the low land. The north-west side appeared to be higher, and, the banks, as much at least as we could see of them, seemed to be of better soil."\(^{22}\)

Oxley did not record sighting any Aboriginal people at the Lake, but on 26 July he wrote in his Journal: "A large native's canoe having been found hauled up near to the spot on which we stopped, appearing to me sufficiently strong

\(^{15}\) Oxley, op cit, p. 126.
\(^{16}\) Oxley, op cit, p. 126.
\(^{17}\) Oxley, op cit, p. 126.
\(^{18}\) Oxley, op cit, p. 126.
\(^{19}\) Oxley, op cit, p. 127.
\(^{20}\) Oxley, op cit, p. 129.
\(^{21}\) Oxley, op cit, p. 129.
\(^{22}\) Oxley, op cit, p. 130.
to be capable of transporting ourselves and baggage to the opposite side of the river, I determined to make trial of it for that purpose, and if found practicable to cross at once, rather than wait the chance of the waters falling sufficiently to enable us to construct a bridge, where, in the event of failing in that design, no friendly canoe might be at hand to assist us."23

When the canoe was launched the next morning, 27 July 1817, Oxley found that “our hopes and expectations had been too sanguine as to her capability: sufficiently strong and buoyant to contain one person, more was too much for her; I therefore of necessity abandoned the design”24 and the party continued up the stream where “the country passed over was low and nearly level.”25 Oxley noted that “The back land was a red sandy loam, very light, covered with acacia bushes, spear-wood, and small cypresses; the only herbage, a coarse tea-grass.”26

The same day, the expedition “crossed one or two large plains, clear of wood and even bushes; the soil a stiff tenacious clay, which, though not flooded by the river, retains all the water that falls upon it...These plains were now dry and hard, and having been lately burnt, the coarse natural herbage springing up fresh, gave them a pleasing green appearance.”27

Also recorded that day was an encounter with the local inhabitants, “A party of natives was seen on the opposite side of the river, consisting of one man, two lads, and two women; they disappeared as soon as they observed us.”28

The next official observations of the area were made in 1836 by the then Surveyor-General, Major Mitchell. Returning along the Lachlan from his expedition to the Murray and Darling Rivers, Mitchell found a very different landscape from that described by Oxley.

His journal entry for 13 April 1836, records his impressions:

“We found the ‘noble lake’ as it appeared when discovered by Mr. Oxley, now for the most part a plain covered with luxuriant grass; some water it is true lodged on the most eastern part, but in no part was this more than a foot deep. Innumerable ducks took refuge there, and also a great number of black swans and pelicans, all standing high upon their legs, above the shallow water, unlike the waters of Lake George, which is brackish that of Regent’s Lake was perfectly sweet, even in its shallow state. It abounds with large fresh water muscle,

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23 Oxley, op cit, p. 130.
24 Oxley, op cit, p. 131.
25 Oxley, op cit, p. 131.
26 Oxley, op cit, p. 132.
27 Oxley, op cit, p. 132.
28 Oxley, op cit, p. 132.
which was the chief food of the natives at the time we visited it ... That
the lake is sometimes a splendid sheet of water was obvious enough in
the lines of a beach along the shores."\(^{29}\)

Mitchell also took the opportunity to re-name the lake “Cudjallagong”, an
Aboriginal word thought to mean “lake”.

The Aboriginal people that Mitchell encountered near the lake had built
shelters of green boughs and used fire for warmth and cooking. He remarked
that “The men were in general strong, healthy, and muscular.”\(^{30}\) They were
able to advise the party about conditions in the country to the west “that after
eight of our daily journeys ... the bed of the Lachlan would contain no water ...
that we must go to the right ... reaching in four days more a lagoon ... there
I must leave the carts, and go with the native on horseback; and that in two
days travelling ... we should reach ... a very great water.”\(^{31}\)

The woman of the local tribe who was given to Mitchell’s aboriginal inter­
preter, Piper, brought “a new opossum-skin cloak, and various presents, that
had been given to Piper with her.”\(^{32}\) Such generosity indicates a comfortable
sufficiency.

On April 16, Mitchell set out for the summit of the Goulburn range and
recorded that “The country we rode over was so thinly wooded, that the hill was
visible nearly the whole way. The soil was good ... The hills were everywhere
rocky ... and on the other side we looked into the unknown west, where the
horizon seemed as level as the ocean.”\(^{33}\)

The observations of these two explorers were made nineteen years apart but
in both cases before the impact of European settlement could have distorted
the stability of the environment. The journals form a unique record of the state
of a ecosystem which had been subject to only one type of human occupancy for
perhaps as long as 40,000 years. Moreover, they warn already of the extremes
of climatic conditions encountered in the area.

Above all, they are a clear statement of the central role of the river in
the life of the region. In a reversal of the patterns found in Europe, it was
not only variation in the local rainfall that was critical to conditions along the
river. Australian rivers did not always flow to the sea, and the Lachlan was
such a case. Mitchell had found despite “an alarming want of water in the river
... abundance in hollows on the surface of the plains; a circumstance clearly

\(^{29}\) Mitchell, \textit{op cit}, p. 34.
\(^{30}\) Mitchell, \textit{op cit}, p. 36.
\(^{31}\) Mitchell, \textit{op cit}, p. 36.
\(^{33}\) Mitchell, \textit{op cit}, p. 38.
evincing that this river, as Mr. Oxley has truly stated, is not at all dependent on the rains falling here."

2.3 Physical Resources of the Region

The lower Lachlan region, defined in the discussion in 1.2.1, is unified by the river but also displays quite sharp internal subdivisions. The dominant impression is of sweeping plains either side of the river, broken only by low eroded hills to the west.

The first impressions of the nineteenth century explorers set out in 2.2 above, refer mostly to the area southwards from the Lachlan River to the Lake itself. This core area of comparatively well-watered plain is only a small part of the region. The river divides the softer southern area from a rather different landscape, a border zone, being the more arid part of the region under study, but the most mild and fertile part of the Western Division of the state. Forming part of the “unsettled districts” in the 1846 Waste Lands Act (often called the Squatting Act), the area was proclaimed as the Western Division in the 1884 Crown Lands Act. This administrative step was to have profound effects on the patterns of land use to the north of the river, emphasising the original natural contrasts with the area on the southern side.

Along the northern bank of the river is a narrow band of fairly open country (see Fig. A16) which has some climatic and landform continuity with the lands to the south of the river and which formed the focus of settlement. Behind this relatively benign belt stretch increasingly arid plains, often covered with thick stands of mallee. Since 1901 the region north of the river has been administered by the Western Lands Board (later Commission). The Board was created as part of a major programme of reconstruction and has the management of the fragile resources of the area as its main concern. The size of the leases and the management regimes imposed on them have further emphasised the contrast between the properties on the rivers, the “backcountry” or dry leases and the smaller farms south of the Lachlan.

LANDFORM

The area belongs to the extensive Western Plains which stretch far to the west and have no high ranges upon them which could modify the prevailing aridity. Three distinct sub-zones (see Fig. A15) can be identified in the region:

- **Erosional Land Forms of the Cobar Pedeplain** of undulating to hilly, stony and gravelly country, with flat topped hills and steep ridges. It protrudes into the north-east corner of the region under study.

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34 Mitchell, *op cit*, p. 33.
• *Aeolian plains* adjoin the Cobar pedeplain. Their sandy-loam and loam soils are the most extensive form in the area.

• *Riverine plains* next appear with fine-textured grey and brown clays. Only a small extent of this country occurs at the western extremity of the study region.

**SOILS**

All of these soils are very susceptible to both wind and water erosion. The results of these processes will be seen throughout the study. Most of the soils are erosion products having limited fertility and set the scene for the struggle of the settlers who tried to make a living from them. Moreover, as the red-brown earths of the Riverina are generally deficient in nitrogen and phosphorus, monocropping and passive fallow lead to a rapid fall in yield which can today only be countered by applications of superphosphate and sulphate of ammonia.

To the south of the river the soils are mainly red and brown pedocals of moderate fertility. Away from the river, the mallee soils which occur to the south, south-west and north are more alkaline. Salt is often near the surface as little leaching has occurred in the dry zone, and it can be readily activated by modern clearing and agricultural practices.

**VEGETATION**

The vegetation is clearly linked to the topographical zones. A small area of treeless saltbush floodplain in the west (Fig. A16) soon gives way to Bimble Box and Bimble Box with Pine. There is also a large area of mallee country. As was pointed out in the report of the Select Committee Enquiry into the Western Division, "Because the solonised brown and soft red soils have a generally high sand content, mallee country is susceptible to windsheeting and drift if vegetation is excessively thinned or cleared. This country often contains unique vegetation assemblages of low pastoral value in their natural state." 35

Much of this country has been cleared for cropping so the potential for erosion is high. The clearing is on a large scale using methods such as chain and bulldozer which are indiscriminate in their destruction. The photographs in Figs. L17 and L18 show typical, adjoining, areas before and after clearing. Large blocks are completely levelled with only a few scattered shade trees left standing and a thin windbreak to separate the blocks.

Throughout the region the grasses, with the exception of the little remaining old man saltbush and the smaller annual saltbush, when it appears, are not especially palatable and are of low nutritive value. In recent years various

grasses have been introduced to the area to improve the quality of the grasses for stock use. This is especially so on the irrigated blocks near to the Lachlan where stock food such as lucerne and sudax flourish when water is available.

CLIMATE

Not only is the rainfall low, (Fig. A19), but it is highly variable. The reader is referred to the area rainfall charts (Fig. A21) which record the monthly figures from 1882. Droughts, however defined, are frequent and severe. It was remarked in the Report of the Western Lands Commission 1901 that “the meteorological history of our Western Division shows it to be essentially a country of almost invariably low rainfall and inevitably recurring drought.”36 The country in the study region is the most easterly and mild in the Western Division but it is still subject to this pattern.

Winds from the south and south-west bring the winter rain, with total falls of under 18 inches (450 mm) per year in the most easterly section of the region but precipitation drops quickly beneath that level to the north and west. Temperatures are relatively mild in winter, and rarely fall below 20 degrees F. Only about 40 days of frost are expected each year. This means that it is not necessary to shelter stock in winter, though losses of young or weak animals can occur during cold snaps.

Summer is hot and dry. Temperatures are over 90 degrees F (33 C) for three months of the year (December, January and February) and average humidity is only about 40 percent. Evaporation is high and supplies of ground water are quickly lost to evaporation. Schemes to cover tanks and dams have been attempted but are expensive and limited in application. The growing season is quite long but subject to much uncertainty and variation. Crops can dry off before ripening in dry hot seasons even if winter rains were plentiful. Stock lose condition in extreme heat. There is an ever present danger of bushfires which can affect large areas in hot, windy conditions.

WATER RESOURCES

(a) The river

The river is a narrow stream with steep banks which meanders in long curves across the plains. Large box and river gums grow along its banks and fallen timbers are a hazard even to small boats. There are stretches subject to strong and dangerous eddies and whirlpools with many drownings having occurred from earliest times. For example, both the man and the child buried in Graveyard Bend on Hyandra drowned in two separate accidents while fording the river. Water transport was never a commercial option. Safe fords are few so

the river formed a serious barrier to easy transport and communication. Even in 1990, it still presents a significant barrier with its widely-spaced bridges. On two stations, Hunthawang and Merri Merrigal, there are private bridges to facilitate the internal working of the properties. In times of flood the Lachlan can be impassable for months, forcing detours of hundreds of kilometres or hazardous crossings in small boats.

(b) Groundwater

There is an underground stream, or moving water table, that has been tapped for wells on a small scale but it tends to dry up in droughts. As Mitchell observed “The deep cracks on the plains, so abundant as to impede the traveller, seemed capable of absorbing not only the water which falls upon them, but also any which may descend from the low hills around.”37 The scale and quality of this water remain matters for speculation.

The area is mainly outside the artesian basin, but some bores have been successful in tapping supplies. The water is brackish, salty, and in quantities useful for stock water only.

(c) Water storage

Lake Cargelligo is in a natural depression with no independent catchment being filled by overflow from the Lachlan under natural conditions. The contrasting descriptions of Oxley and Mitchell, parts of which were quoted above, clearly demonstrate that the size and depth of the lake varied greatly according to the conditions in the catchment area of the Lachlan far to the east. During the great drought of the 1890’s and early 1900’s, the level of the lake proved erratic with it being recorded as completely dry in 1900 when games were held in the dry bed.

The benefits to be gained from controlling the level of the lake were clear, and the Lake Cargelligo Storage project became the earliest State water conservation scheme in New South Wales, with the weir reaching completion in 1902. Associated with it are works including inlet and outlet channels and various control structures such as diversion weirs, regulators, levees and floodgates. A report held by the N.S.W. Water Conservation and Irrigation Commission records that the total cost of construction was £34,800.38

The storage scheme consists of three lakes that are filled by excess water from the Lachlan by a series of weirs, dams, cuttings and regulator gates. The water is diverted from the river during periods of high flow to store it for release to the lower Lachlan River when it is needed in summer or drought.

37 Mitchell, op cit, p. 33.
38 Report held by the Water Conservation and Irrigation Commission at North Sydney, in the Library, Document 627.8 (944) CAR.
As well as the stability provided to the pastoral and agricultural industries by the Lake, it serves the needs of the township and also provides extensive recreational facilities rare in the west. The Lake supports fishing, sailing and other water sports in addition to a supply of water for house and public gardens that enhance the life of the area.

About fifty kilometres west of Lake Cargelligo another storage scheme, Lake Brewster, was constructed between 1948 and 1954. It expands the amount of water stored in the area and lessens the demands on the Lake Cargelligo scheme at peak demand periods so that water levels can be maintained in the lake for longer. Lake Brewster (formerly called Lake Ballyrogan) is also a diversion system from the Lachlan with a range of associated works. The scheme is intended to improve conditions for the lower parts of the Lachlan.

The Lake Cargelligo storage scheme is now embedded in a network of weirs and dams that have resulted in a considerable taming of the Lachlan. Among the larger structures are Booberoi Weir (1902), Condobolin Weir (1922), Forbes Weir (1930) and Jemalong Weir (1940). Artificial regulation of the river was achieved when Wyangala Dam was completed in 1935 and increased when the dam was expanded in the 1960's. Wyangala Dam has provided considerable control over the extremes of water flow which vary widely from year to year. The storage capacity of the dam has also increased the amount of water available for irrigation farming.

The presence of the water in Lake Cargelligo has not resulted in a large market garden or orchard type of development because of the distance from markets which are already served by growers nearer to them. It has allowed local farmers access to water for irrigating crops such as grains and oil-seed flowers and for supporting stock.

(d) Floods

Since settlement, frequent floods have been recorded along the Lachlan. Large falls of rain in the catchment area far to the east are carried a long distance with some flooding along the way, especially at Forbes where, on average, one river level of critical flood height is recorded each year. In Forbes the flooding lasts only a few days as the banks of the river are high and the flow is swift.

In the lower Lachlan below Euabalong, however, the area is flat and the river shallow so the flow is moderate. Flooding results in the inundation of large areas, sometimes spreading out from the river for about two kilometres on the plain and more in dry creek beds and low lying areas. The water often remains there for long periods as the inland areas to which it drains cannot absorb the large quantities present.

Most flood damage is caused to equipment and crops in the areas adjacent to the river which cannot be removed even when warnings are adequate. Areas which are inundated for long periods are also covered with silt and are out
of production for months at a time. This means that stock must be found alternative accommodation, often entailing agistment, and that pasture will be lost.

Communications are interrupted by rises in the river so that roads are cut, bridges inaccessible, telephone lines broken and railways are sometimes cut for short periods. Pumps and irrigation equipment are submerged while fences are damaged by objects carried by the flood water. Sometimes the flooding persists at a moderate level for some months so that staff travel is disrupted and operations such as shearing must be postponed or the sheep moved elsewhere for the purpose.

While these problems are serious at the local level, they have not been a barrier to settlement in the area. During the early period when the settlers were in a phase of learning about conditions in the area, houses were often built near to the river for convenience of water supply but were flooded at the next rise of the river. Local knowledge of flood levels has been built up since then so that structures are located away from susceptible areas or protected by levee banks. Warnings are issued as floods move down the river so that precautions are taken and stock losses are rarely serious.

While the controls on the Lachlan have increased with the construction of the dams and storage facilities discussed above, most of the effort has been directed towards the conservation of water. Flood control remains a matter for the future.
CHAPTER 3

The Transformation of the Landscape

3.1 The Process of Settlement

Landscape is not only landform. Political, economic and technological forces shape the use of the land which in turn influences the evolving cultural landscape. These forces in the colony of New South Wales were already building up to a huge wave of change when Mitchell made his journey along the Lachlan in 1836.

At the time of Oxley's observations of the region nineteen years earlier, settlement in New South Wales was still mainly confined to the coastal strip east of the Great Dividing Range, the County of Cumberland, and to the small outposts at Bathurst and along the coast.

The colony had always experienced problems in producing a reliable food supply. Part of the problem was the nature of the coastal area. In their study of land use in this continent, Wadham and Wood present the view that "The coastal districts of Australia are, in the main, remarkable for the relative poverty of their soils."1 The number of stock was growing rapidly and the need for more and better land was a powerful spur to exploration. When the Blue Mountains were finally crossed in 1813, Governor Macquarie at once built a road across the divide and the stock owners were soon grazing their cattle on the dry, open plains beyond.

But Macquarie strictly controlled the process of expansion and under the policy of concentration of settlement, it was to the south rather than to the west that the next wave of expansion turned under his direction and encouragement. The investigations to the south of the "Cowpastures" by Throsby from 1817 and Hume in 1818, soon led to the spread of settlement as far as the eastern banks of the Lachlan and to Lake Bathurst.

To the north of Sydney also, the process of settlement flowed. First investigated by Howe in 1819, the Hunter Valley was opened to selection in 1822. Response was enthusiastic and 372,131 acres were granted in the first few years, but it is argued by Roberts that further expansion was blocked by the rugged terrain of the Liverpool Ranges to the north.2

Very quickly then, in that brief push, the boundaries were set to the area which the Government was to declare the Nineteen Counties of the Settled Lands in 1829 (See Fig. A10). By this action the colony was divided into two radically different territories, the settled and the unsettled.

Roberts draws out the implications of this division in his lively account of the period:

"Within, land could be alienated, settlement was officially encouraged, police protection was provided, roads were made, and provisions existed for local justice and the like; but, without, no land could be granted or sold, occupation was positively prohibited, and any man who dared to trespass had to rely entirely upon himself ... The stockmen might push out, but as far as the Government was concerned, it was just as if they had gone east from Sydney Harbour into the sea." 3

But despite this policy, designed to maintain control in a convict settlement, to prevent the problems of dispersion across huge areas and to allow the orderly alienation of land, the forces toward expansion could not be contained.

While the next phase of diffusion was building up, however, the "settled area" was to be the scene of a rapid process of adaptation. For here unfolded what is probably best described as the learning phase of Birmingham and Jean's Swiss Family Robinson model of settlement. 4

When the settlers arrived in the colony they carried with them a complex cultural and technological baggage. The attitudes and technology they brought from Europe had to be tried in the new environment. Often they proved to be inadequate or inappropriate to the harsher land, and a new constellation of skills and technologies developed on a trial and error basis. Sheep and cattle handling were quite different in both the scale of numbers of animals and in the vast areas over which they ranged. Moreover, a familiarity with the vagaries of the climate was not the least valuable part of the intellectual capital of the new settlers as they pushed ever harder at the limits to occupation.

It has been argued by Butlin, in his study of the financial basis of rural industry in Australia, that "Pastoral investment was the vehicle of human control over nature in the spread of settlement into the interior." 5 The pace of settlement, therefore, was highly dependent on the industrial conditions in Europe because this concentration of financial resources "directly and indirectly was based on the inflow of British capital." 6

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3 Roberts, op cit, p. 136.
6 Butlin, op cit, p. 323.
Certainly, this was a period of strong capital inflow, both human and financial, and it is to the merino wool industry above all that one must look for some explanation of the extent of the pressure for expansion.

Captain John Macarthur had early seen the need for an export commodity which was valuable enough to remain profitable despite the long journey to the European markets and he embarked on a programme of breeding sheep to produce the fine wools then in much demand in Britain. In 1803 he travelled to England with some samples of his wool clip and managed to obtain some pure merino sheep from the King's own flock for his experiments in breeding. In 1807 Macarthur shipped the first bale of Australian wool to the London market, where it sold for a high price as a curiosity. Following this encouragement, growth was rapid and by 1810 there were 25,888 sheep in the colony.

In Britain the years after the Napoleonic Wars witnessed a dramatic decline in the local wool growing industry. At the very time that the woolen manufacturing industry was rapidly expanding as a result of the new mechanically powered equipment, competition from Spain and more especially from Germany provided serious challenges on two fronts. Firstly, the German wool was cheaper than the English product. Secondly, it was a more sophisticated wool greatly enhanced by the addition of Spanish merino stock which resulted from Napoleon's releasing the Spanish flocks to northern Europe. Roberts traces the outcome of these trends and his work is the basis of the following brief account of these events. The new German wool was more suited to the post-war demand for ever finer cloth. In Yorkshire, specialised manufacture of the new styles of cloth grew rapidly. Further, much very cheap, coarse wool was produced to feed the demand for cheap cloth at a price the English farmers could not match. Not even an increased tariff imposed in 1819 helped the English producers.

The whole technology and economy of the Australian wool industry was developing in this context. A small but steady flow of between 60,000 and 90,000 pounds (27,240 and 40,860 kg) had come to London each year and had gradually established a market niche. Then, in 1818, freight costs fell to three pence per pound and a preferential duty was established for colonial wool. In a rapid expansion of Australian production, by 1821 the annual shipment was up to 175,400 pounds weight of wool.

In 1822 "in what was perhaps the pivotal point in the history of the Australian wool-trade, the Society of Arts voted him (viz. Macarthur) two gold medals for importing wool as good as the finest Saxon." Duties were reduced to a sixth of those imposed on German wools. Moreover, the qualities of the clip were found to better fill the new demands of the mills for ever longer and finer wools.

7 Roberts, op cit.
8 Roberts, op cit, p. 41.
The expansion of the wool trade was immediate and dramatic, as may be seen in the table below which is based on Roberts.

**TABLE 3.1**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>EXPORT IN POUNDS WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1821</td>
<td>175,400</td>
</tr>
<tr>
<td>1823</td>
<td>400,000</td>
</tr>
<tr>
<td>1826</td>
<td>1,106,300</td>
</tr>
<tr>
<td>1830</td>
<td>2,000,000</td>
</tr>
<tr>
<td>1835</td>
<td>4,250,000</td>
</tr>
<tr>
<td>1837</td>
<td>7,000,000</td>
</tr>
<tr>
<td>1839</td>
<td>10,000,000</td>
</tr>
</tbody>
</table>

Spectacular as they are, the export figures above do not tell the full story of the Australian producers success. Having established themselves in the British market by 1822, they were well placed to take advantage of the developing crisis. By 1824, English wool was not able to meet the price or the fineness of the German imports. A House of Lords Committee on the Wool Industry examined the position in 1828 and found it hopeless for the English farmers. The German producers were quick to recognise the threat posed to their dominance by the Australian wools and tried to meet the challenge by a strategy of breeding enhancement. But other forces were building up in Europe. The developing industrialization of the German wool-growing area encouraged sharp population growth and pressure on land prices which prevented any expansion of the area available for wool growing. Costs were rising. The transport of wool to London cost more from Germany than it did from Sydney, because of the practice of discount back-loading.

What is more, the genetic side-effects of the constant push to finer and finer wools had produced small and delicate sheep. Australian wool was both stronger and softer. In the new economic climate, the Germans could no longer compete on the London market. In fact, Germany itself soon needed imports of Australian wool to keep the local mills supplied.

The English economy had by this time recovered from the post-war slump and growth had generated substantial capital seeking a field of investment, much of which was soon directed to New South Wales in inflationary quantities where "practically anybody could obtain money from the banks on his personal note." Moreover, there was plenty of stock for sale and the attraction of a huge expanding export market beckoned. So, while "the Government erected a huge non-tresspass sign over the interior," this proved no barrier and "everywhere, the lowing and bleating invaders were showing themselves a more relentless

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9 Roberts, op cit, p. 49.
10 Roberts, op cit, p. 4.
force of occupation than regiments of red-coated soldiers, and were pressing
over plain and mountain alike."\textsuperscript{11}

The Government still maintained its policy of concentration of settlement
but by 1835 the surge outward had reached Gundagai in the west and further
fuelled the speculation so "Everywhere, people were dabbling in sheep... and
now the colony once more tripped gaily towards an orgy of over-speculation."\textsuperscript{12}

There was also an inflow of human capital as free immigrants arrived in
greater numbers than ever before to find that "The mania was in full swing,
and every able-bodied man thirsted for the bush and pined to ride in the dust
behind masses of smelling sheep and live on an unchanging diet of mutton-
chops, unleavened damper, and post-and-rail tea ... Thus the little community
of 70,000 dreamed and speculated, and thus sheep, too often ridden with scab
and catarrh, set the tone of everything."\textsuperscript{13} Such was the state of things that "it
needed only Mitchell’s return late in 1836 to change the isolated ventures into
a tumultuous frontal onslaught."\textsuperscript{14}

The land tenure problems were addressed in the July 1836 Bill to Restrain
the Unauthorized Occupation of Crown Lands, generally known as the Squat-
ting Act. Bowing to the reality of the situation, this legislation allowed any
reputable person to take out a licence for £10 a year which gave grazing rights
over any area of land, whether inside or outside the old limits of occupation.

Enforcement proved problematic and political confrontations delayed the
effective implementation of a system of management but finally, on 21 May
1839, the nine districts were proclaimed and the Lachlan Squatting District
became an administrative reality.

3.2 Settlement Reaches Lake Cargelligo

It is not recorded precisely when the wave of settlers hit the lands, described
by Oxley as tranquil, in the Lake Cargelligo region of the Lachlan Squatting
District. By 1841 Francis Oakes held the leases for “Gagelluga” (i.e. Cargelligo)
and Uabba. No traces of the early occupation of Gagelluga were found during
the survey but Uabba (Site Report UB) provides a palimpsest on which is marked
the traces of continuous occupation enduring from that time to this.

Writing later about his own first-hand experiences as a settler Brodribb
remarked that:

\begin{itemize}
  \item \textsuperscript{11} Roberts, \textit{op cit}, p. 1.
  \item \textsuperscript{12} Roberts, \textit{op cit}, p. 8.
  \item \textsuperscript{13} Roberts, \textit{op cit}, p. 9.
  \item \textsuperscript{14} Roberts, \textit{op cit}, p. 6.
\end{itemize}
“Very few squatters ever thought of making permanent improvements on their stations, beyond a few bark huts, and a bark woolshed, perhaps the store for the supplies would be made of rough gum slabs, placed in the ground some 12 or 18 inches, and nailed to wall-plates, and covered with bark, roof fashion, and the bark was then covered with heavy log riders to make the building more secure. The tenure under which they held their runs was a very insecure one - merely an annual lease, authorising them to occupy land beyond the limits of location, and they did not know at any moment the limits might be extended ... and their runs ... be put up to public competition.”

Bark structures around Lake Cargelligo did not often survive the later building operations when the stations became more settled. Slab, however, was a more enduring material and most of the homesteads in the area have at least one such structure. Particularly interesting was the slab cottage on Euabalong, (Site Report EB1) recycled in various guises and used as recently as the 1960’s as worker housing and for camping by fishing and hunting visitors since then. It was finally brought down by the floods of 1990. The kitchen in the homestead at Merri Merrigal (Site Report MM1) is even now based around an original slab structure still serviceable amid modern appliances and air-conditioning. Precise dating is not possible but these slab structures certainly belong to the earliest phase of occupancy.

The next year, 1842, saw more licences issued. Owen O’Neill held Wooyeo (Site Summary WY) and G. K. Bryant held Boolerie, now known as Booberoi (Site Summary BB). The Whooyeo homestead includes most types and styles of materials in its rambling maze of structures, including a wooden house of quite large extent which family tradition holds to have been started in 1843.

The amount of timber for these early structures was not large enough to have had any but local impact on the native treecover, though they attest to the range and quality of the available wood, with large river box for slabs and cypress pine for shingles and drop-log walls.

The extent of these early stations was immense and the first attempts at settlement were frail and isolated. But the pattern of tenure and the technology of the grazing industry which it entailed were to have profound effects on the land and to shape its evolution. For here was established a unit of the world system economy where use of the land no longer focussed on the satisfaction of the needs of the local inhabitants but, rather, on feeding raw materials to the voracious industrial market economy of Europe. The original four leases (Cargelligo, Uabba, Whooyeo, Booberoi) form the geographical core of the region and the process of the subdivision of these holdings provides the means of

following the changing landscape as it responded to the new system of market pastoralism.

3.3 Settlers Secure their Place in the Ecosystem

In his article exploring the influence of the landscape on human society, Reader remarked that "The way of life of a people is often a sophisticated and resilient response to the constraints of the environment they inhabit." The consolidation phase of pastoralism in the Lake Cargelligo region, beginning with the first registration of leases in 1841, was one of trial and error in the use of the land and in the structures built by the settlers. The scale of holdings, the type of stock, the rate of stocking were all matters for experiment, while the constraints of an isolated area are visible in the form and fabric of the structures for work and shelter. The impact of European settlement on the landscape itself also began to take on a lasting and obvious form as the first tentative moves were made to clear and exploit the land.

The first leases taken up in the lower Lachlan established large areas as the domain of "squatters," a word that at this time was no longer a term of abuse, but the accepted local name for a grazier with leaseholds of Crown Lands.

Regrettably, no local records survive from this earliest period of pastoral occupation in the region. However, by looking at the physical evidence that endures on the land some patterns emerge that throw light on the process of coming to terms with the colonial environment. In the study area, settlement is known to have begun by 1841 as runs were registered by that date. However, there are no structures which can be dated to this first phase of occupation with any degree of certainty. This is not surprising in the light of the financial constraints of the time. The first concern of a grazier must be the survival and management of his stock. His own comfort must await the emergence of some surplus resources. Absence of features can be just as compelling as their presence in tracing the strategies adopted by the settlers. In the Lake Cargelligo area, the lack of evidence for early structures suggests that the wait for some surplus funds was a long one. The pattern of occupation and the location or absence of the technology of stock management which were to emerge during this period in the area are as informative in their own way as the building of large houses and barns can be elsewhere.

It was probably unfortunate for the graziers that their arrival at Lake Cargelligo coincided with the beginning of the great financial crisis of 1841-1844. Abbott remarked that "A new sheep-farmer in 1840 was therefore faced by a far


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from encouraging situation. Wages were high because of the labour shortage, while the costs of rations (which formed part of the payment for labour) were also high because of the drought."\textsuperscript{17} In the remote Lachlan district a further constraint was imposed by the distance from the markets "Making it difficult and expensive to get supplies into the stations and wool out."\textsuperscript{18} The limitations set by the costs of transport were a matter for discussion at the time. In 1840 Governor Gipps wrote in a despatch that "as every step in this direction leads the Settler farther from the Sea ... the limit seems ... to be attained, beyond which the feeding of Sheep will cease to be a profitable employment, the Wool not bearing the expense of transport from a more distant country."\textsuperscript{19}

Moreover, the financial basis of the runs was somewhat tenuous. Despite the insecure system of land tenure, the unbounded optimism of the 1830's had provided a flood of capital to finance the purchase of stock and the equipment necessary to establish a station in the virgin country they were to graze. However, this came at an additional cost to the borrowers. Interest rates were high owing to the fact that loan collateral was minimal when there was no freehold land to secure a mortgage and the banks did not lend unsecured capital. Consequently, the squatters were forced to borrow from business houses charging inflated rates of interest to cover the additional risks involved.

At the height of the economic boom, in 1837, the price of a sheep was as high as £3 a head. By 1839 this had fallen to 12 shillings and 6 pence under the influence of a drought complicated by falling wool prices in London. Transportation of convicts ended in 1840, so the graziers no longer had a source of cheap assigned labour. Moreover, "immigrants arriving indeed declined in 1840,"\textsuperscript{20} the year in which the population reached 200,000. That the high rates of expansion came to a sudden stop may be seen from the decline in Land Revenue to the Government. In 1840, under the influence of the press ever further out, it returned the Government £316,000. In 1841, conditions had reduced this to just £85,000, as speculation and expansion responded to the market conditions.

The high stock prices enjoyed by the producers during the 1830's were based on more than the price of wool itself. Stock were needed by two distinct local markets. Firstly, the establishment of the colony in South Australia created an opportunistic demand for materials and livestock of all kinds and the local producers expanded their output to meet the need. This was on top of the existing market for the sale of surplus stock to new arrivals which,

\textsuperscript{17} Abbott, G.J. 1971. The Pastoral Age. A re-examination, Macmillan, Melbourne, p. 72.
\textsuperscript{18} Abbott, op cit, p. 72.
\textsuperscript{19} Gipps, Despatch to Lord John Russell dated 28 September, 1840, in Historical Records of Australia, Series I, vol 20. p. 843.
\textsuperscript{20} Abbott, op cit, p. 72.
Abbott wrote, had “provided handsome returns for many years to established graziers.” 21 By the time the wave of expansion reached the Lachlan, however, there was no prospect of such a trade for the settlers as the limits to profitable stock raising had surely been reached.

For these reasons, as well as the harsh conditions, cattle formed a major part of the Lake Cargelligo production. Cattle leave a different pattern on the landscape as they need no woolsheds and walk themselves to market. However, there must be such a market for fresh meat as the animals soon lose condition and meat is perishable. Distance from the market remains a major limitation and the depressed financial state of the colony generally at the time Lake Cargelligo was settled must have compounded the difficulties.

It may well be that the first leaseholders in the Lake Cargelligo area had been forced to borrow heavily of the high-interest funds. Of the four original leases (Cargelligo 1841, Uabba 1841, Booberoi 1842, Wooyeo 1842), only two of them were still in the hands of the original leaseholders in 1846/7. Oakes had relinquished Cargelligo to D. and S. O’Sullivan, perhaps to consolidate his position on Uabba. Wooyeo had passed to T. O’Sullivan (apparently unrelated). Uabba and Booberoi had not changed hands.

It seems likely that these early graziers had weathered the financial storm by reducing expenditure to a minimum and postponing all development. When the homestead sites are examined, very little can confidently be ascribed to this first phase. At Uabba (Site Report UB1) the earliest surviving structure is the pisé portion of the homestead which is thought locally to have replaced an earlier wooden structure in the 1860’s. A separate kitchen block which could represent an evolution from a first rude shelter was demolished in the 1950’s without records being made. The site of the homestead near to the river is probably the original choice of a place of settlement as access to water was paramount, especially in the first phase when no domestic or stock water conservation measures had been implemented. The south bank of the Lachlan is higher than the northern one, so it provided a more benign site for habitation, being less subject to flooding. The house, therefore, probably remains at the original site.

Nor is there anything at Booberoi (Site Report BB1) to suggest substantial investment in improvements at this early stage. The drop log structures are of open date but were probably built in the 1860’s or later.

Not, of course, that early shelters need have meant a large cash outlay. Describing his experience on his lease at Wanganella, Brodribb related how he built a house: “During the winter I occupied my time in building a small two-room cottage; labour was very scarce ... for upwards of six weeks I worked at

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21 Abbott, op cit, p. 56.
the building. I split nearly all the shingles for the rooms ... Before leaving for my family, I put up a small bark kitchen."\(^{22}\)

After advising the new settler "To proceed with extreme caution, and to build nothing that he does not feel to be absolutely and indispensably necessary,"\(^{23}\) Atkinson remarks that "Many persons on first taking possession of a grant of land, content themselves with the shelter afforded by a bark hut ... and many ... will rest content with no better habitation for perhaps several years."\(^{24}\) He also assures settlers that "Happily the materials for such buildings as are necessary in the infancy of an establishment are generally to hand"\(^{25}\) and so it was at Lake Cargelligo where the first fragile structures were fashioned from the materials available and later yielded to the more substantial buildings of an established industry.

The complaint regarding the shortage of labour was to be a constant one. As Brobribb himself later remarked "Unfortunately, all the newly-arrived immigrants stick to the towns or centres of population, instead of getting into the far interior as soon as possible, where they are sure of employment."\(^{26}\)

This pattern was not peculiar to the western area. As Bolton observed:"Many more migrants found their way to the United States during the nineteenth century, and yet New York and Boston retained a far smaller proportion of the intake. The fact was that the United States could offer much more land for farming and many more opportunities on its frontiers of settlement than Australia. Most skilled workers in Australia gravitated to a metropolis."\(^{27}\)

Wooyeo (Site Report WY1) presents the most varied range of features at an early phase. The huge original lease (160,455 acres in NSWGG of 1885) has long been broken up and the former homestead now stands abandoned on land held for several generations by the Elwin Family. Family tradition holds that the wooden structure most recently used as a service building (Fig. WY13) was built in 1843. Even if this estimate is substantially too early, the structure must be one of the first in the area. Of considerable size (it last housed an office, a staff dining room, a bathroom, a kitchen, a dairy and a verandah) it is probably the first house on the lease which once included the site of the present town of Lake Cargelligo. Again, it is situated on the northern bank of the Lachlan River as near as practicable to the water supply.

\(^{22}\) Brodribb, op cit, pp. 88-89.
\(^{23}\) Atkinson, J. 1826. An account of the state of agriculture and grazing in New South Wales, reissued in 1975, Sydney University Press, Sydney, p. 94.
\(^{24}\) Atkinson, op cit, p. 95.
\(^{25}\) Atkinson, op cit, p. 94.
\(^{26}\) Brodribb, op cit, pp. 131.
If this structure does indeed date to 1843 it must represent a fairly unusual exception to the general trend in New South Wales, for that was the year in which many squatters were declared bankrupt under the new 1842 Insolvency Act as a result of the pressure of low wool prices (one shilling per pound weight in London), interest rates of up to 20 per cent and sheep prices of six pence a head with no market for the excess numbers bred on the stations. Perhaps it was the very worst year of the crisis with the failure of the Bank of Australia, a joint-stock company, leaving its shareholders personally liable for its commitments.

It was in this crisis atmosphere that Wentworth's "Lien-on-Wool" Act was passed in 1844. This legislation effectively allowed leaseholders to mortgage assets other than land (especially sheep and the wool they carried) thus allowing more flexible financing. The Solvent Debtors Act allowed those with some long-term prospect of recovery to retain their business thereby giving some stability. It is not known if these measures were directly used by squatters in the Lake Cargelligo area, but the effects must have been felt strongly in this marginal region on the economic periphery still in an early phase of adapting local production to that necessary for participation in the world economy.

A base line for stock prices was provided by the discovery by O'Brien in June 1843 that the products from boiling down stock to tallow etc. yielded a minimum of six shillings per beast. The squatters gave an immediate response to this new aspect of their industry with 200,000 sheep being boiled down in 1844 and 750,000 head in 1845.

3.4 Subdivision of the Original Leases

The year 1844 was a good season in Australia and wool prices rose in London so that the trend to financial recovery started from this base of new financial arrangements. The first hiccup in fitting the fledging industry into the world economic order had been survived and the technological base of the grazing industry had been able to diversify into products other than wool.

Expansion was further encouraged by the Waste Lands Act of 1846 which allowed some security of tenure to the squatters by granting 14 year leases in the settled districts. What is now the Western Division was declared part of the "Unsettled districts" with leases being offered for 5 year terms. The land on the north bank of the Lachlan was covered by these provisions.

Unfortunately, definite dates for occupying such lands remain elusive, but settlers were certainly active north of the river at this date, for example Hyandra (Site Summary HY) has an oral tradition of settlement during the 1840’s and like others was well into the second or even third phase of adaptation by the 1870’s when records become available.
It seems likely that the pattern of land alienation in the Lake Cargelligo region resembled that elsewhere in the Riverina at this time as the experimental wave of occupancy tested its systems and methods against the landscape which it was starting to transform. By 1845 most of the land on the Lachlan and Murrumbidgee Rivers was taken up as far as the Murray and the pattern of occupancy was emerging.

Despite the haziness about the date and order of occupation, a clear trend is obvious: the first stations were along the river and permanent creeks. Indeed the central role of the river is shown by the distribution of leases in a band along its course. Moreover, the homesteads were not located in the centre of the run as would have been most practical for the day to day running of the operation, but as near to the river or creek as possible (Booberoi, Boorithumble, Brotherony, Euabalong, Hunthawang, Hyandra, Merri Merrigal, North Whoey, Uabba, Wooyeo).

So, already, a pattern had been established with large runs dominating the prime resources of the area. This gave the early holders an opportunity to establish themselves in a way that protected the big landholders from later arrivals. Moreover, it gave them the scale necessary to establish basic services such as water storage, holding yards, shearing sheds, farm equipment and clearing within their own boundaries. The village-like scale of the homestead areas at such properties as Hunthawang, Merri Merrigal and Uabba attest to the power of concentrated resources. Another advantage of scale is the diminishing unit cost of transporting goods both in and out of a run. It would also ease the provision of credit, thus consolidating the advantage of the large holders.

3.5 Diversification of Economic Base of Pastoral Industry

The speculative boom of the 1830’s was brought to a close by a fall in wool prices, rising costs in remote areas and the end of expansion as the flow of capital from England ceased. Many bankruptcies followed and the price of sheep dropped to one shilling, or even less in some areas. The 1843 Insolvency Act ensured some stability and the Government took measures to end the banking panic. Wool prices in London slowly rose, from eleven pence per pound in 1844 to one shilling and threepence in 1846. The technique of rendering stock into tallow was developed and provided a base price for stock. Security of tenure also became a burning issue and the Waste Lands Act of 1846 provided stable leases. As a result of these measures, the 1850’s brought a measure of stability if not prosperity to the grazing industry as the scale of boiling down expanded (two and a half million sheep were processed in 1850) and the infrastructure of marketing and transport became more sophisticated.

As elsewhere, the opening up phase of settlement was followed, not led,
by Government land surveyors in this isolated region. One attempt at central planning was made in 1850 when Surveyor Larmer set out a reservation for a future village on a bare, dry plain between the river and Lake Cargelligo itself. However, the orderly development of this site was pre-empted by the discovery of gold in 1873 on the site of the present township beside the Lake, which ensured the growth of the town on the more congenial lakeside site. The usual rectangular grid plan, however, was imposed on the town. Jeans has written that towns “developed an uninteresting similarity partly from the unimaginative adherence to these regulations, a development not intended ... the regulations allowed for variations according to the site, so that the subsequent practice of running streets unheedingly over hills, steep slopes and flooded land results from uncaring officials rather than the government intention.”

The discovery of gold in 1851 and the consequent “Rushes” in New South Wales and then Victoria provided a considerable shift in the economic base of pastoralism for now a growing population of miners provided a lucrative local market for fresh meat in areas well inland from the traditional coastal markets. Moreover, they paid at once in cash, so it is little wonder that this trade appealed to the indebted squatters who were still constrained by past borrowings in a sluggish market. Even in 1850 two and a half million sheep and 260,000 cattle were boiled down for tallow and the returns on this industry were minimal. Graziers might survive under such conditions, but they would certainly not be able to invest in improvements or technical advances. Moreover, the cost of leases was high. Throughout the Riverina there was a considerable switch to beef production, to cater to the market demands. Beef had a further advantage over wool in that the animals were driven to market at a fraction of the cost of transporting heavy bales of wool to a port and thence to London.

For squatters on the Lachlan, the new market was particularly attractive as it lay on the most direct and least difficult trade route. No steep mountains impeded the path of the drovers and their herds across the plains to the Murray and thence to the Victorian goldfields. Commenting on a trip which he made from his Riverina property in January 1859, Brodribb stated “In those days there was no direct communication between my Wanganella station and Sydney; thence by sea to Sydney.”

At Lake Cargelligo the 1850’s was a time of drought. The Lake itself was dry for the first time since records began. Even in 1836 Mitchell had seen some pools of water left and fishing continuing. No hint survives of local strategies but it seems that there was no shortage of eager settlers.

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29 Brodribb, op cit., p. 100.
Attitudes toward seasonal fluctuations were often more colourful than scientific. As Bolton observed: "With no precedent from the rest of the world to serve them as a model and no reliable records of the past to guide them, the Australians of this pioneering generation tried to discern regular patterns in the coming of good seasons and droughts. E.S. Hall, editor of the Australian, suggested in 1830 that the weather of New South Wales followed a seven-year cycle ... Other theorists favoured a ten-year cycle ... W.S. Jevons rejected the ten-year cyclic theory in favour of a twenty-year variation."30

Yet others asserted that ploughed areas attracted rain and that the interior would not offer a stable cycle until it was thoroughly cleared and farmed. Another popular theory held that the action of hoofed feet would greatly improve the fragile soils as they repeatedly compressed the areas on which the stock grazed. A robust expression of this is given in Furphy’s novel Such is Life:

"It had never occurred to him that a physical revolution was already in progress; that the introduction of sheep meant the ultimate extirpation of all trees and scrubs, except the inedible pine; and that the perpetual trampling of those sharp little hoofs would in time caulk the spongy, absorbent surface; so that these fluffy, scrub-clad expanses would become a country of rich and spacious plains, variegated by lakes and forests, and probably enjoying a fairly equable rainfall."31

CHAPTER 4

The Pastoral System of Land Use

4.1 The Ascendency and Impact of Sheep

The emergent culture of market pastoralism had established itself during the testing years of the 1840's and 1850's by applying a European technological ideology to the new suite of variables found on the Lachlan and then adapting the imported practices in a complex process of coming to terms with local conditions. Some knowledge of the weather patterns had been painfully learned and economic realities had been driven home by the fluctuations in market prices. The expansion of the local Australian market as a result of the population growth associated with the gold rushes had widened the economic base of local producers and had brought a wave of new peoples, often with a different set of skills, to regions far from the coastal cities. The fencing of the runs had started with the expansion of the cattle market and had gathered impetus with the move to sheep production in the late 1860's. The adoption of this simple new technique of land management set in train a wave of ecological changes that were to have widespread effects on the landscape.

The pattern of settlement along the Lachlan which had emerged in the 1850's was maintained in the following decades with a small number of people triggering immense changes to the landscape in a demonstration of the power of the newly arrived technology. Those few people, perhaps fifty or one hundred, in an area the size of an English county with their herds of hoofed animals and their market imperatives were to participate in a process of total transformation of the landscape.

Markets for both sheep products and cattle had been established and a boost to the infrastructure had been provided by the pressing needs of gold mining for reliable transport and information linkages. Stock routes to the Victorian goldfields had been established. Roads remained rudimentary in the immediate Lake Cargelligo area, but easier crossings of the coastal mountains were established and postal services began to spread across the country. The Budd Journal records that "Mail Contracting was first started in the mid-Lachlan in 1855 ... the mails in those first contracts were conveyed on horseback." Later, this mail route connected with another one which ran from Hay to Booligal.

and then along the Lachlan and so formed a land link between Sydney and Melbourne. Coaches were introduced so that passengers could be conveyed and the line was taken over by Cobb and Co. A stop for changing horses was established at Hyandra where the original stable used in this service still stands, in a very fragile state, with its drop-log animal stalls and wooden frame fodder boxes (see Site Report HY1).

The 1860's had opened with a succession of good seasons in the area, reinforcing the graziers' hold on the land and setting the process of transforming the landscape seriously underway. The pattern of land tenure along the Lachlan was not yet based on villages but remained focused on the huge tracts of leasehold. Good seasons encouraged stock numbers to rise while returns on wool and meat grew steadily enabling the landholders to undertake building on a much enlarged scale. Substantial new homesteads were constructed on most of the properties and a jumble of service buildings mushroomed around them. The beautiful pisé structures at Merri Merrigal, Hunthawang and Uabba all date from this time. As is usual for this area, no records survive of the construction.

The number of sheep in New South Wales was estimated to be 6,119,000 in 1860 while cattle numbers had reached 2,408,000. Large scale overlanding of these animals to the fattening and sales centres near the Victorian goldfields spread weeds and resulted in defoliation along the rivers where they followed the meandering course of the stream. Sheep numbers grew rapidly. In 1870 there were 16,308,000 sheep while cattle numbers were steady at 2,195,000 head. Another huge expansion of sheep numbers occurred in the following decade with 35,398,000 sheep and 2,580,000 cattle recorded in New South Wales in 1880(Jeans2).

The number of cattle was restrained by the limitations of the local meat market until the invention of a practical method of freezing meat could allow the development of an export market. The spectacular increase in sheep numbers was a response to the demands of the distant industrial markets where the wool was processed.

In the study area, cattle had been the first grazing animals to be introduced by the settlers who spread out from the settled districts along the river courses. Cattle were tough, did not need shepherding or shearing and thrived on the original grasses. Moreover, they could survive at greater distances from water than could sheep. As William Budd remarked in his Journal “pioneers with the means to employ labour and who secured leases on the Mid Lachlan ... grew cattle and horses mostly as sheep at the first stages of settlement required more care and stricter supervision to protect from the ravages of the Australian wild dogs than the larger animals.3 As there were no fences to constrain their

3 Budd Journal, pp. 16(2)-17(1).
movements, the animals established their own territories and would "always be found within a short circuit of that area." However, "cattle and horses running in those unrestricted areas became more or less wild and unmanageable" and many escaped altogether to become another control problem later. In her reminiscences about life in the Riverina, Freeman records that the wild horses "were very severe on the fences and dams" and were often hunted. Budd observed that "wild cattle in unrestful attitudes never gathered beef" but if they were undisturbed they "would prove very prime, as cattle men say 'beef to the heels'... much higher in market value."  

There is much anecdotal evidence of lawlessness at this phase with reports of stealing, duffing (that is, taking the unbranded young from its mother, weaning it and then branding it with a false brand) and brand changing of the relatively unsupervised cattle. While estimates of numbers in the district are sketchy, Budd reports that the O'Sullivan brothers who held several leases including Wooyeo and the original Erribendry "sent regularly from two to three thousand head of fat cattle annually to market ... they employed drovers for sending them to Melbourne markets." The distance followed by the stock routes was about 400 miles (about 600 km) and took four to five weeks. Some of the risks encountered during such a trip included stampedes and the usual seasonal and geographical stresses of the outback. There was always the prospect of severe loss of condition among the herd as they travelled the crowded stock routes with an attendant drop in the prices realized.

The fat-cattle market, nevertheless, had dominated local production until demand and prices fell in the early 1860's. A serious cattle disease, pleuropneumonia, had also become a problem at this time as it spread northwards from Victoria necessitating stringent measures of quarantine and destruction of infected stock.

It is no wonder that a more durable and readily transportable product was to find favour in this isolated area located at such remove from the markets. Fig. A22 shows the growth of sheep numbers relative to cattle numbers, during the 1860's, while Fig. A23 uses these figures to graphically indicate the relative areas utilized. Both figures are after Buxton.

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4 Budd Journal, p. 17(2).  
5 Budd Journal, p. 17(2).  
7 Budd Journal, p. 44(1).  
8 Budd Journal, p. 35(2).  
9 Buxton, G.L. 1967. The Riverina 1861–1891: An Australian Regional Study, Melbourne University Press, Melbourne. Fig. A22, p. 27 and Fig. A23, p. 31.
4.2 Pastoral Investment

To equip and work a sheep station was a far more intense activity than to run cattle on a sparsely fenced lease. Capital, as well as a range of specific management and stock handling skills, was needed. Butlin has claimed that "pastoral investment was the vehicle of human control of nature ... it transformed the social and economic status of the pastoralist and ... led eventually to a new pattern of labour relations in rural society."\(^{10}\)

Wool was viable only because of its position as an export commodity. The inflow of capital to the industry came heavily from overseas. Shaw has argued that in the period from 1878 to 1891 overseas capital invested in Australia trebled from £90 million to £275 million,\(^{11}\) and that "overseas borrowing continued to sustain the boom" which included the construction of roads and railways.\(^{12}\) With an expanding quantity of high-value exports the interest costs could be sustained, but during the 1880's wool prices started to fall. In 1884 wool averaged twelve pence per pound weight, but in 1893 it realized only seven pence. Yet by 1890 interest obligations were taking forty per cent of the country's export earnings.

The twenty years of the rural investment boom was, according to Barnard, "almost entirely a product of the expansion of the industry in New South Wales."\(^{13}\) The study area is located in the geographic centre of the state and was a fairly typical example of the process of land utilization as it was implemented at the frontier of investment as both established cattle grazing land and new drier country was turned over to the production of wool.

The beginning of a more intense phase of pastoral occupation in the area is marked by the acquisition of both Cargelligo and Wooyeo by the C.B.C. Bank in 1871 and their transfer to the Trust Agency Co. of Australia in 1872 before they were finally taken over by the squatters Holt and McKellar in 1873.

Wool prices reached a peak in 1871 and, no coincidence, Butlin has shown that "it was in the twenty years from 1871 that the big upsurge of rural investment occurred ... in three cyclical phases. In the first phase, rising from 1871 to an extreme peak in 1877 ... the level of pastoral investment increased extremely rapidly in what was, perhaps, the most profitable period of pastoral

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\(^{12}\) Shaw, op cit, p. 89.

enterprise ever encountered in Australia. The following phase was a brief slump during 1880-2, followed by another phase of growth. The object of this investment was to increase the stock-carrying capacity of the runs. Most crucial of the techniques underlying this more intensive land utilization were extensive fencing and water conservation measures.

4.3 Fencing

The first step in extending the new, more intense, land management techniques was the erection of a network of boundary and subdivision fencing to allow optimal pasture utilization, the separation of different types of sheep and to minimise loss from stock straying. Much of the capital invested during this time was directed toward fencing the runs. It was a huge investment as before the 1870's, most station fencing was limited to stockyards, plus one or two very small paddocks for the horses, a small crop paddock and one or more holding paddocks for the stock. The new technology demanded a much more extensive network of barriers on each run.

Buxton has pointed out that on cattle stations, especially those near to the markets and those lying on the stock routes, the move to fence the run had started well before this time. He is even able to refer to an advertisement which appeared in the *Pastoral Times* on 20 October, 1859, by the O'Sullivan brothers for “contracts for twenty-five miles of fencing” on one of their Lake Cargelligo leases. This, like all such early fences however, was of post and rail construction. Building costs were high as the work was labour intensive and used vast amounts of timber. It was not a practical way to enclose the huge runs of the time, and it would only be after the arrival of affordable imported wire to string through posts that the practice of enclosure and subdivision was adopted on a large scale.

Much of the extant fencing was insubstantial. The exceptions were the sturdy cattle yards built to control the rather wild animals which ranged on the open pastures of the unfenced leases. Often built of huge local box timbers, these yards were durable and some survive to this day where they have escaped later encroachment. On a site near the ford on the Lachlan on Hyandra a particularly large set of cattle yards survived until they were destroyed in land-planing operations for irrigation in the early 1970’s. Built of river gums for both posts and rails the yards were very solid and would have been strong enough to hold wild cattle. Local oral reports include a memory of a one mile long wing fence to guide the beasts into the yards which were large enough to hold

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14 Butlin, *op cit*, p. 325.
15 Buxton, *op cit*, p. 38.
16 Buxton *op cit*, p. 39.
about one thousand cattle. It is possible that these were the yards of the old Erribendry run which spread along the north side of the Lachlan without clearly defined boundaries. The run produced large herds of cattle for the Melbourne market during the gold rush period in the 1850's. Such yards were used for sheep work after the switch from cattle and became integrated into the new work flow.

Fencing was a prerequisite to the intensification of land use on the extensive leases of the Lachlan. Labour was short and the new style of management required that flocks be closely managed on a scale hitherto unknown. The availability of smooth fencing wire from the early 1870's and the improved transport links made it technically feasible to enclose and to subdivide the runs. Fencing wire was sent from the ports by boat to Albury and by train to Echuca which brought it within range of the Lachlan stations. It was also convenient to backload wire when wool was taken to transport nodes for shipment to market.

Most of the pre-1870 dividing fences in the area were simple brush barriers made with available trees and branches and then infilled with cut scrub. Some small vestiges remain, for instance at the dip on Hyandra, and the short stretches of a former dividing fence scattered through the mallee behind the run. Such fences cause minimal disturbance to the landscape as they are made from materials from the immediate area, are fairly insubstantial and so do not present a serious barrier to the movement of native animals. The impact of the wire fences was to be a far more serious one.

The introduction of wire enabled a great intensification of enclosure on each station. Specialist fencing contractors were employed to build the boundary and dividing fences of pine posts, cut locally, and six strands of wire, separated by stretchers of a lighter wood. All the work of cutting the posts, haulage, digging and building was done with manual methods.

With this seemingly simple addition to the technological base of the industry a whole new style of land management began. No longer were the stock closely shepherded in small numbers, but were allowed to wander at will within the fenced enclosures. An immediate result was the eating out of the choicest herbage, and that closest to water, by stock left to their own devices. The patterns of foraging and movement of native animals was also changed by the barriers. They were forced away from their traditional eco-niches along the river onto areas as yet unfenced. Some local people hold the theory that their numbers built up to huge proportions on the virgin pasture available there and then added extra pressure on the riverfront country when they were forced to migrate during the great drought of the 1890's and 1900's. Water management became critical, even on properties with river frontage, as supplies of stock drinking water had to be provided within each paddock.

Stock management techniques were revolutionized by the introduction of fences. Sheep were no longer shepherded in small mixed flocks which roaming
nomadically over the leases in response to the available grasses in an essentially opportunistic use of the land. Now flocks and pasture were closely managed to maximize the production of wool. This entailed the breeding of different strains of sheep for the dry western conditions, the rotation of pastures and expansion into dry areas behind the riverfront.

The scale of fencing on a state-wide basis was huge. As Butlin has recounted, "whereas in 1871 possibly 20,000 miles of fencing existed in all of New South Wales ... by the end of the seventies three-quarters of a million miles of fencing had been stretched across the New South Wales runs." During the 1880's another one million miles of fencing were erected in the state. Costs were high and, as usual, labour was scarce. Some of the disappointed gold prospectors are thought to have turned to fencing in the study area.

The station records which are available in the area do not cover this period, but some idea of the costs applying in the district may be obtained from later entries in the AML&F papers at ANU/ABL where annual returns for Hunthawang include amounts for the repair of fencing as well as the addition of netting to existing wire fences and the erection of new fences. In 1892 over 31 miles of wire netting was purchased at a cost of £1040. 12. 4. 18 By then, the rabbits had arrived in the area and netting was added to existing wire fences in an attempt to exclude them.

Investors with capital and those graziers making substantial profits could best afford these improvements. For many others, a pattern of rural borrowing was encouraged by this need to invest in new technology. Finance was freely available through the various rural investment companies at increasingly high rates of interest as the 1880's progressed. It is quite likely that the move to build more extensive and comfortable homesteads, so dynamic in the 1860's, was cut short by this new demand on finance and labour.

The introduction of fencing has had some unexpected consequences. One of the more visible landscape changes has been the road built alongside almost all fences, which serves as a firebreak as well as providing access. Particularly on hillsides, these tracks have become eroded and form gullies (Fig. LS14). Less easily seen, but quite ubiquitous, are the pieces of wire of all lengths and sizes which are spread about the landscape. The wire is a hazard to the livestock and native animals which walk on it, often being injured. Wire is also dangerous to horses, motor vehicles and farm machinery which are entangled in it or punctured by it. Spread by a myriad of natural processes, wire is encountered long distances from where it was deposited. As old fences are rarely removed, but left beside the new one, the problem can only increase.

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17 Butlin, op cit, p. 331.
4.4 Water Conservation

Water conservation measures were also essential if the backblocks were to be developed and occupied on a year-round basis. Simple excavated earthen tanks were the most common method in the area. They depended on rain to fill them and soon dried up in severe droughts as their large surfaces were very subject to loss by evaporation.

In practice, essentially all stock water for paddocks not contiguous with the river in this period was provided by earthen tanks. Thus, the usefulness of all off-river country was completely determined by the ability of the lease-holder to successfully construct such tanks.

The first earth tanks were built by constructing a dam across a gulley or some other natural receptacle for rainwater. Hence, ground tanks are often referred to as "dams".

The siting of a tank was very important: it needed to be sited in some kind of natural depression so that rain water falling on the adjacent countryside could be channelled into the tank. The tank builders became very expert in laying out extensive systems of drains in the surrounding countryside which would convey a large percentage of the run-off into the dam. Dams possessing up to 20 miles of such drains were constructed. Tanks typically had a capacity of 1000-5000 cubic yards, but instances of 10,000 and even 20,000 yard tanks were not unknown.

Tanks were created using horse or bullock teams to excavate the earth. Each layer of earth to be excavated was first ploughed and then a scoop was used to remove the loose earth. The construction of these tanks was carried out by specialist contractors known as tank-sinkers. While either horse or bullock teams could be used to construct tanks, bullock teams were usually preferred, partly because the bullocks were more effective at packing the earth down by the action of their hooves so as to form an impermeable layer (see below). The use of bullock teams to construct tanks survived into the 1950's in the area.

Once constructed, such a tank could fail in a number of ways. Firstly, if it was poorly sited then it would not catch sufficient rain water to fill it.

Secondly, some soil types were very permeable to water and the water in a tank located in such an area would quickly seep away. Even with experience it was not always possible to recognize problem soil types before choosing the tank site. Thus, a large investment in constructing a big tank could be entirely wasted. Various methods were tried to make such tanks waterproof. For example, one method involved the use of cattle to tramp down the earth. Another method was to mix rock salt into the earth surface of the tank and then have this worked into the ground by walking mobs of cattle over the ground.

Finally, even if a tank were correctly sited and it did not leak, then because of the very friable and loose nature of the soils, it would quickly become filled with silt. In the study area, a major strategy adopted to overcome this problem,
was to direct the water from the catchment drains into a smaller silt-tank. The idea was that the silt would settle to the bottom of this tank while much of the water (minus silt) would flow over a dam into the main tank. Practically every tank observed in the study area was accompanied by a silt tank (Fig. GN17). The accumulation of silt (both in the silt tank and in the main tank) necessitated cleaning out, or excavation, of the silt every 5-6 years. If this was not done, the tank would silt up entirely in 10 - 20 years. Further, the silt was often boggy, and would trap sheep and cattle when the water level was low.

So as to avoid fouling of the water by stock (a major problem in the case of cattle) and also as a measure to avoid the bogging problem mentioned above, water from the tank was often pumped by windmill to adjacent troughs. Now this immediately introduced the need to constantly monitor the windmill and pump every couple of days. If the equipment broke down in the middle of summer, any stock solely dependent on that one source of water would start dying in 3-4 days.

The construction of such dams had significant impact on the adjacent landscape. Firstly, the rushing of water along the drains frequently resulted in the erosion of earth so as to form cut-aways. Secondly, the intersection of sheep pads at such a tank would permanently scar the landscape and sometimes lead to additional erosion by water. Thirdly, the congregation of large numbers of sheep and cattle in the immediate vicinity of the tank would promote the growth of concentrations of weeds introduced with the stock: Bathurst burr, stinkwort, etc. On a positive note, tanks provided a water supply for the local fauna.

To equip and operate one of the large Lachlan runs required many such tanks as well as other equipment. At the edge of the study area lies The Overflow, a huge run of 290,663 acres which provides some idea of the capital investment needed to produce wool on a station without natural water supplies. In the Annual Report of the Union Mortgage and Agency Co. of Australia, 1894, in ANU/ABL, the Improvements were stated to include:

Fencing: 350 miles
Paddocks: 48
Yards: 12
Wells: 2
Tanks and dams: 89

Water was also needed for shearing. In the 1870's, this was mainly for stock to drink and for the dip, but with the arrival of steam engines in the 1880's a larger supply was needed. Roof water was stored in galvanized iron tanks beside the woolshed and these could be replenished from the river if the shed were sited nearby.

A dip was often associated with the woolshed and also required water. It was most convenient to locate the dip on a watercourse in the vicinity, as a plunge dip used several litres of water per sheep so a large supply was needed if it was to share the woolshed’s supply. Spray dips were less common and also needed a large supply of water.

Where drinking water was carted or pumped for stock, troughs also had to be constructed. Logs were often hollowed out for this purpose. Galvanized iron also played its time-honoured role here.

Windmills were used to pump water from the river and, later, from tanks and bores to watering holes and troughs. At first they were wooden. The only known survivors in the area are those at Brotheroney between the homestead and the river (Fig. BY13), and the one at Wooyeo (Fig. WY18). Later the familiar metal variety became common.

Homesteads also needed a reliable supply of water. All of the first wave of houses were located near the river or, as an alternative, along Booberoi Creek (Erribendry, North Whoey and Boorithumble). Roof water was stored in converted ship’s tanks, in galvanized iron tanks when they became available and in large underground tanks as may still be seen at Booberoi and Hyandra. Water was obtained by means of a hand pump.

In the study area, wells within a mile or two of the river would often tap a useful supply of water. However, particularly on the north side of the river, wells further away the river were rarely successful. Some establishments were close enough to make use of this potential for household use and traces of old wells survive at several homesteads (Hunthawang, Hyandra, Merri Merrigal, Uabba).

To provide well water for stock was a huge undertaking at this time when wells were excavated by simple methods of human power. Brodribb reports on his experience with “eight blocks of waterless country in the Lachlan district ... they found that there was not one drop of water on the blocks ... I found my cousin and his son busy sinking a well. They were down about 120 feet.”

Freeman, a resident of the Riverina for most of her life, gives an account of the local practice of the process at Bynya, a property in the area:

“Well sinking in the seventies needed much skill and determination ... It was not known if underground water existed so far out

“At 200 feet water was struck, but the supply was deemed insufficient, and for the next 115 feet, through hard ground, Jim Slattery delved into the bowels of the earth. Naturally he worked in a wet shaft which needed constant bailing, because water from the 200 feet level

trickled down on him ... to loosen the hard ground, he used blasting powder, putting it into a greased bag, then covering it with a thick coating of pitch to keep the water out. Into the end of the bag he thrust a water proof fuse, which when lighted, fired the charge after a given interval, according to the length of fuse. Drilling two holes and inserting two charges, timed to explode a few minutes later, he would be hauled up to within 100 feet of the top where he would hang suspended in the large well bucket, waiting for the explosion.

"Then down he would go for dear life, shovelling earth into buckets.

"After going down 325 feet, indications of more water failed, so he put in a stage at the 200 feet level, and drove an 18 foot tunnel, opening out to 10 feet wide, into the side of the well. This had the effect of tapping a further supply and the chamber, together with the 115 feet shaft below, acted as an underground supply tank."21

Even after such a long and arduous excavation, especially in those areas away from the immediate proximity of the river where the need for water was greatest, disappointment was common. Brodribb comments that "between 1872 and 1876 I spent £1,700 developing these blocks, but failed to secure permanent water, although I dug several wells."22 In his study of the Riverina, Williams has put forward a figure of about a fifty per cent success rate but notes that their use was not widespread because of the cost to build and work them and the fact that the water was sometimes salty. This was a particular drawback in the area because, as Williams points out, when sheep are living on saltbush they need fresh water as the "leaves of Atriplex nummularia contain approximately 20 per cent crude protein ... sheep on a saltbush diet will die if their water supply is too high in dissolved salts."23

The late 1870's saw a phase of technical evolution in all these areas, including the introduction of mechanical boring for artesian and sub-artesian water. This enabled very deep bores to be sunk but the process was expensive and success in finding water where needed was not guaranteed. When found, the artesian water was brackish but it was considered fit for stock. Beginning in 1884, a series of Government bores were built and maintained along the travelling stock routes and this greatly helped the process of moving stock through this arid region.

21 Freeman, Murrumbidgee Memories, pp. 94-95.
4.5 Clearing

Another huge wave of change to the landscape was set in train at this time by the large scale clearing operations to both established pastoral areas near the rivers and to the backblocks being opened to the industry by the provision of water. Ringbarking had been practiced at Lake Cargelligo since settlement, but it was the investment boom of the 1870's that saw the wholesale clearing of large blocks. People had used the local cypress pine for structures, fences and for mining but the impact had so far been purely local. As Bolton wrote, "Most Australians were so overwhelmed by the sheer quantity of bush timber that they took its inexhaustibility for granted." 24 A Riverina perspective is given by Freeman who wrote that at Bynya in the 1870's "much ringing and scrubbing was done at this period. Hundreds of thousands of beautiful pines were destroyed, no one thought they would ever be of value." 25

Cutting down trees and then grubbing the stumps out of the ground was a heavy and expensive task, so graziers turned to ringbarking as a quicker and less expensive way of increasing grass cover. Ringbarking was contracted to specialist operators who usually brought a team. To kill the trees two cuts are made all around the tree and the bark in between the cuts is removed. This prevents the uptake of water and nutrients. The living trees used most of the groundwater under them, so preventing the growth of grasses. Graziers found that by simply ringbarking the trees they could quickly increase their carrying rates as the grasses sprang up within a few months. Their response was enthusiastic and as Bolton has said soon "the main enemies of Australia's trees were the pastoralists" 26

The ringbarked pine trees were left standing. For grazing purposes, there was no particular advantage in removing them, although they could impede the movement of stock if very dense. As the branches fell off the dead trees in later years it was found that the debris formed a refuge for rabbits and so the trees were often burnt in situ. Box trees and river gums demanded a more active management as suckers formed each year and had to be removed if the tree was not to regenerate.

Along the Lachlan ringbarking was concentrated on the strip of country extending about a mile from the river on the northern side where the tree cover was mainly large box trees and to the south of the river where there was more open country with larger trees. The belts of thick mallee to the north of this zone required a different technology and were only tackled in the 1920's

25 Freeman, Murrumbidgee Memories, p. 98.
26 Bolton, op cit, p. 42.
and, again, more recently when potential returns seemed to justify the huge initial outlay. The mallee belts to the south of the river were tackled from the 1880's and a splendid mallee-roller of local engineering may be seen at the Lake Cargelligo Museum (Fig. GN12).

Costs are hard to establish as there was much variation according to area and type of treecover. There is a local tradition confirming that most of the work was carried out by groups of itinerant Chinese who had been left without work when the goldfields ran out. At this time a small Chinatown flourished on the river at Narandra and provided a pool of labour as well as several contractors and merchants to supply teams of workmen. Freeman has written of the contracting network centred there and some attitudes of the time including: "Strange to say, white men would perform all kinds of bush work such as building fencing, dam-sinking, shearing etc, but they did not care for ringing and scrubbing; they called it 'Chinamen's work'. "27

As late as 1902, The Lachlander of Condobolin carried advertisements such as the following:

To Stationholders
Any Landholder, requiring SCRUBBING or RINGBARKING, or any other work, executed by contract on their land are invited to communicate with the undersigned either personally or by letter.

W. On Tiy
Lake Cargelligo.28

In the Sands Directory for 1904, On Tiy & Co. are listed as running a General Store at Lake Cargelligo.

4.6 Technology of Stock Management

The move from fat-cattle production to the large scale pasturing of sheep for the production of wool was made in the Lake Cargelligo area at about the time that the wave of pastoral investment in fencing and water conservation transformed the technological base of the industry. Some graziers had always kept sheep for their wool. Most had kept some sheep for meat. But the scale and intensity of sheep grazing in the 1870's was a new phenomenon which was to have a huge impact on the landscape.

Before the construction of fences divided the runs into paddocks, the sheep had been tended by shepherds. This meant that the flocks were quite small so they could be managed by one or two shepherds who, in theory at least,

27 Freeman, Murrumbidgee Memories, p. 109.
28 The Lachlander, 1 February, 1902.
maintained tight control over them. Shepherds observed the animals constantly and were alert to early signs of disease or other problems. They also developed a close empirical knowledge of the locality and rotated the sheep to take advantage of grasses at different times.

Flock management was transformed by the fences. Large numbers of sheep were left to fend for themselves in paddocks with only an occasional muster to disturb them. As the sheep ranged over a large area there was a lower concentration of animals and less disease. They were not folded into enclosures at night but ranged according to the pasture. Sheep, however, are social animals and tend to group themselves in large flocks and forage in groups. Without the shepherds to direct them, sheep tend to eat all the herbage near to the water before ranging further. This has caused permanent damage to pasture and encouraged erosion of the banks and surrounds. When left to their own devices, sheep develop patterns of foraging and paths within their territory, known locally as “sheep pads” or just “pads”. This is another mechanism for erosion, particularly near to sources of water.

With the change from cattle to sheep came a less flamboyant style of stock handling. When half-wild cattle had roamed the open ranges the stockmen who managed them required a high level of skill and courage to face the daily perils of mustering and cutting out. Some of the heroic aspects of their role were painted by contemporary artists who responded to the strong style and romantic image of their activities. Some of these paintings appeared in the Illustrated Australian News, for instance “A Breakaway by Night” on 13 November, 1886 and “On the Old Man Plain, Riverina – First Scent of Water – Stockmen Restraining Cattle” on 5 November, 1881. Others were published in Harper’s Magazine and Century Magazine. Most included such elements as wild cattle with large horns, stockhorses boldly approaching the cattle and strong male figures brandishing whips. They express the contemporary perception of the cattleman as a heroic and daring figure.

The contemporary artist’s view of sheep management is much less dynamic. A typical work is William Hatherell’s “Mustering Sheep” where two men, only one on horseback, are shown with a compliant mob of sheep. There are a few sheep breaking away from the mob. The figure in pursuit of the breakaways is not a gallant stockman on a racing steed, but the new hero of the time, a collie sheepdog. There were sheepdogs on the First Fleet accompanying the shepherds Philip brought to the colony and right from the beginning they played an important role with the flocks. In their study of working dogs, Austin and Zaadastra report that fox collies were imported in 1825, but that it was the arrival of the kelpie type of collie from Scotland in 1847 that marks the move to a local type. The breed’s long hair posed problems in the heat and long

rough grasses so local breeders developed the sturdy kelpie with its short hair, great stamina and aptitude for working with sheep both in the paddock and inside the woolshed.

4.6.1 Land Use Patterns

The pastoral practices of the nineteenth century have left their signature on the landscape. Pastoral uses can often be recognized in the patterns now visible. While some variation was possible, the sheep stations developed a recognizable style of land use. A tripartite division of land resources was common. It was based on the needs of the stock.

Horses

The very best pasture was reserved for the horses. They were a critical element in the scheme of management of stock and they provided the motive energy for other work such as clearing, hauling, ploughing and transport. A station needed at least three different types of horses:

(a) Stockhorses. Sturdy animals with great endurance. For sheep work, they did not need to be as well-trained or agile as they had to be for dealing with cattle.

(b) Cart and Sulky horses. Larger animals to provide transport for people and goods both on and off the station.

(c) Draft horses. Very large strong animals to do the heavy work of ploughing and hauling heavy loads such as timber.

This was the minimal requirement for a station and there was much scope for expansion of these categories. Most establishments also kept riding hacks, light sulky horses and ponies while some could boast of thoroughbreds and racehorses (especially Booberoi and Merri Merrigal).

Structures associated with horses include stables, yards and dedicated paddocks. Most stations had a stable for management of the horses. At Hunthawang, Hyandra and Merri Merrigal the stables have floors made by inserting pine logs about two feet vertically into the earth, giving the effect of cobbles. Drop-log structures known or identifiable as stables remain at Booberoi, Boorithumble, Hyandra, Hunthawang, Merri Merrigal, Uabba and Whoey. The stable provided a shelter for the storage and maintenance of the harness and the various horse-drawn vehicles. Activities such as chaff-cutting were also centered here.

Cattle yards were often also used for horses, although a special set of horse yards were useful. Merri Merrigal has such yards and Booberoi is known to have done so in the past. A night horse paddock was usually maintained to confine one horse which could be readily caught and then used to muster the others needed for the day's work. Often adjoining the stable, a night horse paddock was always within a short walk of the homestead.
Also to cater for the needs of horses, a second area of good land was usually devoted to a cultivation paddock. The cultivated area was usually between twenty and forty acres in extent and was for the production of additional feed, often oats, for the horses. When the animals worked all day, they needed a more concentrated food than grass. It also allowed some storage of fodder for times of drought or flood.

The rest of the run was turned over to the sheep and further subdivided to suit their needs.

Rams

The rams were allotted the best remaining paddocks, usually small ones near to the homestead. This was the established pattern well-recognized in the community as, for example, the party seeking a quiet camp site in Furphy's novel *Such is Life*, one of whom remarks that "The ram-paddock's always a risk - too near the station." ³¹

Rams were the most valuable animals and needed good fodder to thrive. In times of drought they were given preferential treatment as graziers strove to maintain their breeding stock. The Hunthawang Annual Balance Sheets for December 1896 include a "Feed and Cultivation Account for Horses and Stud Sheep" with costs of over £190 for feed purchased and ploughing, cutting and harvesting costs of over £143.³² It was easier to supervise the rams under such conditions, as they were prone to get out of enclosures and wild dogs were a hazard. Moreover, they had to be kept separate from the ewes to control the timing of lambing. For about ten months of the year the rams were confined to their own paddocks and then joined the ewes about four months before the lambs were wanted. A common ratio was one ram to every fifty ewes.

Ewes and Lambs

Breeding ewes were put into the next best paddocks. These can often be identified as the middle-sized enclosures with good pasture. The reproduction rate, in terms of percentages of live lambs born, depend on a supply of good feed and water. If the ewes are stressed there are few lambs and less of them survive. The management of ewes is a complex matter as they are prone to many problems and very sensitive to the supply and type of herbage. The peak need for grass arises when the animals are lactating, so lambing is often timed to occur between April and September when the grass is at its best and there is little risk of blowfly strike. Lambs are typically weaned at eight or nine months of age, just as the breeding cycle is about to begin again.

Most human intervention occurs at the time of lambing and at shearing. There have always been different theories about the best time to shear ewes. One holds that it is best to shear about a month before lambing to avoid blowfly strike. Another very common strategy is to wait until three months after lambing.

The later shearing has a further management advantage in that it can be combined with the lamb marking operation which is carried out when the lambs are between one and six months old, typically at two or three months. It is a labour intensive activity involving a muster of all ewes and lambs so holding paddocks are needed. The sheep yards at the woolshed were suitable if the animals were already in the vicinity for shearing, but otherwise a rough set of yards were erected. Such holding yards were often built at the extremities of runs to minimize distances walked. On Hyandra traces of three sets of yards survive even now.

Lambs are separated from their mothers and then subjected to several procedures thought essential to management. Firstly, their tail is removed to minimize blowfly strike. The males are then surgically castrated. All are given ear marks with a punch tool: the station brand on one ear and an internal sign to indicate year of birth on the other. They are then released back to the ewes. Each year's increase of lambs must be treated or else the males become unmanageable. It is best not to mark in summer because of fly strike, so that is another reason why graziers prefer winter or early spring lambing. This is not the usual European timing, so it must be a local response learned in the harsh conditions of an outback summer.

Lambs are subject to a range of predators including eagles, foxes and wild dogs. Without shepherds they are very vulnerable so some stations assigned extra stockmen to protect them when very young. Yet others allowed the sheer scale of numbers to carry them through some losses.

Another common disease in the lush tableland areas nearer the coast is footrot. In the dry conditions of the west this rarely occurred, although it appears after floods. As Wadham and Wood wrote “The disabilities imposed on farming and pastoral enterprises by the dryness of the climate are in part offset by the very real advantages derived from its genial nature, which is of such significance to the livestock industries. In very few districts is close housing necessary during the winter.” At Lake Cargelligo no provision had to be made for animal housing and sheep seemed to thrive in the open during even the coldest winters. Other such diseases of the damper regions as liver fluke and some worms were also happily rare in the west.

A further subdivision of land was made to provide weaning paddocks for

the lambs as they left the first soft pasture. They were an intermediate quality of paddock, somewhat more favourable than the ones allotted to the wethers.

**Wethers**

The largest, and often the roughest, paddocks were set aside for the wethers. Large, sturdy, and needing less supervision than the rams or ewes, they occupied the areas least cleared and often farthest from water as they were able to tolerate a longer daily walk to drink. A sheep needs about two liters of water per day, more in summer or when the grass is very dry. They are not very particular and can survive on low quality water, a great advantage as the back country was opened to grazing with often rudimentary water supplies.

4.6.2 Other Requirements

**The Dip: Structure and Process**

Once the fences were built, one of the first structures to be provided was a dip. Sheep are subject to many pests and parasites such as ticks, lice and keds. Not often fatal, they lower the quality and quantity of the wool. Lice live on the skin, so sheep lose condition and the wool becomes yellow and matted. If sheep are dipped annually, ticks and lice are virtually eliminated, flies only for a few weeks. Normally, dipping is done near to shearing when wool is short allowing the skin to be reached. About four weeks after shearing is considered optimal so that cuts have healed, but in practice dipping is often done straight off the board to save another muster.

The technology of a dip is simple but has many possible variants. A large supply of water is necessary, so the dip was built near a supply of good, permanent water if it were available. A extant example is the structure on Hyandra which is built on the bank of Booberoi Creek. Should there be no such supply of water the dip may be near the woolshed and use its yards. Such a dip is located at Coan Downs, a large backcountry station on the edge of the study area (Site Report CN1). If chosen, spray dips were located near the woolsheds. They were considered less effective in the harsh conditions of the area.

Most graziers in the area favoured the more thorough plunge dip. A plunge dip has four essential elements:

1. Holding yards and forcing yards.
2. Slide.
3. Dip race: terminating in an ascending ramp where the sheep were dunked with a forked stick to ensure that their heads did not escape treatment.
4. Draining Pen: with a concrete or tin floor to allow the sheep to drain and the excess to flow back into the dip.

There was ample scope for individual sites to allow or require variation to the basic layout. Refinements were also possible, such as, for instance, the decoy pen to hold a sheep at the top of the ramp to reassure the sheep entering
the race and maintain a smooth flow of animals through the process. Such a pen was included in the Hyandra layout (See Site Report HY3).

The dip solutions used were usually arsenic based powders that had to be dissolved before being added to the water in the race. After use, the overflow and residue were allowed to flow straight back into the creek or river. The supply of the dipping powder was expensive and bulky. It took about thirty boxes of Coopers Dip to treat the 6,000 sheep on Hyandra during the 1950's. No doubt they were brought to the early stations, together with wool packs, by the teams that took out the wool.

Water was the other essential requirement and the dip was sited with this in mind. If it was near the woolshed it probably shared the tank kept for the steam engine from the 1880's onwards. Otherwise it was carted in a adapted ship's tank by horse teams. If it was located near a watercourse, hand pumps eased the work. An example of the type of hand pump in use in the area is kept in a store room at Hyandra (Figure HY30).

Sheep carry dirt on their feet and after two or three thousand have passed through a race there is about a foot of heavy mud accumulated in the bottom. It had to be shovelled out and the dip refilled with fresh solution. Usually left beside the watercourse, this sludge forms another residue.

While the dipping operation is labour intensive and requires a number of people to assist in regulating the smooth flow of sheep through the different phases, the work flow is efficient and the whole operation is soon over. The mustering is the most time consuming element.

**Blowflystrike: Process and Prevention**

On the hot western plains, blowfly strike is a major hazard in sheep management. Even today, graziers can lose eighty per cent of their sheep if they are not treated. Some graziers regard it as the worst problem of sheep management facing the pastoral industry in Australia.

The process involved is difficult to regulate as it arises from the normal life-cycle of both species involved. The flies lay their eggs in damp places in the wool and around wounds. Especially vulnerable are the tail, pizzle and neck. The eggs soon hatch as maggots which eat the flesh. This causes severe trauma to the sheep. Death rarely occurs in less than two weeks and can take as long as six weeks if the affected sheep are adults in good condition.

The problem is worst in summer and is promoted by humidity, so summer rain induces many severe cases. The period from January to March is the worst time of year.

Actions taken against blowflystrike are both preventive and curative. Most common are:

1. Shearing
2. Crutching
3. Dipping
4. Individual treatment

The strike rate is least when the wool is short so shearing is often timed to ensure that the sheep have less wool at this time. Crutching is a partial shearing of the most vulnerable areas of the sheep’s body and so it involves a full muster of the stock and much stock movement around the station during hot weather. It is common to crutch all the ewes as they are particularly vulnerable. Sometimes this is done in the paddock under a tree or temporary shelter to avoid the trauma of moving them. Dipping provides protection for only a few weeks but if timed well, or repeated in a specially wet year, can prove life-saving.

Once a blowfly strike has occurred, the only treatment is to catch each sheep, clip away the wool surrounding the strike with hand clippers and treat it with an antiseptic solution. This is a very labour intensive operation and graziers may not attempt it if they have large numbers of sheep, preferring to absorb the loss of a percentage of the stock.

In wet or humid seasons it may be necessary to muster the sheep each month into temporary yards and crutch them on the spot to avoid large numbers being affected. The cost of such work is high and individuals graziers will do a cost-benefit analysis before undertaking the outlay.

Woolwash

On the remote sheep stations where the costs of transport were a heavy burden the graziers had found it convenient to wash their sheep before shearing them. This halved the cost of transport and met the preferences of the buyers who wanted clean wool. A swiftly moving stream was considered most suitable for the task and yards were erected to direct the flow of sheep in, through, and out of the wash.

In the study area no physical traces of such structures were found. Several severe floods have affected the river and creek areas over the past century so the flimsy yards usually erected for the purpose, should they have ever been present, could quite likely have vanished without trace. As the dominant industry had been cattle production throughout the 1840’s and 1850’s, it is possible that no woolwash was ever built on the river. Butlin points out that by the 1870’s “one major structure, the washpool, was becoming obsolescent. Increasingly, wool was being moved from the stations in the grease.”

The only documentary evidence that was found is the name “Woolwash” on maps of the area and located at the northern end of Lake Cargelligo itself. This is a plausible location for such a facility associated with Wooyee as the original woolshed was located near the Lake. Alternatively, given that the term

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34 Butlin, op cit, p. 332.
used is "woolwash" and not "sheepwash", it may be that a facility for washing the fleeces after shearing was sited by the Lake. The only other mention of the process in records of the area are some entries in the Annual Station Reports of Hunthawang which list the cost of scouring rams fleeces and some other unspecified fleeces. No traces of a woolwash were located on Hunthawang and no memory of one was elicited by discussions with owners and residents.

4.7 Developing Rural Technology

As well as the pastoral innovations of fencing and water conservation that have been described in several sections above, the 1870's and 1880's saw a range of inventions and developments in all areas of rural technology.

Steam engines became common during the 1880's and were put to many uses, especially for shearing. Jeans has studied the development of rural technology and records that Wolseley shears were first marketed in 1887 and soon came to replace hand blades. One particular advantage of the power shears was, as pointed out by Buxton, that "by the end of one season, complete novices were shearing eighty or ninety sheep per day and experienced shearers were reaching 140." The impact on the landscape came chiefly from the need for wood to run the engines.

An efficient oil engine came onto the local market in 1887 and offered great versatility as it could power a range of implements and pumps and so be used for a range of tasks throughout the year, as well as for shearing.

Imported barbed wire appeared and made the enclosure of cattle easier as it could be added to the top of a conventional post and wire fence, transforming it into a much more substantial barrier.

Mallee-rollers were improvised locally from heavy boilers and a superstructure of large logs to clear the densely covered mallee plains. Mallee is difficult to handle as multiple branches spring from its base and, if cut, the root can simply send up new shoots. Ringbarking was useless in these conditions but the process of knocking down, rolling and burning the mallee was effective.

Agricultural machinery evolved rapidly in the wheat belts. A stripper was invented in 1843 but was not common in the Riverina until the 1870's. Jeans has described the sequence of technical evolution whereby iron ploughs had replaced wooden ones in the 1850's and were in turn replaced as the "steel share took the place of the fragile cast-iron share" in 1888. Most important


37 Buxton, op cit, p. 251.

38 Jeans, Rural Technology, pp. 17-18
for recently cleared country, the stump jump plough was invented in 1876 and its hinged shares enabled farmers to plough rough areas without constantly breaking their equipment.

4.8 Mining

Even during the time when pastoralism was the dominant industry in the area, there were other forces shaping the landscape. One of the most powerful of these was mining. On 13 April, 1871, gold was accidentally found near to the Lake by Mrs. Foster who was employed to cook for a group of burr-cutters on the Wooyeoo lease. A minor gold rush followed as news of the find leaked out and the Lake Cargelligo Gold Field was proclaimed on 22 May, 1873. The gold was in two quartz reefs and necessitated deep shafts. The Sydney Mail of 12 July 1873 reported that the diggings were not progressing favourably and that 200 persons were at the site.

Foster's Gold Mining Company operated the main mine. At the end of 1875 the reef had been found to be 150 feet long at a depth of 95 feet. A battery with twelve stampers was operating. Problems continued with water in the mine giving a lot of trouble and pumps were brought in. By 1877 the shaft was down to 150 feet and the quality of the stone had improved so crushing commenced but in August 1878 operations were suspended for survey. No returns are known for 1879 or 1880. The mine was never very productive despite heavy investment in equipment and ceased to operate in 1884. Small diggings near the town also ran into problems with water and low returns and the reservation of 136,000 acres as a Gold Field was lifted.

As Bolton has written, "the first impact of the gold rushes was almost entirely destructive ... early gold mining created a voracious demand for timber, so that the country around a mining town was usually levelled bare, leaving no shelter against wind or dust."39 Dowd found that while the Lake diggings were never on a large scale, the shafts were deep, 185 feet,40 and much timber was needed to line them and to fuel the crushers. Figure GN1 is a photograph of the main mine operating in Lake Cargelligo in 1877 and gives some idea of the impact of even a small operation on the surrounding area.

Perhaps the most enduring impact of the gold mining period on the Lake landscape, however, was the arrival of a larger and more diverse population in the area. While many among the first influx of hopeful prospectors soon moved

on to more likely sites, the district was left with a new resource. New skills became available locally. Most importantly, however, the new arrivals marked a new direction in the social landscape of the area. Before the gold was found, the area was the preserve of a mostly male frontier population of squatters, stockmen and drovers with a few women in service roles such as cooking. With the influx of a more balanced population during the mining years, however, this original mix widened to include women and children. The number of people was not large but their influence was strong in the directions taken by the town. They provided a pool of casual and seasonal labour for the area and laid the basis for an urban centre.

The following population figures are taken from the article by Dowd,\(^{41}\) for the period 1881 to 1923, and from the Commonwealth Statistician thereafter.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1881</td>
<td>166 (after end of mining)</td>
</tr>
<tr>
<td>1891</td>
<td>347 (with 72 habitations)</td>
</tr>
<tr>
<td>1901</td>
<td>302 (with 50 habitations)</td>
</tr>
<tr>
<td>1911</td>
<td>415 (with 88 habitations)</td>
</tr>
<tr>
<td>1921</td>
<td>483 (with 135 habitations)</td>
</tr>
<tr>
<td>1923</td>
<td>1408 (with 321 habitations)</td>
</tr>
<tr>
<td>1947</td>
<td>986</td>
</tr>
<tr>
<td>1954</td>
<td>988</td>
</tr>
<tr>
<td>1961</td>
<td>1118</td>
</tr>
<tr>
<td>1966</td>
<td>1127</td>
</tr>
</tbody>
</table>

Most of these habitations were built from local pine which provided a convenient and inexpensive building material. Some originality was, however, attempted. The Lake News of October 1, 1980, published a photograph of an old house made of kerosene tins filled with sand, taken in 1932 when it was still used as a house (Fig. GN2). Nothing is known regarding the date of its construction and no traces remain at the site near the present Memorial Hall, but it remains an example of the ingenuity displayed by an isolated population with limited resources.

To cater for the needs of the larger and more diverse population established during the mining boom, a range of local services grew up including a post office (1874) and a police station (1879), a telegraph office (1880), a school and a church (1881). Roads were built to cater for local movements as well as to tap into the regional network. Banks were established to provide financial services and solid, formal buildings were erected which still serve to this day (Figs. GN8, GN9).

A new pattern of land use was also established when 30,000 acres were opened to small selectors under the 1861 Crown Lands Alienation Act following the lifting of the Gold Field reservation in 1880. That year, five settlers took up

\(^{41}\) Dowd, op cit, p. 215.
land and another twelve did so in 1881, with five in 1882.\textsuperscript{42} However, as Dowd remarked in his article on the settlement of the district, “settlement generally was slow, there being no inducement for settlement other than for pastoral purposes.”\textsuperscript{43} The selectors established the base of agriculture in the area by growing produce for the town. Later, when the land had been cleared and transport links established, they were ready to produce cash crops for export from the region to both local and overseas markets.

\textsuperscript{42} Dowd, \textit{op cit}, p. 209.
\textsuperscript{43} Dowd, \textit{op cit}, p. 209.
CHAPTER 5

The Vernacular Architecture of Pastoralism 1: Woolsheds

...the bush carpenters, unconscious of anything but the job to be done, constructed veritable cathedrals of timber.

Cox, Freeland and Stacey

5.1 The Woolshed in the Landscape

Scattered across the landscape of the region, beside roads or isolated in paddocks of wheat, stand a series of buildings which recall the era of pastoralism on the Lachlan. While they operated at full capacity for only a short time, about twenty years, the woolsheds were the focus of a system of land use that utterly transformed the landscape of the area during its brief period of supremacy. Large, simple structures built of local materials, the woolsheds are an eloquent expression of the demands of an exacting environment.

As Jack has written “We have no Gettysburg, no Versailles. The occupation of the land and the building of cities is the heroic Australian achievement.” These structures, in particular, are closely bound up with the national mythology of the squatter and the shearer, the drover and the bullock-team, with all the people and processes involved in producing the fleece at the time when wool was king.

The history of the rise of the woolsheds and their subsequent fate is linked inexorably with that of the area and so will be approached from that viewpoint. They were the central unit of the wool industry, efficient factories for the processing of the fleeces on which the economy depended. Moreover, they were closely woven into the social fabric of an isolated community attempting the experimental utilization of a harsh and capricious environment. The length of time that they were in use was brief but even now the scale and concentration of the buildings hold an echo of the role they once played. In their prime the

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woolsheds dominated the scene, but now they are melting into the landscape around them.

This section will be concerned with the woolsheds of the Lake Cargelligo area. It will begin with the early, simple shelters for the station ration mob and will move to the large, planned buildings of the pastoral investment boom of the 1880's and beyond.

5.2 Practice and Process

The essential elements of a woolshed are shelter and a work area. The earliest woolsheds in the colony were very simple, of bark and slab, and gave the necessary shelter to the shearers. Likewise, the thatched roof woolsheds using forked tree trunks as supports, as described by Freeman, served well for the small scale operations of the early days of settlement. By the time that the wave of pastoral investment of the 1870's took hold and stimulated the vast expansion in sheep numbers, however, something more substantial was needed.

While many variations of detail are possible, the basic plan of a woolshed involves a roofed structure which allows the flow of sheep into the shed, the removal of the wool and the exit of the sheep at the other end, with provision for the classing, pressing and storage of the wool.

The Process of Shearing

The woolshed is part of a slightly larger complex which includes forcing yards to control the flow of sheep into the shed via a ramp with a slatted floor. Any but the simplest shed will include a set of sweating pens where sheep can cool down and dry out before handling. The floor of this area is also slatted. Usually the sheep are put into the sweating pens the night before shearing as shearers have always refused to process wet sheep. Most sheds are built on piers approximately one metre high to allow additional sheep to shelter under those parts that have a solid floor.

From the sweating pens sheep are put into the catching pens behind the shearing stands. Most often two shearers share the pen behind them. A pen holds about twenty sheep and is small for ease of catching. Sheep are penned by rouseabouts and the pens are replenished continuously. Again, the floor is slatted. The hinged swinging door opens in both directions.

The shearer catches each sheep and then drags it onto the shearing board. This is the centre of operations, with a solid floor and a stand for each shearer. The stand consists of the area in front of the pen, usually with a high wall, a

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shelf for tools and the shearing equipment. In the days of hand blade shears, there was some freedom of movement for the shearer, but the introduction of mechanical shears has meant that each shearer must remain at his own stand, within reach of the downpiece carrying power.

When the fleece is removed, it is picked up by a rouseabout and taken to the classing table. Here it is skirted, i.e. the rougher edges are removed, then it is assessed by the woolclasser and rolled into a ball before being put into the appropriate woolbin. A row of open bins (mostly six to eight bins) usually stands at the back of the board area separating it from the woolroom where further woolhandling occurs. In the days of the wool boom, the scene would also have included figures immortalized in the traditional folk song “Click go the Shears” such as:

_In the middle of the floor in his cane-bottom chair_
_Sits the boss of the board with his eyes everywhere._
_Notes well each fleece as it comes to the screen,_
_Paying strict attention that it's taken off clean._

Shearers have always been paid on the number of sheep that they shear, and the owner may refuse to pay for poorly shorn sheep, hence the attention to this matter. Another tradition was to mark with raddle any sheep that was not satisfactorily shorn so that it could later be deducted from the shearer's tally. Much conflict between owners and shearers derived from this practice and it was a central issue in the strike of the 1890's.

An assistant would be needed for each four to six shearers but it was rare to employ more than one woolclasser. In modern practice, the woolclasser is the person in charge of the board area except for exceptionally large sheds that also employ a separate overseer. When the shearers were employed directly by the station, the "boss of the board" would have been the station owner or manager.

After a sheep is shorn it is pushed down a chute to a counting-out pen for each shearer. At the end of the shift a count is made by the woolclasser and a tally kept. This is the end of the involvement of the shearers with the sheep.

After the sheep return to the care of the station staff they are put into a forcing race and wedged firmly together so that they can be branded, treated for any cuts not yet dealt with and often also administered various preventive medications. The sheep are also sometimes dipped at this juncture or else they are returned to grazing paddocks.

_Wool Handling_

Beside the flow of sheep through the shed, there was also the handling of the wool itself. In the 1850's and 1860's it was common to wash the sheep before they were shorn to meet the demands of the market and to reduce transport costs. This entailed a separate installation and also drying pens. Some drafting
yards are floored to keep washed sheep clean but none were known in the study area. From the 1870's onwards washing was discontinued at most stations and sheep were shorn in the grease.

The first cut made by the shearer removes the belly wool which is then flicked onto the board, retrieved by a rouseabout and put in a separate basket. The blaise (face wool) is also left on the board for inclusion with the locks.

The fleece is spread onto the main table and the skirtings are removed to the piece picking table where a tripartite division is made;
(a) broken - almost fleece quality;
(b) pieces - small pieces of fair quality wool;
(c) stains - discoloured wool.

Wool bins are kept for each category and the wool is then processed in the usual way.

The main fleece is classed according to fibre diameter and length. At least three categories are maintained and often many more according to the size of the clip, the variation within the flock and the preference of the station. Age of sheep, their health, gender and breed will affect the wool, as will the condition of the pasture, drought and parasites.

The scraps of wool swept from the board and other scraps are put together as locks and processed as a group.

From the wool bins the wool is taken to the woolpress where it is compressed. The woolpress has evolved considerably since the time when Brodribb pressed his wool into boxes with a shovel.\(^4\) Large screw presses were common in the 1870's but entailed two men making 150 turns around the woolbox for each bale. A faster system was the rack and pinion system which Freeman documents in his study of woolsheds as being installed at Yanko shed in 1866 and which was soon generally adopted.\(^5\) Hydraulic presses have been available since the 1960's but many rack presses are still in use. A fine old screw press was burnt in the fire which destroyed the North Whoey shearing shed in the 1980's.

After pressing, the bales were sewn closed, stencilled with the station name and the details of the contents, then weighed and recorded in the wool book. Bales were then stacked in the woolroom to await transport to the market. In the isolated Lake Cargelligo area the wait was often a long one, sometimes prolonged by flood making the roads impassable, so ample storage was needed for at least one year's clip. Coan Downs, a particularly isolated property, had

\(^5\) Freeman, op cit, p. 40.
a whole separate building for storage as well as the spacious woolroom (Site Report CN1).

The linking services of transport and communication always presented extra challenges in the area. Roads were only dirt tracks much subject to flooding while the river has always been a barrier. Wool was usually taken to a distant railhead by bullock-team, a slow process. It was only after the spread of agriculture and railways that a line to Lake Cargelligo was completed in 1917.

The Shearers

Shearers have always been one of the most colourful groups of rural workers, arousing strong opinions on all sides. As Adam-Smith remarked of bushmen "these men were the larrikin princes of our traditions and the shearer was king. His peregrinations throughout the land ... cloaked him in a glamour no other man had." 6

During the golden days of pastoralism, the mid-1860's to the end of the 1880's, shearers were employed directly by the stations from large groups of itinerant workers who travelled "on foot, horseback, camels, bicycles and later in cars" as described by Adam-Smith. 7 They gathered at the stations hoping to be engaged, but remained uncertain until work began. The conditions that they met were often oppressive and always spartan. Adam-Smith has written a detailed account of these matters. 8 The traces left by these men, for hired shearers in Western New South Wales were almost always men until the 1970's, are to be found in the sheds and the accommodation as well as in the popular ballads and folklore of the time.

The shearers were required to sign an agreement which set the terms of their employment in detail, usually in favour of the pastoralists. Shearers were paid for the number of sheep shorn with the owner reserving the right to refuse payment for any sheep that he deemed to be unsatisfactory, or for any fleece slightly damaged. The shearer had to agree to wait until the shed cut out for payment. The contracts of the time did not specify working conditions for the shearers.

Blade shearing was a skilled occupation and took years to master fully. Learners picked up the skill in an informal way by working as roustabouts and assisting the shearers, often shearing the last sheep at break time.

Powered shears were an Australian invention and the Woolsey handpieces introduced in 1888, at Dunlop station, were the end of a long chain of experiment. Steam power had been available before this but it was only adapted to

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7 Adam-Smith, op cit, p. 18.
8 Adam-Smith, op cit.
woolshed usage with the availability of the shears. The introduction of the new technology was controversial and resisted by many but was well established by 1900. It came as the industry declined and in the face of new pressures. The sheds were modified to fit the demands with the addition of engine rooms and the shearing equipment.

For each shearer on the board, there were also support workers in various proportions, so that the number of people to be housed was large. As shearing only lasted a few weeks, it is no wonder that the owners provided the bare minimum of accommodation. In this area it consisted of a group of huts, wooden rooms for sleeping set in a row, and a kitchen/mess area. Large sheds also had a separate cottage for the wool-classer (for example, at Booberoi).

Few original shearers' huts have survived in the area. They were never substantial structures and the processes of re-use for other station purposes, use for recreation, and clearing of the area for agriculture have taken their toll. The oldest huts remaining are those at North Whoey. In plan and construction they are very similar to huts known to have been erected in the 1950's so showing that the vernacular traditions remain intact. Later huts include more developed ablution blocks and details to meet the Industrial Award regulations, but retain the simple plan and construction of the early examples.

5.3 The Fabric of the Woolshed

Location of a woolshed on a property was decided by access to water and the possibility of access for transport. Convenience for stock movement was also a factor. For reasons of hygiene and comfort, if not also social distance, it was preferred to locate the woolshed at some remove from the homestead. Gojak has suggested that an inverse relationship exists between size of station and the proximity of shed to house. Of the nine sheds covered by this survey all are located well away from the homestead, except for Hyandra which was not built as a woolshed but converted from a stable.

Early sheds used whole tree trunks to support the beams with a central box frame deriving its strength from the size of the members. The sheds at North Whoey and Boorithumble (Figs. NW9, NW11, BL15, BL17) both have this construction. The three McFadzean sheds (Wooyeo, Uabba and Naradhan) are also based on this strong central box, although they display more sophistication with roof trusses and beams and accord well with the comment made in Cox et al: "They are massive and handsome buildings, unselconscious yet dignified, and noble and full of the unstriven for and timeless qualities that come from thoroughly honest and competent building by both men and materials.”

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Cladding ranged from bark and drop-log to sawn timber and galvanized iron. In the study area no bark or slab sheds are known. Coan Downs station, the most northerly of the stations in the survey, has a large drop-log shed which is still in use. Freeman presents convincing evidence that the shed was commenced before 1874 to accommodate 76 blade shears. The enthusiastic use of the slender cypress pines is an example of local utilization of the materials available at the time (Fig. CN4).

The Wooyeo shed, built in 1873, is clad with cypress weatherboard, (Fig. WY20) as is Naradhan, which was built in the 1880's (Fig. NR2). Once again, the trees were available near the site. Booberoi is now clad with galvanized iron, (Fig. BB10), but was mentioned in an article in The Pastoralists Review of 1912 as being of weatherboard.

The enthusiasm of galvanized iron ensured its ready acceptance and it was used to roof all the large sheds. Boorithumble has wooden shingles under the current iron roof (Fig. BL18) as does Hyandra. Hunthawang and Merri Merrigal are late sheds, both replace earlier sheds on the properties, and both are fully clad in galvanized iron (Fig. HW26 and Fig. MM14). The stations were not slow to adopt the products of the factory when they offered benefits such as ready availability and ease of construction.

5.4 The Early Woolsheds

The first woolshed in the Lake Cargelligo area was probably a very temporary shelter. Settled by cattle owners in the 1840's at a time when the price of sheep and wool was low, wool growing did not assume an important role in the area for some time.

The Budd journal describes how small mobs of sheep, usually acquired from passing drovers, were kept to add some variety to the diet of the settlers in early days. Like the first of the stud sheep of Captain Macarthur which, according to Sowden, were shorn on the grass paddocks in front of the homestead without benefit of a dedicated structure, these early sheep were probably shorn with little ceremony. Wool was not worth much even at the distant market while the cost and difficulty of transporting it from this isolated area was formidable.

11 Freeman, op cit, p. 212.
No traces, or even anecdotal traditions, survive of any such modest structures in the study area, although they no doubt existed.

During the 1850's the discovery of gold strengthened the beef market and cattle remained the dominant industry on the huge open leases which then covered the area. After the gold rushes had diminished, however, cattle became less important because they supplied a strictly local market before the invention of refrigerated ships allowed an export trade to develop. Using the new pastoral technology of fenced runs and water conservation, the graziers of Lake Cargelligo began the switch to wool production.

The wool industry that emerged during the 1860's was highly capitalized, requiring large investments in infrastructure. The scale of production was expanded to fit the demands of the consumer economy in Europe and, at the same time, the new security of tenure gave confidence to the pastoralists to invest huge sums in the runs. One of the first necessities was the construction of a woolshed.

Some of the solutions to this need utilized the traditional ingenuity of vernacular building. At Hyandra, which was not one of the large runs but shore about six thousand sheep, the large existing stable/hayroom was remodelled and extended to include a shearing board, wool room and pens. The original horse stall area of drop log was retained (Fig. HY17) but the central area became the wool room. The original round log floor was slippery so cut boards were laid at the press end.

A board area was established by extending to the north (Fig. HY19). Only two stands were fitted here. This prolonged shearing which took six weeks in the 1950's when six thousand sheep were shorn. This caused other problems as the capacity of the sweating pens was limited. A tarpaulin was mounted over the adjoining sheep yard but it proved only a partial solution as rain came in at the sides. A room for the steam engine was located behind the board area and included the old smithy. Later a portable petrol-engined shearing plant was used on the board. Outside, a set of "skids" served as a loading ramp.

Cox has observed that "by the 1870's the Australian woolshed had begun to lose some of its ruggedness and started to gain in size, scale and planning. Set apart from the homestead, it became an organized group of buildings and often smaller units of simple timber huts were erected."¹⁵ This process can be discerned in the group of purpose-built structures which were built on the homestead leases along the northern stretch of the Lachlan.

Probably the first permanent woolshed to be built in the area was the one on North Whoey (Site Report NW2). Located on a rise near to Booberoi Creek it was conveniently positioned for a water supply. The shearers' huts

were nearby beside a gully close to the creek. At the time of the site visit, 1981, the shed had galvanized iron cladding but the owner stated that this had replaced the original weatherboard in the 1930's. The framework had partially collapsed, as may be seen in Figures NW8 and NW9, and included both round and cut timbers. The framework was heavy, gaining its strength from the size of the wood (Fig. NW10). Supplies of such cypress pine were readily available near the site until the 1930's.

This shed was destroyed by fire after the first visit of the survey team to the site for preliminary recording, but before another visit for full measurement could be made (Figs. NW14 and NW15). The general features of the structure were, however, recorded so it is possible to fit it into the sequence of local sheds.

The slatted areas of the floor were made of thin round uncut rods and the central area of wide boards (Fig. NW10). Large, handmade nails were used (Fig. NW13). A sheet of "Gosper & Oaks" corrugated iron was found, probably from the original roof as no trace or memory of a shingle roof remained.

The overall plan of the shed was rectangular with a central board area and sheep pens at either side (Fig. NW9). The woolroom was quite small and low and was located at the end of the board, suggesting that the shed was commenced early in the phase of converting to wool production. There had not been a previous woolshed on the run which had been a cattle property. A large screw operated wool-press, a Humble and Nicholson "Ferrier" type, still in working order, was destroyed in the fire. The metal screw survived the blaze and lies in the open. The steam engine had been removed for recycling as a mail-box (Fig. NW16). The sheep-yards had also been destroyed before the first visit but are known to have stretched to the north.

The floor was low, too near the ground to allow sheep shelter underneath (Fig. NW9). It was higher than the wool room with wooden steps down. This alone suggests an early construction date, as the need to have dry sheep for the shearers became pressing as the scale of operations exceeded the normal station capacity and hired specialist workers were brought in. Perhaps it is reasonable to regard this shed as an experiment with swiftly evolving forms that produced a structure that functioned for about a century but, nevertheless, was soon improved upon by others.

The woolshed still in use at Boorithumble also suggests an early date with its heavy frame. Solid lengths of round timber firmly anchor the heavy roof system (Figs. BL15 and BL16). An original roof of wooden shingles is visible beneath the galvanized iron (Fig. BL18). This shed is also located near to Booberoi Creek, about one kilometre from the homestead. While the creek is often dry now because of irrigation upstream, it would have been a reliable source last century in any but the most severe drought.

The plan is similar to that at North Whoey, a long rectangle with the wool room separated from the board by the wool bins (Fig. BL15). Again the
wool room is lower than the board area. This scheme was adopted to allow all possible space for wool to be stacked for storage. Boorithumble is also low, without room for sheep to shelter underneath, but a shelter has been added to the north end by roofing part of the sheep-yards.

The cladding is of weatherboard fixed with hand-made nails as at North Whoey. Sections have been reinforced with galvanized iron and an engine room for the steam engine was added to the side (Fig. BL14).

An interesting adaptation to the isolation of the site was the use of the roof area as a loft for storing wool when delay in transport caused wool to be stockpiled. The remains of a lifting device are beside the loft door on the facade (Fig. BL12) and cross-bracing of the shed is intact but the floor of the loft was removed to fit skylights.

5.4 Workshops of the Golden Fleece

One of the first of the much larger sheds constructed in the area was at Wooyeo. This shed was built by a specialist contractor who built many wool-sheds throughout the Riverina and so brought a body of design experience to the task. William McFadzean of Narrandera was contracted to build a new, replacement, woolshed at Wooyeo in April 1873. The original site beside the Lake was abandoned when gold was discovered there the day after work on the shed began, and the extant woolshed was built several miles to the north.

Wooyeo is a huge, T-shaped, shed of 52 stands with many carefully designed features to facilitate the smooth flow of work. There is a central board with skylights above for lighting. The roof timbers are lighter than those seen before with long beams across the central span of round timbers tied to beams supported by round uprights. The elements are repeated in a regular pattern giving a harmonious rhythm to the fifty metre length of the shed. Much of the timber is rough and adze marks are clearly visible on the cross beams.

The wool room is a spacious area set at right angles to the board giving an overall T-shaped plan which is very efficient in terms of work-flow. By placing the wool handling area in the centre, the distance for picking up the fleeces is minimized and the wool classer can supervise both ends of the board.

In the details, also, the hand of a craftsman are visible. The sheep-pens are carefully mortised as are the gates. The sliding sheep-pen gates are set on wheels in grooves and still function after a century of hard wear. Gaps are left in the cladding at the top of the walls for ventilation (Fig. WY26). On the board, near to the wool room, is a trapdoor to allow easy clearing of the floor wool to the underfloor area which is walled and floored (Fig. WY31).
Whitewash is still visible on much of the timber and is probably associated with the social life that centred on the shed. A song written in 1888 celebrates the annual ball held there:

O, who has not heard of the Wooyeo Ball,
Where the clans of the Lachlan, the great and the small,
Come bent on diversion, from far and from near,
To shake off dull care at least once a year.
The lairds of fat wethers assembled in force,
And with them their dames, as a matter of course, ...

The current condition of the woolshed is fragile. The changing patterns of land use in the area since the policy of closer settlement broke up the big leases on this side of the Lachlan and encouraged the growth of agriculture. As Freeman observed, this has left the shed stranded "amid a sea of wheat, with its ends slowly disintegrating, losing each year some fabric to the earth around it."

The end of the pastoral occupancy of the region is reflected in the changed use of this, the largest of the woolsheds which has been transformed from being an efficient wool factory for over 100,000 sheep annually to providing multiple shelter and storage uses for a small mixed farm. Only a fraction of the original building is of use to the farm and so the rest cannot be maintained and is rapidly merging back into the landscape that it helped to form (Fig. WY20).

The shed on Uabba was also built by McFadzean about a decade after Wooyeo was completed, in the early 1880's. It was a much smaller structure, 28 stands, and retained its original role as woolshed to a medium sized property until it was destroyed by fire in 1988. As a result it was carefully maintained and remained in good condition to the end.

Again the T-shape plan was used (Fig. UB12) with a spacious woolroom at right angles to the board. The cladding was weatherboard. The roof was galvanized iron with a half-hipped treatment at each end (Fig. UB14). The uprights were of whole cypress trees but the beams and rafters were of lighter sawn timber (Fig. UB20). Fine joinery was present both externally and inside the shed. Outside, the mortising and finish of the south end included underfloor fencing to enclose the storage area (Fig. UB17) with posts cut to hold the cross beams.

Unusual and useful details inside the shed included a system for raising and lowering a series of sheep-pen gates into the sweating pens using a pair of wooden counter-weights on a pulley at each end of the gate (Figs. UB26, UB27). This would have smoothed the flow of sheep through the shed.

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17 Freeman, op cit, p. 207.
The finish of the elements of the interior were of uniformly high standard, as may be seen in photographs of the carefully adzed sheep-pens and the wooden hinges of the gates to the catching pens (Figs. UB21, UB25).

The wool room, like that at Wooyeo, was lower than the board to maximize storage. A wooden loading platform stood in front of the wool room (Fig. UB14). There are no traces of lifting equipment.

The shearers’ accommodation is about 150 metres away and includes a six-roomed dormitory, a kitchen with a double oven for bread making and an ablutions block (Fig. UB19). These structures appear later than the shed and were probably frequently renewed and extended over the century of operations to conform with the rising standards set by the Industrial awards.

The final shed built by McFadzean in this area is the one still standing at Naxadhan. Built in 1888 on land selected the previous year from the old Naradhan run, itself carved out of the original Erry bendry lease, by Mr. T. Templeton, this shed has withstood the vagaries of change better than the others. Planned at the end of the wool boom for a smaller property than the extended Wooyeo lease, it has not been overtaken by change to the same degree.

Even now the property is owned by descendants of the original owner who still use the shed for shearing, although the numbers of sheep have declined with the growing importance of wheat in the district. Originally, there were stands for 28 blade shearers, but only 12 stands were connected to the new oil engine which was installed in 1903. An interesting local use of available resources was made in the 1920’s and 1930’s when the woolshed was used as a depot shed for the shearing of most sheep from the district.

The typical McFadzean T-shaped plan was used for this shed which is located near to the base of a sheltering hill (Fig. NR2). Known as “the black shed” from early days, the exterior seems to have been treated with heated tar to preserve the timber and the pleasant shading of the surface can probably be attributed to this.

A solid frame of whole cypress trees is covered with a weatherboard cladding (Fig. NR3). The roofing timbers are sawn pine with “Gospel Oak, Finest Quality” iron nailed to them (Figs. NR22, NR23). A small engine shed was added to the western side of the woolroom in the best additive tradition of the rural vernacular (Fig. NR7).

Many fine details are present in the interior woodwork which contributed to the smooth functioning of the work-flow. Raiseable pen gates with wooden counterweights allow the smooth flow of sheep (Figs. NR12, NR13). Sliding pen doors to the sweating pens (Fig. NR14) allow full use of the space.

The woolroom is 1.83 metres lower than the board which excludes sheep shelter beneath. A sketch by Freeman based on an old photograph shows that
there was once a loading platform like the one at Uabba. For wool handling
there are removeable rails on the wool bins (Fig. NR17) and trapdoors to allow
wool to fall into the bins below (Figs. NR18, NR19).

The shearers' huts, now gone, were a resource much used in the district,
for social gatherings as well as for road and railway contractors needing a place
to camp. They were also open to travellers "humping their bluey" during the
Depression of the 1930's.

Naradhan shed is located near the village of the same name which lies
about thirty kilometres from the Lachlan. The lack of a ready water supply
was no doubt a factor in the late date of construction. Conservation techniques
such as the construction of ground tanks were necessary before land so far from
the river could be used for intensive grazing.

Even further from the river but to the north, in the demanding environment
near Mt. Hope, lies Coan Downs which was taken up during the 1860's and
used as a sheep station from the start. The woolshed appears on a map dated
1874, so it is one of the earliest in the area and certainly one of the largest
having had stands for 76 blade shearers. Ten stands remain in active use. Part
of the shed was dismantled this century and about forty feet of the shed was
removed but it remains a huge space at 140 feet in length. The whole board
area is clad in drop-logs of cypress pine which were cut on the property (Fig.
CN4).

The internal timbers are also large and a strong central box spans the shearing board. Skylights admit light through the galvanized iron roof of "Gospel
Oak three crowns" sheets. The joinery lacks the professional refinements of the
McFadzean sheds but it is sturdy and serviceable and has worked for over a
century in this most demanding landscape.

The woolroom was added some time later and so converted the original
rectangular plan into a T-shaped one. This section is of a sturdy frame but is
clad in weatherboard and lower than the main shed. This, the most remote shed
of any size in the entire district, had particular need for ample wool storage.
An additional wool store once stood opposite the woolroom and was connected
to it by a light railway to ease the transfer of bales.

The last woolshed constructed during the pastoral age is the one still in
use on Booberoi. The run was purchased in 1880 and converted from a cattle
run at that time. About 50,000 sheep were kept at that time and the shed was
built for 26 blade shearers. Originally a weatherboard structure, the cladding
has been replaced with galvanized iron in recent years (Fig. BB10).

Internally, the shed is of round timber with the familiar central box structure providing strength (Fig. BB14). Stands were placed on both sides of the

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18 Freeman, op cit, p. 199.
central board and chutes returned the sheep to the counting out pens (Figs. BB15, BB16). An engine room has been added to the western side of the shed.

The wool room is located at the end of the board beyond the wool bins, so preserving the original rectangular plan of the shed. The shed is low and provides no sheep shelter underneath, so an unusual and most effective solution to the problem was found in the construction of a separate shelter shed to hold 3,000 sheep. This has been supplemented by a long connecting shed which provides additional shelter (Figs. BB11, BB12).

Taking full advantage of its location just 500 metres from the Sydney – Broken Hill railway line it has been common for sheep to be brought from associated properties by train for shearing. Transport of wool is also simplified by this location so that no large storage facility is needed. Booberoi has changed little since its construction and this is related to its continuing role as the centre of a property which has continued to have a large pastoral component to its operations. The subdivisions that took place to the south of the river in the early twentieth century did not affect this part of the study area.

5.5 Continuity of Traditional Forms

There are many architectural parallels between Hunthawang and Merri Merrigal, from the pisé houses to the swinging bridges on both, so it is not surprising to find that the woolsheds now in use on both properties strongly resemble each other. Neither woolshed is an original structure dating from last century, but both include the same elements of work areas and sheep movement as do the sheds dating from that time. It seems that little has changed in woolshed design since the form first emerged.

The site and details of the original sheds are not recorded, although there is a local tradition of the Merri Merrigal shed having been burnt for revenge by a shanty operator. No doubt a new shed was built at once to cope with the annual clip. The presence of an old steam engine beside the shed (Fig. MM14) lends weight to the theory that this is the site of the original shed. Certainly, its location near to the water supply of the Lachlan and convenient to the road would have been as compelling then as now. Moreover, the sheep-yards may have survived the fire giving a compelling economic reason to use the same site.

The shed is made of a solid frame of whole cypress with lighter cut timber for the roof (Fig. MM20) in the local tradition. It is clad in galvanized iron throughout. The wall at the back of the shearing stands is unusually high (Fig. MM18) and includes the traditional shelf. Sliding gates, another local feature, are fitted to the pens (Fig. MM19) and the wool room is lower than the board (Fig. MM20) to maximize storage as was common in the sheds of the nineteenth century.
The most individual feature of the Merri Merrigal shed is the line of windows ranging around the perimeter in groups of three (Figs. MM14, MM20) to provide generous light and ventilation. This is the only development from the first facilities built in the area, and reflects the modern concern with working conditions. The large roofed loading platform nearby is a logical extension of those seen on the McFadzean sheds of the golden age.

The Hunthawang shed is much larger (Fig. HW26) but in the same style and of wood with iron construction. It also has a series of windows, with slatted ventilators added, at the top of the wall (Figs. HW28, HW32). The attention to detail and function are the only real change (Fig. HW33). Outside, the traditional loading platform and lifting device stand in front of the low woolroom (Fig. HW31) and a raiseable ramp to load sheep on to multi-decked transports has been improvised from an old wagon wheel (Fig. HW29).

The continuity of form in both these sheds reflects the continuity of function that has marked both of these properties throughout the period of reconstruction and the growth of agriculture. The relative value of large acreages on the riverfront remain as high as when the settlers first arrived in the area.
CHAPTER 6
The Vernacular Architecture of Pastoralism 2: Homesteads

6.1 The Homestead Complex

With prosperity, the farm service buildings increased in size and became the apex and climax of Australian timber structures.

Cox, Freeland and Stacey¹

The homesteads which were built on the runs around Lake Cargelligo during the period of pastoral occupancy did not stand in isolation from the many ancillary buildings surrounding them. All of the homesteads were part of a wider homestead complex which was integrated into the work flow of a pastoral station. The annual cycle of production was centred on the group of buildings comprising the head station where activities ranging from financial planning to repairs of the harness were carried out. The homestead was an essential part of this unit.

Each station had a different range of buildings to suit its individual operations, its economic circumstances and the aspirations of the owner, but a core group of essential structures were to be found at most of them. Butlin lists the physical assets to be expected at a station in 1890 as including, beside the homestead:

(ii) Outbuildings of kitchen, store, blacksmith’s shop, shearing and woolsheds, and shearer’s huts (extras: dairy, granary, stables).²

Plant, such as wagons and tools, as well as stocks of materials for people and work were also listed, and the investment items of fencing and water conservation. Buxton observes that “in the Riverina this degree of investment had been reached thirty years earlier”.³ Based on his analysis of twenty River-

rina stations, Buxton lists the improvements on the stations in the 1850's as including the homestead and:

Outbuildings
(a) Related to accommodation:
Kitchens, cellars, men's huts, laundry, shearers' huts, store (food and clothing)
(b) Connected with the working of the station: shop, carpenter's shop, stable, cart yard, harness room, coach house, hayshed, milking yards or sheds, pigsty.4

With the exception of wool facilities on cattle properties, these improvements were needed in the isolated conditions of the Lachlan before any large scale grazing could begin, despite the usual problems relating to precarious tenure and land title which inhibited the erection of permanent structures in many parts of the colony.

All the extant homestead complexes in the study area are composites of materials, techniques, and quality of finish. All are built predominantly of timber with only three pisé homesteads and three brick homesteads showing any variety in basic materials. Traces of wooden shingle roofs survive under the ubiquitous galvanized iron but no bark remains.

For the most part, the wood used was the local white cypress pine, (Callitris glauca) sometimes referred to in the literature as “Murray pine.” Box and gum were also used where great strength and/or size were needed, for example, as uprights in woolsheds and barns and for cattle yards. The cypress gives a straight grained timber, suitable for most building purposes. There were complaints about the many knots it held but they did not affect durability. Large belts of this timber grew in the area so that tall trees and uniform sizes were to be found. The trees were a rich resource for the settlers in an area with few alternative building materials. Some areas of the Riverina were visited by contract wood cutters but no records survive of any but station labour in the early phases of settlement in the area. Most bushmen had considerable skill with the axe at that time so that the simple techniques of wood preparation and construction were freely available.

Some more exotic woods were used for internal finishing, for example, the cedar ceilings at Hunthawang, the window and fireplace at Brotheroney (Figs. BY6, BY7), and the hallway at Wooyeo (Fig. WY9). These, however, were luxuries to be found only in the established phases of the more well-endowed homesteads.

By 1860 galvanized iron was common throughout the Riverina as the transport infrastructure of roads, river-steamers and railways expanded and

4 Buxton, op cit, p. 52.
developed, especially in Victoria. However, it was still an expensive and time-consuming process to bring supplies to these isolated runs so that local wood was used for as many purposes as possible. Nevertheless, much use was made of galvanized iron on all the properties for a wide range of building types and it became the universal roofing material of the area.

The great versatility of galvanized iron also helped to compensate for the lack of other building materials in the area. Bricks, for instance, were in short supply so galvanized iron was often used to make a chimney top over a base of the rough local stone. Many humble structures scattered about the district have such an improvised chimney, especially outstation huts and shearer's quarters.

The austerity imposed by isolation is a particular feature of the buildings of the region. Little in the way of embellishment or variety is present. Even later, no sizable importation of exotic or novel materials was undertaken. Pressed metal sheeting, for example, was a suitable lining material for the area because it excluded dust very efficiently. However, it is only at Boorithumble and to a lesser extent, at Booberoi and Uabba, that it was used.

Cox referred to this spare building tradition in the harsh conditions of the Australian outback when he commented that:

The frills and embellishments of more urban structures are discarded and a bare bones architecture of stark simplicity prevails as a positive response to the demanding environment. The constraints of heat and dust and light become the major concerns of design in this landscape.  

Decoration and variety are most obvious by their absence. There is no tile, no stone flagging, no cast iron, no brick pavers or edges. No verandah has columns or even turned wood posts. None of the homesteads have a second story. Yet convenience and comfort of a high degree were achieved by these structures which frame the built environment with the simple devices of space, air-flow and insulation.

All the homesteads have a verandah. Some have enclosed part of the verandah with wire mesh to create comfortable sleep-outs for the summer, for example at Hunthawang (Fig. HW7) and Hyandra. All such comfort zones are practical, but few approach the elegance of the elevated and freestanding gauzed sleepout added to the front of Merri Merrigal which Cantlon has described as a "strangely Eastern-looking structure."  

Figures MM2 and MM4 show the sleepout in winter without its summer screen of vine.

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Hallways were used to create a breeze in most of the homesteads, while "breezeways" were made by joining different blocks with a gauzed walkway rather than enclosing the gap as at Hunthawang (Fig. HW8) and Wooyeo. Another method of climate control was the use of French windows opening onto the verandah in many of the rooms to increase air flow, as can be seen at Brotheroney (Fig. BR3), Hyandra, Uabba and Wooyeo (Fig. WY4).

Covered walkways linking various service buildings and the main residence were also constructed to provide shelter from the elements. Wooyeo had a long "gangway" with a floor of wooden boards while Hunthawang still uses a range of both straight and curved examples (Figs. HW9, HW11, HW12, HW13). Separate kitchens were also a feature of the area, often maintained to this day, as at Merri Merrigal, Hunthawang and Hyandra. This measure not only lessened the dangers of fire, but also isolated the heat of wood-burning stoves which were kept alight at all hours.

The establishment of a garden around the house area was another strategy used to mitigate the heat and dust. All the homesteads had some garden area. Exotic trees and plants were common and some, especially the hardy pepper tree, flourished. This vegetation provided a softening screen against the elements. The garden at Hunthawang is a particularly well-developed island of comfort with its large trees, green lawns and small fountain (Figs. HW2, HW4). Such gardens are only possible when a reliable supply of water is available.

Most homesteads also had vegetable gardens, often maintained by Chinese gardeners, as at Booberoi, Hunthawang, Merri Merrigal, Uabba. As Freeman commented in his study of the homesteads “no large Riverina station was without its contingent of Chinese men to tend the ornamental and vegetable gardens.” When labour became less affordable, maintenance was a problem and standards dropped. Fruit trees were also attempted on a wide scale but many perished in the periodic droughts. The grape vines so carefully tended at most homesteads were also attacked by disease. Anything left was eaten by the rabbits when they arrived.

The homesteads were the second or even third phase of building on the runs. Most were built during the 1860's and 1870's at the time of the pastoral boom. The houses themselves have have seen many phases of extension and repair, or of neglect and abandonment, depending on the individual circumstances of the station they serve. The complex of service structures surrounding them also reflects the changing fortunes of the runs. Various additions and expansions of the complex were built in response to such trends as the shift to sheep (woolsheds and stores) or the arrival of rabbits (poison sheds). All show a period of hiatus during the great drought of the 1890's and 1900's. Most later

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show repairs and re-use and have phases of expansion associated with new land use patterns (sheds for wheat growing machinery, silos).

6.2 An Environment of Timber

All the homestead complexes in the Lake Cargelligo area are built with the local cypress pine as the basic material for most structures. An interesting variation is to be found in one of the earliest surviving buildings, the horizontal drop-slab hut on Euabalong (Site Report EB1). Slab is not a common technique in the area, probably because it is much harder to work than the more common cypress. However, in the triangle between the Lachlan and Booberoi Creek where Euabalong is located, there is almost no pine. To have brought pine from the nearest source some miles away would have been more work than using the river gums at the site.

The slab hut shows a long evolution of both form and function. The original block of two rooms is of slabs dropped down between uprights with battens, secured with handmade nails, forming grooves to hold them. There was a large fireplace of irregularly fired bricks using a reddish mortar which has collapsed in a pile (Fig. EB2) leaving few clues about its construction. The hut probably served as the main dwelling on the station when it was first built.

Nearby is a block of staff housing used for both shearers and other workers as needed. Sometime this century, probably during the 1940's, this service block replaced a large homestead thought to date from the 1870's, of which all traces have been lost. Fortunately, the former owner remembers the house in detail and has described it for the record. This homestead was built of weatherboard and lined with hessian covered with lining paper and then with wallpaper. There were also two drop-log rooms. As the roads developed and the capacity to haul loads expanded, Euabalong was able to use the more convenient materials for the buildings needed at that stage. In one of the boom periods of the present century, a new homestead was built some distance away to accommodate the new pattern of land use then operating, especially wheat growing and irrigation-based grazing.

At the original complex, the sequence of building use matched the changing demands put on the facilities. When the now-lost homestead replaced the slab hut as the main dwelling on Euabalong, the hut began its next phase of use, probably as staff housing. At some stage, probably before the 1920's, an ablation block was added to the northern end to serve the workers using the nearby accommodation block.

In recent years the hut, by then known as the "cook-house" served as a kitchen, especially at shearing time. Most recently, it was used for recreational purposes by visiting fishermen and campers. The hut collapsed during the 1990
Lachlan floods after more than a century of useful life reflecting in its various phases the changing needs of the property as it evolved through the stages from initial settlement to established occupance.

Few other early structures have survived in the vicinity of the hut but a bark hut for harness and saddles is known to have stood nearby. The lost house included the typical elements considered the bare essentials for life in the district, at the time of the pastoral boom, of an office and a ballroom as well as the usual domestic and service accommodation. Its total eclipse is associated with the success of the subsequent occupance.

The neighbouring property of Booberoi is located where Booberoi Creek branches off from the Lachlan and includes areas of flat redsoil plain with mixed tree cover. It is, therefore, able to obtain supplies of cypress pine more easily, although none grow in the immediate house area. The stable is of drop-log construction with a door in the loft in the classical manner (Fig. BB6). Other drop-log buildings formed part of the complex and served the evolving demands of the station until recently. One is known as the “oil shed” and has been much reinforced with other materials.

The complex is centred on the weatherboard house which is thought to have been first built in the 1850's but much extended and enlarged since then. It is a comfortable house with a verandah and sheltering trees (Figs. BB2, BB3). It originally had a separate kitchen behind the main block but this was demolished after the modern kitchen was incorporated into the main house. The dining room has both walls and ceiling of pressed metal, a wonderfully dust-proof material for the conditions.

A large underground tank for storing water caught from the galvanized iron roof (Fig. BB4) is close to the verandah, and gives generous supplies of rain water. This method of water storage is expensive to build but very durable. Only Hyandra has a comparable facility. Part of the verandah is enclosed with gauze wire, making a sheltered and pleasant room which overlooks the cool lawns and garden. While many of the small service buildings have not survived, a meat house still stands behind the kitchen area.

Surrounding the house are the varied buildings that go to make up a station headquarters. An office, constructed of weatherboard, is close to the verandah. A cottage used as a jackaroo's quarters is set at the front while a long row of dormitory type blocks of staff housing are at the rear of the homestead (Fig. BB5).

Behind the mostly domestic and administrative blocks are the working facilities. A group of service buildings includes a stable, storage sheds, machinery sheds, an old smithy, a garage and petrol bowser, and stock yards. Booberoi is a large property so that some of its operations are decentralized to other parts of the the run, especially to the pumping station and the shearing shed where additional blocks of staff housing are located (Fig. BB13).
One of the most interesting homesteads in the district is the Wooyeo residence. Located near to the high banks of the southern side of the Lachlan, as near as was practical to the precious water supply, this recently abandoned house is a clear example of the use of local materials in a form suitable to the climatic imperatives. This is a large house built entirely of cypress drop-log construction. The even sizing of the wood and the careful finish of the elements display a quality of workmanship to match the size of the house (Fig. WY3).

Unlike most drop-log structures this is not a small cottage or service building, but a substantial homestead built to replace, or at least to supplement, an existing shelter. It is even larger than the Willanthry store building which served many functions including that of an inn beside the ford of the Lachlan about fifty kilometres downstream. Freeman commented that Willanthry “is perhaps the best extant example of drop-log building technique in the Riverina.”

The date of Willanthry is more explicit than most in the area as construction in the early 1860’s seems likely as a Reserve on Willanthry run was taken up in 1862 and a post office and store opened that year. The precision of the adze work at Willanthry is comparable to that at Whoey. The Sydney Morning Herald records an unusual recycling operation which has seen part of this structure moved to the Yarramalong Valley and reconstructed on a small farm during the 1990’s.

At the Wooyeo complex, the oldest block is thought by the owner of the farm on which the complex now stands to date from 1843, the time of first settlement in the district following Mitchell’s expedition in 1836. It is a typical small cottage that has undergone many changes of role and layout. The roof is now galvanized iron over a shingle base and the walls are of drop-log. It served as a kitchen, a staff dining room, and held a laundry and separator area as well as the office (Fig. WY14). The chimney is enclosed in a water heating tank built of galvanized iron (Fig. WY15). Vegetation is now heavily encroaching on three sides and the fabric is deteriorating. It was connected to the homestead by a covered wooden “gangway” with wooden flooring. Nearby are the much overgrown remains of a sunken dairy, another necessity in the climate.

The main drop-log homestead is thought to have been built in 1860 and its atmosphere of rugged comfort is consistent with this date. The 1860’s were the peak period for homestead construction in the Riverina as profits flowed as a result of the beef sales to the gold rush areas. It was also the last opportunity for the settlers to establish some comfort before the new demands for investment in fencing and water conservation redirected funds.

The front verandah, now screened, has its ceiling lined with sawn boards and battens (Fig. WY5). French windows open onto the verandah from the bedrooms, a popular local device to promote air circulation. Each bedroom

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8 Freeman, op cit, p. 137.
has a ceiling of polished wood with battens (Fig. WY10) and a floor of six inch wide (15 cm.) boards. The drop-log walls are covered with hessian and a thin plaster. A hole in the ceiling of the fourth bedroom shows the original roof of round timbers and shingle. Polished wood is also used extensively in the entrance hall (Fig. WY9) and the lounge room.

As well as four large bedrooms, a dining room and a spacious lounge, Wooyeo has a pleasant screened and latticed verandah (Figs. WY6, WY7). Parts of the originally open verandah have been enclosed to provide several bathrooms and also a teacher’s room and a sewing room. The date of these changes is not clear but the simple finish suggests an early date.

A collection of service buildings nearby include a sawn timber cottage used as the store-keeper’s cottage and office, although the store itself is lost. The former stable is used as a woolshed for the farm on which it is now located. These buildings both have the same unusual roof with a half-hipped gable and an octagonal ventilator of the type that is used on the homestead (Fig WY17). Water storage tanks are scattered about the complex. On the riverbank nearby there is a tank stand and the remains of a wooden windmill-base which provided a reliable water supply to the house in all but the most severe droughts.

While no formal pattern can be found in the arrangement of structures at Wooyeo, it is clear that buildings supporting household activities, such as the dairy, and those providing staff accommodation were located closest to the house. Structures relating more to station activities, such as the stable and poison hut, were located outside this immediate circle, with some of the now uncontrolled exotic vegetation as a buffer against the dust.

Few extensions were made to the basic core of the house that served from the 1860’s until the 1970’s. When built, the homestead was designed to serve a large and isolated pastoral lease. Following Closer Settlement schemes at the end of the First World War, it found itself on a much smaller mixed farm. As it remained in the hands of resident owners, it survived as the centre of a new occupancy of agriculture. The service complex shows much repair and recycling of the buildings to accommodate the later practices.

The drop-log poison hut (Fig. WY18) is very like the one located at Boorithumble (Fig. BL7) which is also built of drop-log with a shingle roof on round framework and not changed since it was built to deal with the rabbit plague of the 1880’s.

At Boorithumble only a few vestiges remain of the early pastoral occupancy. Taken up in 1882 from the original Errybendry run, this was always a moderately sized property, running 15,000 sheep in its first year (Site Report BL1). It never operated on the scale of the earlier leases, but its isolation on the Booberoi Creek imposed the same need for self-sufficiency as elsewhere. The property remained in the hands of the same family for almost a century.
The homestead was recently abandoned for a modern house on the property so it, also, is now at risk. Built in 1914, this structure belongs to the period of reconstruction following the great drought. It has changed little since it was built and does not have the usual accretion of extensions and connections, in some contrast with the earlier homesteads. Typically for the area, it is constructed of weatherboards on a sawn frame with a galvanized iron roof, but has an unusually detailed finish with curved barge boards and a bull-nosed verandah (Figs. BY2, BY3). Internally, it is lined in a rich array of pressed metal (Fig. BY5) with a riot of different patterns covering the walls and ceilings including the kitchen. Coloured glass panels, ornate fireplaces and wooden panels are also present. This is a break with the austere tradition of the early structures and must reflect its date of construction as well as the tastes of its owners.

Continuities with earlier practice in the area are also present in the use of cypress pine for the cladding, the galvanized iron roof and the extensive verandahs. Water storage was also on a large scale and food stocks were housed in the pantry area. The homestead is located on the northern bank of Booberoi Creek where it is above the level of the periodic flooding of the area.

Beside the poison shed, only a fragile stable remains in the vicinity. The old shearing shed is some distance away and much stock activity is located there. Probably some clearing took place when this homestead was erected in 1914 and superfluous structures were removed.

A few hundred metres to the east, on the other side of the creek are the remains of the original Erryndry homestead. In a grove of exotic trees including mulberries, are a few wooden footings which is all that remain of the old wooden house. A series of severe and long lasting floods have inundated the southern side of the creek in modern times leaving a deposit of silt which obscures any trace of outbuildings. Documentary sources, especially the Budd Journal, suggest that this was an early cattle station passing through many hands before becoming an ancillary station to Booberoi. In these circumstances, few survivals could be expected. Nevertheless, the stream-front location, the use of wood and the exotic trees place it firmly in the local tradition.

6.3 The Pisé Experiment

The use of pisé for the homesteads at Uabba, Merri Merrigal and Hunthawang introduced a new element into the architecture of the region. For

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the first time, a substantial building was constructed of a material other than timber. Moreover, these buildings were planned. No longer were the settlers content with a simple wooden structure which could be extended as life demanded, but a phase had been reached in the settlement process where a solid, even imposing, home was desirable.

Lewis has made a study of the origins and sequence of pisé in Australia and notes that the first reference to its use is a report in the Hobart Town Gazette in 1823 on a house at Coal River. This house presents some difficulties as does another oblique reference to a Macquarie Plains house also in 1823. However, Lewis records that “there is no element of doubt about Richard Willis’s property” north of Campbell Town, in Tasmania, where Land Commissioners inspected a pisé house under construction in 1827.11

Other pisé houses are known in Tasmania, South Australia and in New South Wales but Freeman has noted that “it was in the Riverina in the late 1860’s and 1870’s that pisé established itself as a vernacular building technique.”12 He cites several stations where pisé was used for a range of buildings in the station complex as well as Cunningham Plains station where pisé was used to build the “homestead, various outbuildings, and miles of fencing.”13

The pisé homesteads in the study area do not use the material in this way. Here, only the homestead itself is in the new material with the surrounding complex maintaining the traditional use of wood. Therefore, it seems clear that the appearance of pisé does not signal the adoption of the technique by the local workmen but that one skilled contractor was operating in the area.

This is supported by the great stylistic similarities between the homesteads. The original plan of Uabba is unclear because later alterations have added a complex overlay of surfaces. Moreover, problems of access prevented a full study of the interior, but in broad outline it seems to have consisted of a central block covered by a hipped roof (Fig. UB3) and surrounded by a verandah. A separate kitchen block stood at the rear of the main block where later additions now obscure the original details of construction. The house faces the Lachlan. This is very like the scheme adopted at the other pisé houses although there are also differences, especially in the later development of the house.

Both Merri Merrigal and Hunthawang are symmetrical homesteads presenting a calm and ordered facade to the world (Fig. HW2 and Figs. MM2, MM3). Cantlon observed that “the similarity between the two is even greater as the plan of the latter before alteration, seems simply to have been the reverse of Hunthawang.”14 Both of these homesteads are built on the banks of

12 Freeman, op cit, p. 80.
13 Freeman, op cit, p. 80.
14 Cantlon, op cit, p. 138.
the Lachlan facing away from the river and Cantlon is convinced that "it would appear that Hunthawang and Merri Merrigal are both by the same designer and/or builder."  

John Brewer came to Merri Merrigal in 1872 from South Australia. Lewis has pointed out that pisé was used in South Australia more than in Victoria. Perhaps Brewer imported the technique with him, or was at least familiar with it. It is known that Brewer and his wife had a family of eleven children while they were at Merri Merrigal, so the standard and size of the accommodation are a reflection of the changing needs of the time.

Of the three homesteads, Uabba has changed most. As well as the pisé block, which is mainly living and dining space, there is a larger brick wing in an unusual style using arches at the doorways and used mainly for bedrooms. The brick block is integrated into the fabric of the house in a roughly L-shaped plan. There was a tendency in the earliest structures to build parallel blocks and link them as needed with a verandah. Such a scheme is used at Hunthawang and Merri Merrigal, at Wooyeo and to some extent at Booberoi. The scheme here suggests that the brick block was added some years after the completion of the pisé block, perhaps when it was taken over by a bank. Above the twelve-pane windows are cracks suggesting that they were once French windows. Italian style shutters that open at the lower half, and fittings for gas lights are added refinements. A rich and varied social life is reported to have taken place at Uabba early this century (see Site Report UB1) and the size of the house would have allowed this. Following the drought, Uabba was run for a series of banks and companies by managers, some for long periods. The piecemeal approach to the buildings is consistent with this history.

The original separate kitchen was demolished in the 1950's when Uabba was in the hands of a finance company. Other support structures including an office, a store and a dormitory have been lost more recently. The homestead now stands in self-sufficient isolation as most domestic functions have been taken into the main structure which underwent another wave of major modification during the 1980's.

Only a few of the work structures from the old complex have survived. They include a poison hut, part of a smithy and a stable. The latter building is of drop-log construction in a sturdy and early style with large round timbers in the roof (Fig. UB10) and a ceiling of sawn timber forming the floor of the hay storage loft. A wooden trough and manger survive (Fig. UB11). Adjoining is a long buggy room (Fig. UB7). Just one weatherboard cottage used for staff housing remains from the accommodation formerly maintained (Fig. UB6). All of these ancillary buildings are of wood as elsewhere in the district. Modern machinery sheds have been added to the complex.

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15 Cantlon, op cit, p. 139.
16 Lewis, op cit, p. 58.
A fine woolshed built by the well-known Riverina contractor, William McFadzean, stood at a considerable distance from the homestead. Much stock activity was centered on this structure and its associated housing. The woolshed was burnt and destroyed in 1988.

A complete change of emphasis is evident at the complex on Merri Merrigal. This property has remained in family hands and much more of its original fabric is still intact. The symmetrical facade looks onto a garden of lawns and exotics with a lined verandah running across its length (Fig. MM5). In front of the house is the elevated gauzed sleepout (Figs. MM2, MM4) which gives the house a distinctive atmosphere of restrained comfort. The main, pisé block is of four rooms finished inside with a fine plaster. Coved ceilings and delicate fireplaces (Figs. MM6, MM7) complete the appointments. Outside the pisé is protected by a smooth rendered surface and its condition is well preserved.

Another pisé wing of three rooms, now used as guest bedrooms, is joined to the main block by a verandah enclosed with gauze. The typical bush device of connecting verandahs provide cooling air currents as well as extra space. Yet another verandah joins the main block to the kitchen of vertical slabs which has been maintained and updated. Painted white, air-conditioned and fitted with modern appliances this room is the latest phase of a structure which has remained in use since the earliest occupation of the lease.

Behind the house a variety of domestic service buildings, including a meat house, a cellar/dairy and several store rooms, are scattered without any particular order towards the nearby river bank. Water storage tanks are also dotted about the perimeter of the homestead.

The buildings relating to the working aspects of the station form a rough line running to the east, beginning with the drop-log structure used as an office (Figs. MM12, MM13) which is thought to be the second phase of accommodation on the run. It is precisely adzed, as are the structures at Whoey and Willanthry, with a carefully fitted window. The front is protected by a verandah in typical cottage style and is well-preserved but the exposed back wall is deteriorating (Fig. MM9). Adjoining is a two room drop-log building (Figs. MM10, MM11) used as a store-room.

A weatherboard cottage with a verandah is next in line. It was used as staff housing and also as a schoolroom when the remoteness of the station necessitated a school for the children of the staff. One teacher taught children of all ages in the one small room.

Especially evocative of the early life of an isolated pastoral station is the station shop. It is a small room of weatherboards with a counter and shelving. Here were stored and sold the goods needed by the residents of what was in effect a small village. The station bookeeper worked here and also ran the retail operation.
Another row of stable and related structures stand to the north-east. Small rooms for harness are of weatherboard, while the stable itself includes a pisé dividing wall and has a floor of wooden blocks forming cobbles. Similar floors are to be seen at Hyandra, Hunthawang and Boorithumble. The use of pisé in the stable is the only case of a material other than wood, or the ubiquitous galvanized iron, being used for a service building that was found in the entire survey.

Horse and cattle yards complete a particularly varied complex of pastoral structures. The woolshed is located some miles from the homestead and forms an autonomous work unit.

Merri Merrigal did not suffer so badly as some other stations in the drought of the 1890’s because of its position as home station of a group of grazing properties and the management policy of moving stock between them as needed. The station was never abandoned and always kept in the one family from this time. After the hiatus of the drought years and the introduction of measures such as wheat growing and irrigation the station complex resumed its slow unfolding.

Finally, the Hunthawang complex which is the most developed and best preserved of any in the study area. Always a large station, Hunthawang must always have had a full range of service buildings in its main complex. The station has been owned by companies since it was taken over by the AML&F Co. during the great drought. The preservation of a high proportion of the station complex structures reflects the professional management of the station over time and the continued success of the operation. Many modern structures, huge steel machinery sheds and storage sheds, have been added to the complex. Most have been grouped on one side and do not intrude on the unity of the old section. Most of the old building remain in use and so they are well maintained. Unlike the random or natural finishes common at most of the other stations, all the Hunthawang buildings are painted cream with a green roof. This removes the rugged aspect so familiar in the area and it gives a pleasant and unified atmosphere to the village of diverse structures.

The use of pisé has been confined to the main block of the homestead which, like Merri Merrigal, has a symmetrical and formal facade facing south (Fig. HW2) away from the river. The house is low and the lined verandah which extends across the front has a cement border to minimize weathering. The verandah posts are set on small cement bases for the same reason (Figs. HW2, HW5) The surface of the pisé is well covered by rendering and remains in perfect condition.

Internally, the space has been divided in a mirror-image of the plan at Merri Merrigal but the surfaces are rather different. On the western side, the formal living room opens onto the large dining room. Both have coved cedar ceilings and plaster walls. The fireplaces are of brick. A small kitchen/pantry
has been made by enclosing part of the verandah but otherwise the pisé block remains in original condition.

The house is surrounded by lawns and gardens with many exotic trees and a small fountain. The eucalypts on the river bank behind also provide shelter and screening.

The pisé block is joined by a breezeway to a weatherboard wing of guest accommodation (Figs. HW6, HW7). Hunthawang was the scene of much social activity, including an annual ball, so space was needed. At Merri Merrigal, a similar block is made of pisé, probably reflecting a more central role in the life of the homestead, most likely as family accommodation.

Parallel to the main block is the separate kitchen, a weatherboard building with a verandah. It is joined to the house by a covered walkway (Figs. HW9, HW10) and to the mess room at the rear by another, longer and curved (Figs. HW11, HW12, HW13). Staff accommodation and domestic service rooms abound behind the house and include an electricity plant, a boiler room, and a gauzed meat house with mouse baffles (Fig. HW14).

The weatherboard cottage used as an office and jackaroo’s quarters (Fig. HW15) was probably a phase of the homestead before the construction of the pisé block.

Outside the homestead area, a line of service buildings stretch along the bank of the Lachlan. Most are of early construction and cater to the diverse functions of the headquarters of a large pastoral enterprise. Some, such as the station shop, have been lost. Many have changed their role over time. One such is the drop-log building now known as a bulk store but certainly the barn referred to by Cantlon. It has a floor of uncut cypress logs like that in the Hyandra stable (Figs. HW16, HW17).

The old coach house (Fig. HW18) now houses cars and farm machinery but the stable and buggy room (Fig. HW19) remain unchanged. A cottage used for staff accommodation ends the line (Figs. HW20, HW21) at the point where the river bank curves to the south. In response, the line of the structures then changes also. To the south is the old smithy, of galvanized iron with lattice doors and station-made shutters (Fig. HW22). Bellows, tools and a work bench remain in situ (Figs. HW23, HW24, HW25).

Late in the drought, in 1904, Hunthawang was so badly affected that it closed down its operations and left only a caretaker, with no sheep at all, until conditions improved. With the end of the drought and the introduction of modified stocking policies, it was brought back into production. The old buildings were preserved and later new ones were added to cover the emerging needs of a modified technology. These included sheds for farm machinery and

17 Cantlon, op cit, p. 139.
irrigation equipment. The village that is formed by the group of structures at Hunthawang includes many such recently built service buildings and facilities. With modern transport, the isolation is much less than in the heyday of pastoralism but the working complex continues to grow to suit the needs of the station.

As at Merri Merrigal, the woolshed is at a distance from the homestead area. Here, it is over one kilometre away on the northern side of the Lachlan and is reached by crossing the station suspension bridge over the river (Fig. HW35). The bridge on Hunthawang is a small one for stock or light vehicles that does not compare in size or sophistication with the one on Merri Merrigal (Figs. MM24-MM29). This, the latest of a series of bridges at Merri Merrigal, is an interesting technical innovation with a horizontal auger built into the guardrail to transfer grain produced on one side of the Lachlan to storage and/or transport on the other side without the long road journey to a public bridge.

6.4 Solid Brick Taken Up

In his study of rural homesteads, Freeman has noted that “the rural settlements tended to inherit the building methods of the urban areas; the use of bricks, stone, timber and later iron was developed and perfected in the towns and cities and was then taken up in the country.” 18 No settler started with a brick dwelling. The first shelter was usually built of the local wood of which all bushmen of the time had much experience. As time went on, however, there was a tendency for station owners to build larger and more permanent homesteads. Brick has the obvious advantage of insulating against both the winds of winter and the heat of summer. It was also seen as less trouble than pisé.

Bricks were made in the Riverina from at least 1848 onwards but they were mostly used for town buildings in such centres as Wagga Wagga and Albury. It was not until the transport networks developed and bagged lime could be readily obtained that it was practical to build in brick on any scale. Freeman has written about the scarcity of lime in the area and found that “by the mid-1880’s bagged lime was being supplied to Riverina builders from Sydney and Melbourne.” 19 However, this was too late for most stations as the wave of homestead building in the Lake Cargelligo area occurred during the 1860’s and 1870’s. The trends towards more secure tenure of the land encouraged the graziers to erect improvements of all kinds and the growing family presence ensured larger and more comfortable housing. The pisé homesteads in the area were the local expression of these trends in the 1860’s. However, they were built by a mobile contractor and did not start a local tradition of pisé construction.

18 Freeman, op cit, p. 80.
19 Freeman, op cit, p. 78.
During the 1870's the material adopted for new homesteads was brick. In the study area there are three such structures, Brotheroney, Hyandra and part of North Whoey. The bricks were made locally but the source of the lime was not recorded. As the building was undertaken by a contractor from outside the immediate area, it seems that supplies were included. No records survive of the contracts involved, but Freeman has reported that most such contracts counted the bricks as they came out of the kiln and that the station supplied the haulage and firewood.20

It is a lengthy process to build a brick house, especially in the isolated conditions of the Lachlan. The making of the bricks is a skilled task that takes more time and resources than was available in previous decades. Hauling wood and then bricks is also slow. Moreover, the construction requires specialist bricklayers, not station staff released from normal duties. It is not surprising that only a few graziers were in a position to undertake such a project.

The brick homestead at Hyandra was built early in the 1870's, possibly started in 1871 and certainly finished by 1875 (Site Report HY1). It was the second homestead on the run, an earlier wooden structure having been located near to the Lachlan in an area subject to flooding. During such a flood the occupants retreated to the sandhill on which the house now stands. The hill has always remained above water level, and so the complex was relocated there. Beside the brick block, there is a long wooden building which includes the kitchen and store rooms and was never a living area (Fig HY9). There was also another, vertical slab, structure (Fig. HY10) that probably served as the main accommodation when it was first built and until the completion of the brick block. It was later used as staff housing until its demolition in the 1940's.

The brick block is a large and formal house with bedrooms at the front, opening onto the wide verandah through French windows Fig. HY4). There is a large ballroom to accommodate social life as well as family living, and a tradition of balls and tennis parties is remembered here. The walls, of colonial bond (Fig. HY5), are thick and provided insulation against the heat. The high ceilings are of painted pine boards. The roof is also high and bulky, set at a steep pitch, probably for heat control (Fig. HY3). As it is a hipped roof there are no ventilators to cool the roof space, such as those fitted to the gable ends at Booberoai and Whoey. Bearers for the floors are set on wooden posts and abut the brick walls, allowing gaps. The verandah is wide, producing a heavily shaded zone in strong contrast to the exterior (Fig. HY5). Delicate ventilators are set along the verandah at floor level (Fig. HY6).

Hyandra was an early station but had many leasees during the swiftly evolving conditions of the 1850 to 1900 period. The original house near to a crossing of the river is known to have been run as a tavern for part of its life, but there is no trace of any such activity at the sandhill complex, suggesting

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20 Freeman, op cit, p. 78.
a change of economic circumstances. The brisk market for beef created by the
gold rush in Victoria had removed the need for non-pastoral supplements. In
his Journal about the area, William Budd has reported that "a Mr. Bagot was
the first Victorian buyer who came to the Lachlan."\(^{21}\) This must have been
a lucrative trade because "after a few visits of fat cattle buying Mr. Bagot
bought stations on the Lachlan, including Errybendrie ... he also purchased
Hyandra from the original owner. Uabba was bought by him from the first
leaseholder."\(^{22}\) It can hardly have been expected that Bagot would have built
a house on the run, and there is no record that he did so. It passed to Budd
and then to Bowler who made the bold economic gesture of building the large
brick house before selling, by legend, bankrupt as a result.

The house is plain, without the embellishments and decoration common
on brick houses in more urban areas at this time. The bricks are close in colour
to that of the landscape, so, despite its bulk, the house merges into the hill.
In plan, Hyandra is very like the earlier wooden houses in the area with a
central hallway, a wooden but unlined verandah and a separate kitchen and
service buildings. It also includes an office. The house has not been extended
and retains its original plan. During the drought of the 1890's and 1900's the
run changed hands again before stabilizing under the provisions of the Western
Lands Act of 1901.

Only the main block of the homestead is of brick, all the other structures
in the surrounding complex are of wood. It seems that they were little changed
by the construction of the new block and only joined to it by a breezeway in
the 1940's. The sand makes any garden very marginal, but cedars, pepper trees
and bitter aloes have been established.

Outside the house yard, the service complex stretches north-west towards
Booberoi Creek. A wooden jackaroo's hut is beside the fence and the stable
cum shearing shed is opposite, much nearer to the homestead than elsewhere.
Hyandra has a long tradition of cattle production and wool did not become
important to this station until relatively late, after the wool boom of the 1870's,
so it does not have a large shed from that time. A smithy has been replaced
by petrol engines and various sheds added to this area and stock yards adjoin.
Modern machinery sheds, hay sheds, silos and new shearing shed are nearby
and show the growing importance of agriculture to the station. Large irrigation
paddocks are nearby, towards the Lachlan, and cleared areas for dry-land wheat
growing are to the north.

The homestead at Brotheroney, to the east, was built by the same contrac­
tor. It has been abandoned for some years and has lost most of its verandah,
but shows the same general plan as Hyandra except that it is truncated at one
end with two rooms less (Fig. BY2). The roof is also high and hipped. The

\(^{21}\) Budd, op cit, p. 32(1).
\(^{22}\) Budd, op cit, p. 32(2).
locally made bricks are laid in English bond with a band of colonial bond at the top and bottom of the walls (Fig. BY9). There are mouldings in the shape of eyebrows over the doors and windows (Fig. BY8) and the windows are of the same twelve pane type as at Hyandra (Fig. HY7). Inside, the walls are plastered and stained wood is used for window frames and fireplaces. At Hyandra, wallpaper and paint cover these areas.

Behind the house is a separate brick kitchen block (Figs. BY10, BY11) with shingles visible under the iron roof. A large freestanding bread oven dominates the room (Figs. BY12, BY13). The only other structure from the associated complex that still remains is the wooden base of an early windmill (Fig. BY14). This property has changed its role and been subdivided so that a different range of farm buildings is used now and the originals have vanished leaving only the core of the brick house to attest the earlier large scale pastoral phase of land-use.

The only other brick structure in the area dating from before 1900 is a single large room at the North Whoey homestead. While this station has been in the hands of the same family for over a century, there have been periods when it was run by a manager, so the house exhibits strong phases of growth followed by stasis. Most recently used for staff housing in the 1940’s, the complex has long been out of use and is in a fragile condition. There is much damage including the partial destruction of the front brick wall, possibly to remove the window or to salvage the bricks for re-use elsewhere (Fig. NW3). The room was used as a sitting room and is integrated into the house by a verandah which joins it to the timber section alongside and links both to the galvanized iron billiard room at the other end. The rest of the complex is built of wood and is in the best additive and improvised tradition of the bush. There was a long tradition of hospitality, especially for travellers, at North Whoey, and the organic growth of the homestead reflects the changing needs over time.

The complex included a stable, a smithy, staff housing, dairy, workshop, store rooms and a range of sheds and lean-to’s in close proximity to the house. All are of wood, mostly sawn pine boards.

This original North Whoey homestead is built on a hill near to Booberoi Creek rather than near the Lachlan where the current complex is located. Flooding may have been a factor in its siting opposite the old, now lost, woolshed and shearer’s huts across the creek. However, there was also pressure from selectors who were active along the river. Little trace now remains of these selections except for the names of various paddocks and features. In this harsh environment, the small acreages selected were not viable. Following the drought this station was primarily a grazing one under the stocking conditions established by the Western Lands Act and the land has gradually recovered. In recent years, extensive irrigation and clearing are again changing the landscape (Figs. LS12 and LS18), and many new structures to support these activities have been built.
6.5 The Tradition of Isolation

The brick homesteads, like the pisé structures before them, did not lead to a change in the tradition of timber as the mainstay of building in the Lake Cargelligo area. Wood remained the central material with galvanized iron imported for roofs and many service structures. Heat, dust and distance still dominate the buildings of the area.

With the end of the pastoral phase of land-use at the turn of the century and the growth of agriculture on smaller areas of land, the needs of the settlers for farm complexes were on a much smaller scale than those of the nineteenth century pioneering stations. However, the constraints of a harsh and unpredictable climate remained the same. The isolation, although lessened by the arrival of the railway in 1917, remained a powerful force in limiting the range and quantity of outside materials and techniques.

Cypress pine was plentiful and saw mills were located in Lake Cargelligo, Euabalong, Condobolin and Hillston from the 1890’s. Large quantities of pine were cut by contractors, milled and sent out of the area as well as providing an ample supply for local needs. As these standardized materials of sawn boards and galvanized iron became the norm, there was less experimentation and improvisation in the structures, less use of drop-log and rough stone.

The tradition of plain, austere buildings without unnecessary embellishment or decoration was continued in the farmhouses of the post-World War 1 settlers. Like their more experimental predecessors, they were direct and honest structures of local materials sheltered by a plain verandah and soon part of the landscape.
CHAPTER 7
The Catastrophe of the 1890’s

7.1 A Mature Industry

The 1890’s opened with a note of optimism. Despite the problems arising from the shearing dispute, progress continued to be made in the frozen meat industry. The Australasian Pastoralists Review reported that “From all sides, come reports of an excellent pastoral season. There have been no bush fires, and pasturage has been luxuriant.”

A new level of professionalism was struck with the opening of a dedicated educational institution, the Hawkesbury Agricultural College at Richmond, in 1891. The Australian marked the centenary of the event with an article including the details that the college was allotted 3490 acres of land when it opened with 26 students in two residential houses.

The wool trade was reported by The Australasian Pastoralists Review to be on the whole satisfactory with Europe and the U.S.A. purchasing Australian wool in addition to the traditional British buyers. The import of stud and exotic stock continued, with German merinos, Devon cattle and American sheep passing through quarantine.

Infrastructure had developed to a stage where a growing network of railways shortened the time the wool spent in transit to the city where it was awaited by a network of warehouses and woolstores, recently documented by Balint, Howells and Smyth. A number of specialized support trades, such as drovers, carriers and scourers, had emerged and a varied and complex marketing network allowed growers to sell their clip either locally or on consignment. Finance was also more flexible as specialist firms such as Elder, Smith & Co., Dalgety, and Goldsborough Mort grew to the point where they added the sale and finance of properties to their brokerage activities. Banks also entered the area with the Colonial Bank of Australasia undertaking wool consignment in 1868 and the Bank of New South Wales soon following.

During the 1880’s the local sales network had greatly matured with the establishment of local branches of foreign dealers and manufacturers culminating

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1 The Australasian Pastoralists Review, April 15, 1891.
3 The Australasian Pastoralists Review, May 15, 1891.
in the establishment of local sales facilities by the wool and finance houses such as Dalgety's (1887) and Union Mortgage & Agency Co. (1888). The period has been described by Barnard in his study of the Australian wool market.\(^5\)

The growing sophistication of the industry is also reflected in the emergence of various local organizations especially the formation of the Australian Shearers Union in 1886 and various graziers groups, some in direct response to the shearers organization, during the 1890's. These not only provided a forum for expressing opinion but published much technical and marketing information in such journals as *The Australasian Pastoralists Review*.

Enmeshed from the beginning in the world system of market capitalism, Australian pastoralism was set up as an export industry employing a small labour force and using a battery of exploitative techniques such as indiscriminate clearing, enclosure and water conservation measures to cope with the small population in a vast landscape. There were no precedents to guide the settlers so they were in effect conducting a huge experiment in land use. This pushed the system to its limits and the events of the 1890's were the result of these policies reaching the limit of application at the same time as the climatic variation swung to its extreme.

Throughout the 1880's a series of technological advances had been widely adopted in the grazing industry. Fencing had subdivided the runs and the arrival of barbed wire had made the control of cattle more practical. Agricultural machinery was of increasing sophistication and power. For example, steel shares replaced cast-iron ploughs in 1888. In the Lake Cargelligo area the increasing use of steam engines for shearing required a supply of wood to fuel them causing further loss of tree cover near the shearing sheds.

The organizational success of the pastoral industry had been remarkable. As Geoffrey Bolton noted "At the beginning of 1788 no hoof had ever been imprinted on Australian soil ... By 1890 there were over a hundred million sheep and nearly eight million cattle pastured in every part of the country."\(^6\) In 1890 sixteen million of those sheep were on the fragile lands of the Western Division. So while the colony as a whole had experienced about one hundred years of grazing the Lake Cargelligo area had only felt this influence for about fifty years.

After only fifty years of settlement the strain of the new system had wrought irreversible change on the landscape. In particular, the tall perennial grasses and edible shrubs were under great stress. Graziers did not seem to realize that these resources were not readily renewable but fragile perennials

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and that their stocking policies were consuming the very capital on which the industry was based. Probably they did not immediately notice these emerging trends because of the scale of the stations.

Life on the properties near Lake Cargelligo had become more comfortable. The early shelters had been exchanged for more spacious and diverse buildings. Homesteads were larger, of more substantial materials and of growing complexity as, for example, the brick structure on Hyandra, the separate sleepout at Merri Merrigal and the schoolroom at Wooyoe. Anecdotal reports of established gardens, as at Hyandra, and a vigorous social life, as at Wooyeo, can be seen to reflect the growing role of women in an environment that had grown beyond the first harsh stage of settlement.\(^7\)

The surrounding service structures were also more numerous and more specialized with a proliferation of smithies, dairies, offices, barns, stables and storage sheds on all the leases.

Most noticeable of all were the woolsheds. Large simple structures of local materials they were the activity centre of the sheep runs during the crucial shearing season when the results of the year's work came into the system of wool classification and distribution. Because of their bulk and also the bustle surrounding their annual operation, they were a prominent feature of the landscape. By the 1890's steam engines were used to power the shearing so a new layer of technology surrounded their operation and brought a range of extensions to the sheds and a group of experts to run them.

7.2 The Drought of the Nineties

*The very dust is turning into rabbits.*\(^8\)

Stable as it seemed on the surface, however, the pastoral system was in a very vulnerable state. In the fragile region of the Lachlan, this was soon to be demonstrated.

The mode of resource utilization evolved by the graziers was based neither on a tradition resulting from long term trial and error, nor on a management plan based on scientific observation of the resources and climate. Instead, it was simply an experiment in stretching the parameters of tolerance in the ecological system. The response to the buoyant conditions of the late 1880's was to increase stocking rates to the maximum. This strategy carried grave risks.


Wadham and Wood point out in their study of land use that "Nowhere in the world is there such a huge area of pastoral land of such erratic rainfall as this pastoral country of Australia."\(^9\) Moreover, the rabbits had arrived.

At Lake Cargelligo the year 1888 had been very dry with only 906 points of rain registered. Following, however, were three good years, 1889 having 2475 points, 1890 having 2405 points and 1891 with 2416 points, as recorded in the rainfall charts for the town, Fig. A19. This was an encouragement to maintain high stocking rates. Not everyone was unaware of the dangers. *The Australasian Pastoralists Review* included an article regarding the overproduction of sheep which warned "that New South Wales is at the present time fully stocked up for a good season, and that were we to experience a dry season that colony would be greatly overstocked."\(^10\) This theme was a constant one in the following issues and various solutions were suggested, most commonly the development of the frozen mutton export trade. It is clear that a pattern of heavy stocking had been well and truly established.

Problems on the runs in the Lake Cargelligo area had already reached the point where official assistance was sought and gained. In the regular column, Review of Pastoral Situation, of *The Australasian Pastoralists Review* is a list of properties seeking a variation in rents as recommended by the Hillston Land Board "in consequence of the ravages of the rabbits."\(^11\) The reductions recommended were substantial:

<table>
<thead>
<tr>
<th>Property</th>
<th>Lease</th>
<th>Resumed</th>
<th>Rec. Lease</th>
<th>Rec. Resumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunthawang</td>
<td>1 1/4 d.</td>
<td>1 d.</td>
<td>0 1/2 d.</td>
<td>2 d.</td>
</tr>
<tr>
<td>Merrigal</td>
<td>1 1/2 d.</td>
<td>1 d.</td>
<td>1/2 d.</td>
<td>5/10 d.</td>
</tr>
<tr>
<td>Naradhan</td>
<td>1 1/2 d.</td>
<td>1 d.</td>
<td>1/2 d.</td>
<td></td>
</tr>
<tr>
<td>Willandra</td>
<td>2 d.</td>
<td>1 1/10 d.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euabalong</td>
<td>1 1/4 d.</td>
<td>1 d.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boorithumble</td>
<td>1 d.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Booberoi</td>
<td>1 1/2 d.</td>
<td>8/10 d.</td>
<td>3/10 d.</td>
<td>1/3 d.</td>
</tr>
<tr>
<td>Uabba</td>
<td>1 3/5 d.</td>
<td>9/10 d.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Like most other rural newspapers and journals at this time, *The Australasian Pastoralists Review* included many articles discussing the rabbit problem and carried many advertisements for products to combat them. Some such proposals were on a scale to reflect the seriousness of the perceived threat, for example, "It is suggested that a barrier fence be erected from the Lachlan River at Lake Cudgellico, thence along the land districts of Hillston and Narrandera

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\(^10\) *The Australasian Pastoralists Review*, November 16, 1891.

... in all about 150 miles." The area was particularly heavily infested, and the same article reports that "One holding in the Hillston district sent to market 700,000 skins during the past six months of the present year."

Included in a long article in *The Australasian Pastoralists Review* are reports of devastation from the areas involved such as one stating "the rabbits are increasing daily and spreading alarmingly. For miles and miles the country is bare of feed, and as unsmilimg as a desert, and runs that a couple of years ago carried 30,000 and 40,000 sheep are either without stock or have so few on that it hardly pays to give the Government the appraised rental."

This was a time of troubles on many fronts with a series of labour disputes and strikes as well as a succession of bank failures. Many properties run by families and individuals were taken over by banks and companies during this crisis. One of the fortunate aspects of the company takeovers was, from the viewpoint of later research, that detailed bookkeeping was implemented. In the study area, Hunthawang was one such property and the station records now form part of the AML&F Co. papers in the collection of the Australian National University's Archives of Business and Labour (hereinafter referred to as ANU/ABL).

7.3 Boom and Bust on a Sheep Station

While some records survive from other properties, Hunthawang is the only property in the area for which such complete records are available so they will be used, with due caution for individual differences among the stations, as a source for costs and values in the area at this time of financial and ecological crisis. The contemporary currency will be used as it is the basis of the reports and relative values are obvious.

The *(Rough draft copy only)* Hunthawang Balance Sheet for the year ending 30th June 1892 is the last time separate accounts were kept for Hunthawang and so it provides a benchmark for later values.

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12 *The Australasian Pastoralists Review*, April 15, 1891.
13 *The Australasian Pastoralists Review*, February 15, 1892.
14 Australian National University, Archives of Business and Labour, Station Records for several of the properties in the study area are quoted in this chapter as they are a unique record of the life of the stations at this time of stress and change. All references to this material are noted in the text.
15 ANU/ABL, Australian Mercantile Land and Finance Co. Ltd. papers, Deposit 6/53, Annual Balance Sheets for Hunthawang Station, 1892. This was the last year separate accounts for Hunthawang were kept.
Some entries regarding Hunthwang in 1892 are:

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunthawang Station Stock</td>
<td>31m 540yds</td>
<td>£36,844.4.7</td>
</tr>
<tr>
<td>Dr. To Wire Netting</td>
<td>540yds</td>
<td>£1040.12.4</td>
</tr>
<tr>
<td>Dr. To Shearing</td>
<td>15,637 sheep</td>
<td>£159.6.3</td>
</tr>
<tr>
<td>Dr. To Scouring</td>
<td>2331 lbs. at 1(\frac{1}{4})</td>
<td>£12.2.10</td>
</tr>
<tr>
<td>Dr. To Pressing</td>
<td></td>
<td>£16.4.8</td>
</tr>
<tr>
<td>Dr. To Droversing</td>
<td>various – total</td>
<td>£278.14.9</td>
</tr>
</tbody>
</table>

Also listed were the costs of rabbit exterminators (£20), 24 dog traps (£11.10.6) and 6\(\frac{1}{4}\) doz. rabbit traps (£2.3.9).

Stock on the run at this date included 23,144 sheep (with 5,652 deaths since 30 April), 65239 cattle and 30 horses. One surprisingly large figure is the 584 sheep and 7 cattle killed for rations. The heavily meat based diet of the time must have been enjoyed in lavish quantities as the Wages Account suggests a regular staff of about ten persons.

The Wages Account, in the same year, offers an insight into the wages prevailing in the district at the time, as well as into the type and number of staff needed to run a large station. The entries are:

<table>
<thead>
<tr>
<th>Position</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>£250 p.a.</td>
</tr>
<tr>
<td>Overseer</td>
<td>£100 p.a.</td>
</tr>
<tr>
<td>Housekeeper</td>
<td>£52 p.a.</td>
</tr>
<tr>
<td>Boundary Riders</td>
<td>£52 p.a.</td>
</tr>
<tr>
<td>Cook</td>
<td>£65 p.a.</td>
</tr>
<tr>
<td>Cook</td>
<td>£52 p.a.</td>
</tr>
<tr>
<td>Horsedriver</td>
<td>£52 p.a.</td>
</tr>
<tr>
<td>Generally Useful</td>
<td>£52 p.a.</td>
</tr>
</tbody>
</table>

A total of £73.18.11 was owed to Lamb Markers, Scrub Cutters and Casual Hands.

This was the last time that separate accounts were kept as Hunthawang was run as one unit with Willandra, a large station to the north of the Lachlan stretching along Willandra Creek. At times Wallandra, another large run situated directly opposite Hunthawang on the north bank of the river, is also stated to be run with Hunthawang.

A further set of local prices and costs are provided by The Willandra Station Balance Sheets for 30 April, 1888, held at ANU/ABL in the AML&F Papers (Mossgiel Box).\(^{16}\)

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\(^{16}\) ANU/ABL, AML&F Co. papers in Mossgiel Box, Deposit 162/B3339, Balance Sheets for 30 April, 1888, for Willandra Station.
In particular, the estimated present value of station and stock are of interest:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>23,211(\frac{1}{2}) acres Freehold</td>
<td>£46,423</td>
</tr>
<tr>
<td>31,859 acres Leasehold Goodwill</td>
<td>£23,894</td>
</tr>
<tr>
<td>23,496 acres Resumed (7/6)</td>
<td>£8,811</td>
</tr>
<tr>
<td>40,000 sheep (9/-)</td>
<td>£18,000</td>
</tr>
<tr>
<td>51 horses (10/-)</td>
<td>£510</td>
</tr>
<tr>
<td>30 cattle (4/-/-)</td>
<td>£120</td>
</tr>
</tbody>
</table>

The 1887 clip of 465 Bales had been shipped to London. Its estimated value was £5,000. The expenses for shearing 40,778 sheep were £407.14.4. Another large cost was the destruction of 30,640 rabbits (£478.2.10).

The Hunthawang and Willandra Balance Sheet for 31st December, 1892, estimates the combined assets of the two stations with stock thereon as £62,000.\(^{17}\) One year later the 31 December 1893 Balance Sheet estimates the value as £67,313.9.9.\(^{18}\) This figure includes 50,000 sheep at the current value of 10/-.

The tradition of generous provisioning was maintained with 1,071 sheep being provided for rations. Wages stayed at £52 p.a. for most workers but the Manager was paid £300. A vigorous campaign against pests is clear from both Credit and Debit entries on this account. 139,858 rabbit scalps were entered as well as 87 wild dogs killed.

The Balance Sheet for the next year, 31 December, 1894, shows a decline in the total assets to £64,494.19.9.\(^{19}\) The working expenses incurred in the eradication of Noxious Animals were £1,142.15.7, while Wages entailed only £1,053.6.11. A loss of £3,280.10.9 was made on the years working. 744 bales of greasy and 78 bales of scoured wool had been produced and 83,316 sheep survived. Some wages were lowered, for example, the Overseer to £80 and the Horsedriver to £39. The enormous number of 446,237 rabbits were destroyed.

Despite the problems, some investments were made in new plant (a Treble Furrow Plough for £32.9.3) and a new Hay Shed (£16) and a killing room and Pigstye were built. Repairs to the Iron on the roof of the House cost £20.19.3.

The following years did not see the production of so much wool. In the 1895 Balance Sheets the clip is shown as 393 greasy bales and 181 bales of scoured wool.

\(^{17}\) ANU/ABL, AML&F Co. papers, Deposit 6/53, Balance Sheets for Hunthawang and Willandra stations, 1893–1904. This refers to the Balance Sheet for December 31, 1892.


Sheep numbers were down to 60,135. The number of rabbit scalps had also fallen (to 137,257). Some improvements were made including over 4 miles of fencing and 4 bridges over the creek. Repairs to chimneys and ovens and a new scullery were the only comforts added. The woolshed stock yards were repaired.  

The total clip for 1896 was 424 bales (322 greasy and 102 scoured). Only 27,403 sheep were shorn although 51,187 were counted. The tally of rabbit scalps was down to 12,856. The decline in total assets continued, with a figure of £60,965 entered.

New elements come onto the books this year. One sign of change is the entry:

Removing and re-erecting 1 mile fencing on Selections £10.0.0

Some building was also undertaken:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erecting Blacksmiths Shop</td>
<td>£3.10.0</td>
</tr>
<tr>
<td>Erecting Telephone Line</td>
<td>£12.11.8</td>
</tr>
<tr>
<td>Building Sheep Bridge over Lachlan River</td>
<td>£6.8.0</td>
</tr>
</tbody>
</table>

The trends emerging in 1896 continued into the following year. The Balance Sheet for 1897 shows that 47,788 sheep produced 480 bales (74 scoured) of wool but only 5,052 rabbits were destroyed. Most wages remained stable at £39 for Bookkeeper, Boundary Riders, General Hands and Blacksmith. A new group paid were Colonial Experience mostly at £26 p.a. A Milk Boy and Butcher suggest a growing specialization.

While the number of sheep remained largely unchanged at 51,128 the wool clip rose to 655 (45 scoured) in 1898. Rabbit destruction was also stable at 5,030. A range of diverse new expenses appear including:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bldg Calf House &amp; Extending Hay Shed</td>
<td>£2.3.4</td>
</tr>
<tr>
<td>Building Meat House</td>
<td>£5.1.8</td>
</tr>
<tr>
<td>Building Fowl House</td>
<td>£0.16.8</td>
</tr>
<tr>
<td>Cricket Materials</td>
<td>£0.3.2</td>
</tr>
<tr>
<td>Water to Lucerne Paddocks</td>
<td>£2.8.4</td>
</tr>
<tr>
<td>49 Stud Rams</td>
<td>£793.7.10</td>
</tr>
</tbody>
</table>

All this activity suggests some faith in the future, which is maintained in

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the Balance Sheets for the year of 1899. Sheep numbers continue the pattern of decline (36,511) and only 333 bales (63 scoured) of wool were cut. Only 2251 rabbits were destroyed. However, improvements continued to the water supply and grain storage and even a lawn sprinkler and hose were purchased. Some slight comfort is suggested by the outlay of £5.8.9 for a Subscription to a Library and 7/7 for tennis balls.

The decline continued in 1900 when the Balance Sheet records that 423 Bales (33 Scoured) were cut from 30,638 sheep. Rabbit destruction scored 7,679 kills. The Manager's salary was reduced to £175. Some desperate purchases included 7 doz. Rabbit Traps and Chains (£3.4.0), Rabbit Nets (£1.3.7) and Ferret Muzzles (3/10).

Slight improvement is recorded in the Balance Sheet for 1901 with 33,791 sheep cutting 527 Bales (75 scoured) and 15,638 rabbits destroyed.

A considerable fall is recorded in the Balance Sheet for 1902 with only 18,705 sheep and a clip of 130 Bales (38 scoured). Some improvements were made, all relating to Water Conservation, and including the erection of a water lift and tank (£46.3.2), sinking and timbering a well (£67.16.0) and purchasing a whim wheel and carriage.

Worse was to come. The Balance Sheet for 1903 records 70 bales (13 scoured) but only 9,944 sheep (including 4114 dead and missing). The Manager was still paid £175 but the other staff must have been greatly reduced as only 92 rabbits were destroyed.

Almost total closedown is recorded in the Balance Sheet for 1904. The stock count entered is:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>12</td>
</tr>
<tr>
<td>Cattle</td>
<td>14</td>
</tr>
<tr>
<td>Horses</td>
<td>6</td>
</tr>
</tbody>
</table>

The only wages paid were to a Caretaker, 12 Months, £110.

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This set of station Balance Sheets chronicles the decline of a station, at the outset already in a tight situation but carrying 50,000 sheep and employing at least ten people, to complete failure in just 14 years. This run was not entirely typical of the area in that it was particularly well capitalized, fully staffed and favoured with long river and creek frontages. The details are not available in such profusion for other properties around Lake Cargelligo, but everything suggests that their position was even worse.

Other papers in the AML&F Co. collection at ANU/ABL yield additional pertinent details. In particular, a Report from Willandra includes the rainfall records. Annual falls recorded were:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>RAINFALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1890</td>
<td>23.47</td>
</tr>
<tr>
<td>1891</td>
<td>24.29</td>
</tr>
<tr>
<td>1892</td>
<td>13.45</td>
</tr>
<tr>
<td>1893</td>
<td>13.28</td>
</tr>
<tr>
<td>1894</td>
<td>23.47</td>
</tr>
<tr>
<td>1895</td>
<td>8.82</td>
</tr>
<tr>
<td>1896</td>
<td>12.60</td>
</tr>
<tr>
<td>1897</td>
<td>9.28</td>
</tr>
<tr>
<td>1898</td>
<td>12.35</td>
</tr>
<tr>
<td>1899</td>
<td>8.17</td>
</tr>
<tr>
<td>1900</td>
<td>12.71</td>
</tr>
<tr>
<td>1901</td>
<td>7.99</td>
</tr>
<tr>
<td>1902</td>
<td>5.31 (later source)</td>
</tr>
<tr>
<td>1903</td>
<td>6.84 (later source)</td>
</tr>
</tbody>
</table>

The rainfall figures for 1902 are from a Western Lands Commission file. Those for 1903 are from the Lake Cargelligo records as reproduced in Nixon. In faded handwriting on the report are some additional comments on the situation:

"The severe wind and dust storm of the past 6 years have considerably deteriorated the country and damaged the improvements it being now a heavy annual expense to keep netting fences, yards, buildings, etc clear of sand."

"A considerable area of the country say 6000 acres completely and 3,000 acres partially is windblown and apparently past recovery."

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32 Nixon, J. The Dusts of Time, p. 28.
7.4 The Region in Crisis

We have really killed the goose that laid the golden eggs. We have been eating our capital in eating out the edible bush, and then the rabbits finished it.

L. Kiddle, Managing Director and Station Inspector, Australasian Mortgage and Agency Co., Melbourne. Evidence given to the Royal Commission on Western Lands. 1901.33

An overview of the region and its context is provided by the Report of the Royal Commission to inquire into the Condition of the Crown Tenants in the Western Division of New South Wales, 1901.34 Appointed on 11 August, 1900, to enquire into and report on the condition of these tenants, the Commissioners took evidence and visited the area before submitting a long and detailed Report on October 5, 1901. For simplicity, this Royal Commission will be referred to as “the Commission” and its Report as “the Report” in the following discussion.

The Report is so eloquent an evocation of the extreme conditions which the Commissioners found that a consideration of the evidence they heard and the conclusions they reached provide a way of approaching the enormity of the ecological disaster which had arisen in under a century of pastoral occupation of the landscape.

The Western Division covers that section of the State of New South Wales to the west of the Lachlan River. The properties in this survey which are located along that divide enjoy some of the more benign conditions in the Western Division, but this is only a relative mildness. Nor is the boundary as sharp as the line on a map might suggest. Much evidence was taken on the question of the location and suitability of the boundary as it then stood35 as well as the relative rents and costs incurred by the lessees. Within the study area the major divide is one of waterfrontage versus “backblocks”, with a gradual trend to harshness to the north and the west along a continuum. There is a local perception that slightly less rain falls to the north of the river than immediately to the south. Soil quality also changes quickly on the northern side. The role

35 Royal Commission into Western Division. Part I, Summary of Evidence.
of the river as a divide is also reflected in the difficulties and higher cost of transport on the more isolated northern side.

For this period of occupation the techniques of field recording and excavation are of only limited utility. Little new was built. The layers of dust destruction that might be found in the standing structures were mostly cleared by the inhabitants as they fought to hang on. Buried fence lines certainly remain in the area, some completely covered by sand or the mud left by repeated flooding. However, the location and then excavation of such vestiges is very time and effort intensive and yields only partial evidence, as many processes can have the same outcome in the local conditions. Fortunately, the Report of the Royal Commission does much to supplement the physical evidence and provides a contemporary description of the landscape as it appeared after the pastoral system had been imposed on the landscape.

The Commission heard evidence that “The country is a howling wilderness ... the abomination of desolation. It is something fearful. There is nothing to be seen but dry, black tussocks ... The soil is as loose and friable as an ash bed.”

That this desolation was not simply a seasonal phenomenon, the result of a few dry summers, was established as other witnesses attested that “these properties were wind-swept barren wastes, a howling desert with nothing but sand and stone; and nothing has grown after the rain on large areas of them ... there are large areas of country where the top-soil has been blown away by the wind.” Moreover, a large part of a property “is as bare as a floor, in spite of a great rain.”

Many witnesses reported that terrible dust storms added to the problems faced by the graziers as “The destruction of bush and low scrub by the rabbits has deprived the country of nearly all surface protection, so that the prevailing winds sweep the face of the country, raising dust storms, silting up tanks and natural waters, covering fences, yards, &c., and destroying feed.”

Most of the reports are in terms of the difficulties that the environmental deterioration had imposed on the lessees as they tried to carry on their industry. “On Momba the sandy open country is just a moving mass.” Elsewhere “there

36 Royal Commission into Western Division. Part I, Summary of Evidence, p. 11.
37 Royal Commission into Western Division. Part I, Summary of Evidence, p. 25, J.H. Boothby.
38 Royal Commission into Western Division. Report p. viii.
40 Royal Commission into Western Division. Part I, Summary of Evidence, p. 24, C.W. Reid.
has been wholesale destruction of all sorts of improvements by the fearful sandstorms ... in some places fences, particularly wire-netting fences, have been buried ... sheep-yards have been so banked up with sand that they are no use. Worst of all, tanks have been so badly silted up by the sand that their holding capacity has been reduced by more than half." 41

Many fences, erected with much expense as a barrier to the rabbits, were buried in this way and "there are lots of places in the West where you can drive over the netting. I know of some places where two fences have been put up, one over the other, and both of them are nearly buried." 42 The attempt to control the pest was not a great success as "rabbit-netted fences are now comparatively useless for what they were put up for. In many instances the fences are feet under the sand, and in others the sand has blown away, leaving gaps fully 6 feet to the bottom of the netting from the present surface." 43

That the speed and severity of these storms was intense can be appreciated from a submission describing one such experience in the area; "I went out in the morning, and there was a tank of mine of 400 or 500 yards; a lot of weak sheep were watering at it. A fearful storm occurred that day, and when I came home that night there were fifteen to sixteen sheep buried alive there, and no remnant of that tank left." 44

The human dimension of such a state of the landscape was not a major preoccupation of the Commission but a taste of the experiences of those who endured these extremes can be gleaned from the account of the five year drought during the 1940's in a book about life on Coorain, a property near Hillston, by Jill Ker Conway. She describes a dust storm at that later date, which must have been much the same as those in 1900. "Glancing toward the west, I saw a terrifying sight. A vast boiling cloud was mounting in the sky, black and sulfurous yellow at the heart, varying shades of ocher at the edges. Where I stood, the air was utterly still, but the writhing cloud was approaching silently and with great speed. Suddenly I noticed that there were no birds to be seen or heard ... A dust storm usually lasts days, blotting out the sun, launching banshee winds day and night ... Animals which become exhausted and lie down are often sanded over and smothered. There is nothing anyone can do but stay inside, waiting for the calm after the storm. Inside, it is stifling. Every window must be closed against the dust, which seeps relentlessly through the slightest

41 Royal Commission into Western Division. Part I, Summary of Evidence, p. 25, J.H. Boothby.
43 Royal Commission into Western Division. Part I, Summary of Evidence, p. 25, W. Hogarth.
44 Royal Commission into Western Division. Part I, Summary of Evidence, p. 25, A.L.P. Cameron.
crack. Meals are gritty and sleep elusive. Rising in the morning, one sees a perfect outline of one’s body, an afterimage of white where the dust has not collected on the sheets.”

Another cause for concern was the growth of noxious scrubs in the empty ecological niches created by the destruction of the native grasses and edible shrubs. The same dismal tale was told many times; “When my firm bought the place it was open box country, covered with a waving mass of herbage ... that was before the growth of the pine scrub ... I spent £5,500 in ringing and scrubbing the leasehold area. That showed an immediate improvement in the growth of grass; but the rabbits came along, and assisted the sheep to eat the country out.”

A documented instance of this process has been described on Hyandra (Site Report HY1) in the unpublished journal of William Budd; “One of the prides of the Hyandra East Station was a beautiful giant saltbush horse paddock consisting of about 700 acres in extent. This paddock formed a perfect scrub of salt bush exclusive to almost any other shrub growth, reaching to 12 and fourteen feet in many places ... overstocking from sheep always destroyed the giant salt bush and with the careless indifference to destruction not a vestige of the splendid show of former days now remains.”

On the question of the causes of the disaster much evidence was taken from all those involved in pastoralism in the Western Division; lessees, selectors, Stock Inspectors, Surveyors, Station Inspectors, Managers and executives of pastoral companies, Banks, Farmers and Settlers’ Associations and other interested parties.

Among the main themes to emerge from the mass of evidence were the drought, overstocking and the arrival of the rabbits. As James Cotton, Stock Inspector, explained ‘In the years 1880 and 1881, before this district was stocked ... the country was covered with a heavy growth of natural grasses... the ground was soft, spongy and very absorbent ... abounded also in numerous edible shrubs ... pastoral matters progressed fairly satisfactorily until the years 1890–1891, when the rabbit pest increased ... destroying all the good natural grasses, the salt and cotton bushes, and most of the edible shrubs and bushes.”

46 Royal Commission into Western Division. Part I, Summary of Evidence, p. 11, R. Griffiths.
The experimental nature of the occupation was also noted by some of those giving evidence, such as D. Elder, General Manager of the New Zealand Loan and Mercantile Agency Company who observed that "I suppose for a thousand years it had lain fallow, and the only thing which stocked it was the kangaroos. Stock was put on ... sheep did well. The men who went out there thought it could be stocked more heavily than the experience we have now gained would warrant us in thinking: so the country began to be eaten out." 49

Some understanding of the processes of environmental change had been gained. For many of the witnesses, however, this was usually seen as a very direct relationship between one or more factors, for example, "The country has altered very much ... Since 1891 it has gone off considerably every year owing to droughts and rabbits." 50 Another witness remarked that "Drought is undoubtedly the cause of the depression." 51 Yet another held the view that "Perhaps the rabbits were the greatest cause of the depression ... they have destroyed the country and reduced carrying capacity to nothing." 52

In the Report, a more sophisticated analysis was given. The Commissioners remarked that "The depression in the Western Division ... is the result of a combination of causes" which they then went on to discuss. 53 While the recent drought was accepted as an obvious precipitator of the calamity, "the meteorological history of our Western Division shows it to be essentially a country of almost invariably low rainfall and inevitably recurring drought ... that the story of our western country makes such a gloomy page ... is probably mainly due to the general failure ... to recognize that drought is the predominant characteristic of the west". 54 This failure to face the reality of climate was in spite of the fact that "There have been not more than eight good seasons in forty-six years." 55 With such a huge gap between the resource perception of the pastoralists and the system they were trying to manipulate, it is not surprising that the collapse was so swift and so severe.

The Commissioner's found that "The overrunning of a large portion of the Western Division by the rabbit may be said to have done much to convert

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50 Royal Commission into Western Division. Part I, Summary of Evidence, p. 6, T.T.W. Mackay.
51 Royal Commission into Western Division. Part I, Summary of Evidence, p. 28, W.J. Dickinson.
52 Royal Commission into Western Division. Part I, Summary of Evidence, p. 4, E. Hayes.
54 Royal Commission into Western Division. Part I, Report p. vi.
distress into disaster". Soon after the rabbit established itself in the area, the droughts reduced the available herbage forcing strong competition between the sheep and rabbits for the available food. A more destructive forager than sheep, the rabbits ate out the edible scrubs by the roots, ringbarked bushes and trees as they ate the bark and ate the first shoots and roots of any grasses which did appear. This long term damage to the native cover of the region was immense and probably permanent. Species such as saltbush and cotton bush were never to be re-established on any scale. The huge scale of ecological damage resulting from the introduction of a few seemingly innocuous rabbits in Geelong are a powerful demonstration of the complex relationships underlying the fragile balance of ecological systems. A fuller discussion follows in the next section.

The over-stocking of the land was also recognized to be crucial. The inflated estimation of carrying capacity was based on an early failure to realize that the edible shrubs were not a constantly renewable resource but the very capital on which the industry depended. Financial pressures resulting from the natural cycles of drought and price fluctuation in combination with the new demands of land division for closer settlement, higher rents following the 1884 Land Act and rising interest rates all pushed the grazier to try to maintain his productivity in the only way open; by increasing the stocking rate. Thus it was that the net of world system economics came to influence the landscape of this remote region.

The Royal Commission was set up, in 1900, at a time of financial crisis to inquire into the condition of the Crown tenants of the Western Division, an area of 80,359,517 acres with 43,311,862 acres held under Pastoral Lease. There had been a series of droughts in the 1880's, yet the number of sheep in the Western Division in 1891 was still 15,406,000. By 1900 the number had fallen to 5,704,000 head. The value of pastoral property in the Division had fallen by something between 50 and 80 per cent. Many holdings had been abandoned or had forfeited their resumed area, others had been taken over by pastoral companies or banks which themselves now faced heavy losses. The closer settlement schemes had been a disaster. Businesses in the country towns were facing ruin. The price of wool was down.

It is not surprising then, that in this atmosphere of financial panic, the Report of the Commission should put strong emphasis on those aspects of the catastrophe which it saw as facilitating reconstruction. A strong recommendation was made that a uniform system of administration be set up under a suitably constituted Board "more elastic and informal than the prevailing system" and taking "a deeper personal concern" in the problems of the Western Division.  

56 Royal Commission into Western Division. Part I, Report p. vi.
57 Royal Commission into Western Division. Part I, Report p. xxiv.
7.5 Catastrophe Theory and the Ecological System

The preceding sections reviewed the contemporary literature, newspapers and primary sources such as station records and company reports to explore the perceptions and responses of the people of the 1890's to the events of the time. This section presents a model of the ecological processes involved in the breakdown of the experimental pastoral system using a type of analysis that has only recently become available.

The concept of an ecosystem as a dynamic model was introduced in Chapter 1. However, the important characteristic of stability, used in the sense of resistance to change, is not quantifiable within the scope of such a model. This is a barrier to exploring the environmental thresholds and landscape sensitivity of the system. However, an approach to situations where sudden changes occur in the pattern of relationships among the elements of a system has emerged through the mathematical theory of singularities, often referred to as catastrophe theory, which received great impetus in the 1960's from work by the French mathematician René Thom. During the nineteenth century the radically new discipline of topology had emerged from the classical field of geometry to study those properties of figures that persist under severe distortion. Thom's innovation was to use this theory to model discontinuous changes in natural systems. His own major early work *Stabilité Structurelle et Morphogénèse* emphasised the importance of structural stability and the concept of insensitivity to change.

The potential of the theory was soon recognized and applications were made to a wide range of theoretical and physical problems. These applications include the social sciences and archaeology as well as the more expected studies in biology, physics and geography. A full exposition of the mathemat-

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ical basis of catastrophe theory is beyond the scope of this thesis but several accessible works, for example Zeeman\textsuperscript{63} and Posten and Stewart\textsuperscript{64} are available.

Catastrophe theory provides a formal means of approaching situations where slowly changing variables produce sudden changes or jumps. Many examples of this type of behavior have been observed to occur in nature. For example, a constant amount of heat applied to a vessel of water can result in the water suddenly boiling. Volcanoes erupt without warning. Lemming populations fluctuate dramatically. At first the intuitive term \textit{catastrophe} was used to describe all such situations, but this led to a certain sensationalism. Moreover, it was felt that the term was emotive and value laden and so many mathematicians now prefer to use the term \textit{singularities} to refer to at least the theoretical aspects of these events. Most applications continue to use the term catastrophe theory and a large body of literature exists using this nomenclature. For the purpose of this thesis, therefore, the original term seems most appropriate and will be retained.

The deep mathematical results in the geometry of many dimensions which were proved by Thom provide a classification theorem of the seven elementary catastrophes which can occur in up to four dimensions.\textsuperscript{65} The word \textit{elementary} is used in the sense of \textit{fundamental} not of simplicity or triviality. While other catastrophes occur in higher dimensions, they are of such abstraction that they are not relevant to likely applications and will not be considered here. Each of the elementary catastrophes describe a pattern of change which is the product of the number of control factors in the equation. The nature of the variables and the type of relationship among them is irrelevant. As in the case of such familiar algebraic transformations as addition and differentiation, the operation is independent of the particular case to which it is applied.

The seven elementary catastrophes may each be formally described by an mathematical equation which defines the geometric form of the model. The book by Zeeman includes a thorough exposition of this process.\textsuperscript{66} The geometrical model which is obtained in this operation may be used to illustrate the phenomena of continuous forces producing discontinuous results in many particular cases. It has been noted by Posten and Stewart that the most direct application of the geometrical model is to systems which at each moment either maximize or minimize some function.\textsuperscript{67} This function is often energy and so

\textsuperscript{66} Zeeman, \textit{op cit}, p. 27
\textsuperscript{67} Poston, and Stewart, \textit{op cit}, p. 2.
systems are often described in terms of equilibrium or entropy. Such an approach is quite easy to appreciate in areas like geology or ecology and provides a convenient vocabulary for the case of landscape stability.

The first of the elementary catastrophes is the fold catastrophe but as it has only one control factor and one response variable it produces a two dimensional graph of very limited application because few systems can be described in such simple terms.

The next singularity has two control factors and one response variable and is called the cusp catastrophe. It is realized in a three dimensional graph, (shown in Figure 7.1). The figure shows how two control variables $a$ and $b$, (for example, heat and stress) produce a series of values for the control variable $x$, (for example, structural cracking). These points form the surface $M$. In general, each combination of $a$ and $b$ produce one point on the surface, but some values can produce multiple values.

The cusp is usually considered the most appropriate model for the social sciences. It is the highest dimensional catastrophe which can be represented in two dimensions and so to graphically illustrate the complexity of the relationships among the variables. The higher dimensional catastrophes require abstract algebraic or topological description and so cannot be used to display a graph of the relationships among the variables.

Figure 7.1

The cusp catastrophe. After Zeeman
The cusp catastrophe, see Figure 7.1, is formally described as the cubic surface $M$ in three dimensions given by the equation:

$$x^3 = a + bx$$

where $a$ and $b$ are the horizontal control axes and $x$ is the vertical response axis. To represent this three dimensional figure in two dimensions, the control space $C$ appears as a plane below the origin on Figure 1. The curve on the surface where the upper and lower sheets fold over is called the fold curve. By differentiating, the fold curve $F$, $3x^2 = b$, is obtained. While the fold curve $F$ itself a smooth and continuous curve, the bifurcation set $B$, which is obtained by projecting $F$ on to the control space, has a cusp or fold at the origin and this is the source of the name cusp catastrophe.

The fold curve $F$ divides the surface $M$ into two sections. The small section $M - G$ (which is shaded on Figure 7.1) is mathematically “inaccessible” and is, for practical purposes, of no interest here. The larger part, the Graph $G$, is the surface where the values of the response variable are set out in graphic form.

The splitting factor which causes the fold curve to appear is a function of the value of the axis at the cusp point $ab$ of the bifurcation set $B$. As this point is the origin of the graph, it can be plotted where convenient and negative values may be included.

To apply this formal model to the impact of pastoralism on the landscape near Lake Cargelligo during the nineteenth century, it is necessary to explore some of the implications of catastrophe theory in detail. This does not involve simple numerical calculations, but a consideration of the way the cusp catastrophe reflects the interactions of the processes involved. As a first step towards fitting the model, two factors must be identified as the control variables whose values produce the response variable. In this context, therefore, let:

$a$ be the annual rainfall

$b$ be the pastoral load on the land, expressed as the number of sheep plus the number of rabbits

$x$ be the condition of the landscape, expressed as the response function.

The values of $x$ form the surface of the graph $G$.

There are six important characteristics of the surface of the graph and these provide a vocabulary with which to describe the behavior of the system. They are:

(1) Smooth and abrupt change. (See Figure 7.2a). Changes may be either smooth or sudden depending on where the point representing the value of the response is located on the surface of the graph. If the point is near the fold, then small changes in the values of $a$ or $b$ may result in a sudden jump in $x$ as it encounters the cusp and crosses a threshold. Similarly, large variations in the value of the control variables may produce only smooth change if the point is located at some distance from the fold.
(2) Divergence and convergence. (See Figure 7.2b). Even if the variables start and end at similar points, the system response to a particular change can move along different paths. The conditions in the system before the change are important here. Should the neighbouring variables pass on opposite sides of the cusp, their subsequent paths will be very different.

Likewise, points separated by some distance can converge towards each other should they encounter the cusp.

(3) Hysteresis (see Figure 7.2c). This involves lags in the system. Should the values of the control variables $a$ and $b$ be reversed, the values of the response variable $x$ may not necessarily reverse. The system may respond with smooth transitions or with sudden jumps across the fold. There are three possible delay conventions:

(a) Perfect delay. The point moves into the fold and jumps to the other surface at the farthest edge of the fold.

(b) Maxwell delay. The system jumps as soon as possible.

(c) Random delay. The system jumps at any time in the fold.

(4) Bimodal Behavior (see Figure 7.2e). This is one of the formal geometric properties of the model. It refers to the possible values which may be taken by the response variable $x$ (for example, fast vs slow or inflation vs deflation) when it is projected onto the surface of the graph $G$. Should the point representing the system be projected up into the vicinity of the fold, then it will take two values because it is projected onto both surfaces of the fold. Should it be projected elsewhere on the graph $G$, then the point will take only one value as usual.

(5) Instability. This is a geometrical property of the cusp catastrophe. The unstable area inside the fold curve is a part of the model by definition. For practical purposes, the area may be ignored in any application of the model.

(6) Stable Structure (see Figure 7.2f). Proved to hold by the classification theorem, this is the formal definition that the surface and fold curve must be a cusp catastrophe should two variables control a single response variable.
Characteristics of the cusp catastrophe.
After Burrin and Scaife.
7.6 An Application of Catastrophe Theory on the Lachlan

The six characteristics of the cusp catastrophe which have been explored in the discussion in section 7.5 suggest that it may be a particularly appropriate way to approach the study of landscape stability. It provides a conceptual framework and a vocabulary which can be used to model the possible responses of the ecosystem to changes such as the impact of market pastoralism.

As it was found above, if it is possible to identify the two control variables and the response variable of a system, then it should be possible to predict some of the responses of the system. Not, of course, in a simple numerical or statistical paradigm. Catastrophe theory allows a much more interesting analysis by revealing the trends in the dynamic system. Following this, the model can be used to identify details which might be of critical importance to the operation of the system. It also greatly enhances the power of statistical tools by clearly identifying important variables for further numerical analysis.

While it is a new theory only recently moved from abstract mathematics to the application area, the only formal requirement which it is necessary to fulfill in order to apply the cusp catastrophe model to situations such as the pastoral system under consideration is that the rate (values) of the process of landscape formation is expressed as a bimodal scale which is controlled by the two variables of (a) climate, as measured by annual rainfall and (b) the stocking rate, as measured by sheep numbers plus estimates of the rabbit numbers.

One of the particularly useful aspects of the model is the way that it includes the initial and ongoing states of the landscape to be a formal part of the model, as expressed by proximity to the fold curve, and so to allow the dynamic to emerge.

As a consequence of its definition, the cusp catastrophe is the formal description of a system with two control variables. In the historical context of the grazing industry, one could identify other possible control variables, for example, number of bales of wool produced per year or the total financial return for a district. These, however, can readily be reduced to terms of stock carried per acre, so stocking rate seems to provide a realistic measure of the strain imposed by pastoralism on the environmental system.

The process of landscape formation has been observed in some places and at some times as being a slow response to gradual changes in the control variables. The current state of the European landscape has long been recognized by historical geographers, such as Pounds, to be the product of many centuries of human manipulation \(^{68}\). Clearing and enclosure have transformed that con-

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tinent relentlessly. The scale of change in Europe, however, was mediated by social constraints and, until recently, a pre-industrial technology.

In the Lake Cargelligo area the early phase of pastoral settlement seemed to follow a smooth pattern of this sort. Quite soon after Mitchell's journey in 1836, the first leases were taken up and hoofed animals introduced. Their numbers grew rapidly, but there were no sudden changes reported in the landscape.

However, even on a local scale, some changes to the stability of the landscape do appear to be very sudden. Examples abound throughout the state during the early experimental phase of occupancy and include the disappearance of the edible scrubs from the Western Division in a period of about twenty years. This suggests that environmental thresholds are involved in the response patterns. The curve of the fold on the cusp catastrophe is a modern mathematical expression of such a threshold and so provides a powerful model of the process.

The proximity of the system to the fold curve on the graph also determines the sensitivity of the system. Should it be located at some distance from the fold and if its relaxation path avoids the cusp, then the adjustment of the system will be smooth and no sudden jumps will occur.

As elsewhere in Australia, the first European settlers found a landscape that had a rich accumulation of the perennial grasses and scrubs on which they could establish an industry. The graziers in the first experimental wave who arrived at the Lachlan between 1840 to 1860 increased the stock load on the environment very substantially and very rapidly but this did not produce a jump in the landscape variable as the system was not then located near an environmental threshold. There was a large reserve of perennial grasses which provided capital to sustain the increase in stock numbers. Moreover, it seems that the rainfall did not vary much. This situation is set out in Figure 3 below.

However, if the initial state of the system is located near to the fold, it is very sensitive to change. Such a situation can be seen in the response pattern of the landscape variable in later years. When rabbits arrived in the area in about 1880, they produced a sudden and unexpected increase in the stocking rate variable. Their numbers have been estimated by various experts and can be expressed in terms of "sheep equivalents", as shown in Figure 7.5. The number of sheep in the Western Division increased from 6.5 million head in 1879 to 15.3 million head in 1887. At the same time, the number of rabbits grew from zero to 16 million sheep equivalents. Few landholders could have been aware of the true magnitude of the rabbit population during the early years of this process and so both variables continued to grow and the total grazing load on the landscape increased fourfold. This is a large increase but comparable rates of growth had occurred throughout the 1870's without a sudden deterioration in the environment.
Smooth change: Where $A^1$ is the system at the start of European occupation and $A^2$ is the system in 1860

Abrupt change: Where $B^1$ is the system in 1880 and $B^2$ is the system in 1900

The crucial difference at the later time, was that the system was closer to a threshold because of the changes that had been occurring, especially:
(a) eating out of the saltbush and other perennial shrubs;
(b) clearing of the treecover for grazing and specialist usage such as construction of woolsheds, sheepyards, dips and farm buildings and the powering of steam engines;
(c) drought had already affected the quantity and quality of annual grasses;
(e) qualitative changes to the herbage as the rabbits ate out the choicest growth at the roots thereby killing the plant.

Any additional load at such a time, when the system was located near the fold, would cause the relaxation path to cross the fold and rapid landscape instability could occur. The records show that large and rapid changes did in fact occur at this time and these are described in the Royal Commission on Western Lands.
The Jump Conventions of the cusp catastrophe specify that the precise rate of the relaxation path will depend on how the threshold is crossed. As was explained above the possible conventions are perfect delay, Maxwell delay or random delay (See Figure 7.6). This flexibility of response makes it clear that it cannot be assumed that all landscape change occurred in the same way.

Just as in cases when an outcome of a smooth or abrupt relaxation path is involved, the sensitivity of the system is important here. Consider, for example, the situation where a very large build up in the stocking rate occurs following a flood so that the groundwater level is high even though all the herbage is quickly denuded and the surface of the ground shows cracking. In the absence of other problems, the relaxation path should be through the narrow part of the fold as the system will recover to its stable threshold more readily than in very dry conditions.

At the time, however, the landscape may appear similar to that on an adjoining block which missed the flood but was subjected to several years drought with constantly high stocking levels. As its originally lush vegetation was eaten out at the roots by rabbits and the seeds blew away with the topsoil it will enter the fold on a steeper path than its neighbour and may emerge at a very distant point, that is, it may be much more severely eroded before it regains its stability.
The characteristic of Bimodality which is entailed by the model suggests that a system undergoing change can respond in one of two ways should the point representing the system be located in the area of the fold. Figure 7.7 sets out such a case. For a given set of values of the control variables, say 10 sheep to the acre and 10 inches of annual rainfall, the response variable $x$ will be projected onto both the upper and the lower surfaces of the graph. The antecedent conditions are important in determining which relaxation path will be taken.

In a year when this stocking rate represents a reduction of fifty per cent from the previous year when the rainfall was 8 inches, the point would be located on the lower part of the graph at $G_2$. In this sensitive location near to a threshold, such a change would push the response over the fold curve and a sudden improvement in grass cover, and therefore surface stability, would occur.

However, in a season following several good years when there was ample grass already, the point would be located towards the top of the graph in a
region away from the fold. No threshold would be encountered and no sudden jump would result.

The initial position of a system on the surface is also important when considering Hysteresis. In a case of simple hysteresis, an initial increase in the stocking rate of sheep may lead to improved management of the land and to deposits of animal manure which enrich the soil and encourage the growth of good quality grasses rather than the initial cover a weedy mix which is early eaten out. The capital generated by the sale of the wool may be invested in fencing which is used to prevent stock concentrations at vulnerable points near waterholes and to exclude rabbits. In theory at least an increased stocking rate may thus lead to a regaining of the stability lost under a less well managed but numerically lighter load.

However, should complex hysteresis result from the position of a system near the threshold the path will be different. For example, the proportion of rabbits in the total stocking rate may increase over several dry seasons despite a reduction in sheep numbers. The greater damage which rabbits inflict on the pasture, trees and soil will push the system near to the fold and the path will vary accordingly, as in Figure 7.8. Divergence describes the situation where two initial points are similar, but an increase in either a or b produces very different results. Again, should one relaxation path pass through the threshold curve, it can take a very different path to the other which justs skirts the fold without entering. See Figure 9.

Consider, for example, two systems with similar stocking rates and adjacent positions near the threshold. A very slight increase in rainfall could come at a critical time (e.g. in spring) in one but not the other. Such a slight differential could allow this system to move down a relaxation path beside the threshold while the other one is pushed over the fold. Very small differences in rainfall can been seen to have disproportionally large effects in the study region. The records for the town of Lake Cargelligo (Fig. A19) show that this part of the area enjoys a consistent advantage over Hunthawang station (Fig. A20) of about one inch per year. This threshold, however, is enough to permit dry land wheat growing on the south side of the river.

There is also a wealth of anecdotal material recording how one crop was saved by a shower at the last minute while a nearby one was lost for its lack.

The final characteristic, Convergence, models the situation where two widely separated points can converge toward the same end values. The swift reduction of the initially lush saltbush areas with river frontages to a condition resembling the arid mallee plains at some distance from the river, suggests that the system moved closer and closer to the fold under the influence of constant changes in the rainfall and stocking rate variables (See Figure 7.10).
Figure 7.8

E: More sheep on good well-watered land
F: More rabbits and less sheep during drought

Figure 7.9

C: No spring rainfall
D: Small spring rainfall

Figure 7.10

C: Saltbush area near river under heavy stocking and drought
D: Arid mallee plain under light stocking and drought
This brief exploration of the stability of the ecosystem clearly demonstrates that the impact of pastoralism on the landscape cannot be modelled by a simple linear function of any single variable. The use of catastrophe theory, however, allows a range of responses to be identified. These responses depend on the interplay of relationships among the control variables, the environmental thresholds and the jump convention when a threshold is encountered as well as on landscape sensitivity. The model, while not providing a numerical solution, has provided a new tool with which to analyse the relationships among the elements of the system.
CHAPTER 8

The Experiment Continues

8.1 The End of Pastoral Dominance

The first European experiment in occupying the fragile western plains had imposed a market-oriented monoculture on an ecosystem long adapted to a less intensive hunter-gatherer regime. Patterns of fire management were changed and the cycles of growth and regeneration were disrupted. A large energy demand was entailed by the constant pressure of grazing sheep. Introduced species, both animal and vegetable, spread relentlessly through the region. As Horne wrote "For as quick a despoliation of a big area as can be found anywhere in history, consider what happened to the Western Division Of New South Wales."¹

All this had happened in less than a century of European occupation. In a wave of individual pioneering the graziers had established themselves on large tracts of unsurveyed land. There had been no government involvement in the early years of settlement and no objective assessment of the resources, just the naive optimism of people seeking the dream of land. This first occupancy was truly an experimental one, so that it is not surprising that the ecological limits of the region were not appreciated and soon exceeded. The final disaster of the drought in the 1890's and early 1900's brought home to settler and government alike the need for greater understanding of the land. Bolton has remarked "That the long-term study of climate was a government responsibility was fully accepted by 1900."²

The organizational basis of the industry was also overextended. Wadham and Wood pointed out the tenuous state of the pastoral system of land use at the beginning of this century with the remark that "The rapid rate at which the pastoral industry had expanded in Australia was not altogether healthy. The very speed of development made the industry vulnerable."³ The great drought amply demonstrated the extension of pastoralism beyond sustainable limits. The huge experiment in occupying the western plains had ended in an ecological disaster for the region and an economic blow to the settlers. The capital sunk into the new technology of stock management had been dissipated.

¹ Horne, D. 1976. Money Made Us, Penguin, Blackburn, Victoria, p. 34.
by the long drought, the stock losses and the lack of financial returns for several seasons. Many of the original settlers had been bankrupted by the experience and numbers of the stations had passed into the hands of financial institutions. In the Western Division of the state, only one quarter of the homestead leases were still held by the original lessee. Clearly, there was a need to introduce a modified system of land use and the implications were social and political, as well as economic and technological. The romance of the early dreamers had given way to a growing government involvement and a more measured perception of resource limitations.

8.2 Land Tenure North of the River

The Western Lands Board (later Commission) was given the responsibility of administering the land to the north of the Lachlan, the border of the Western Division. The recommendations of the Royal Commission, discussed in Section 7.4 above, were passed into law just three months after the publication of the Report by the Western Lands Act of 1901. This was a hasty reaction in a crisis atmosphere so that the resulting legislation is somewhat vague and does not address all the issues. Many amendments and extensions have been necessary over the ensuing years. The Report of the later Joint Select Committee to enquire into the Western Division notes that “Irregardless, it was a major act of reconstruction, creating a separate administration, and attempting to satisfy the demands of both the pastoral companies and the remaining Homestead Lessees.”

Perhaps it was the attempt to reconcile these conflicting interests that laid the seeds of later problems.

Under the provisions of the Act, the existing leases were extended until 1943, allowing the possibility of stable long-term financial arrangements. The Crown also reserved the right to resume part of the area in exchange for further extensions of the lease, a provision used to facilitate the later soldier settlement schemes. Policies of closer settlement have had a disastrous history in many parts of Australia and the Western Division was no exception. Schemes of amalgamation and the granting of “build up” blocks have followed.

The 1901 Act provided that the Board should take “A deeper personal concern” in the leases “under a system much more elastic and informal” than the old system of short leases. This very personal policy has lead to claims of


“capture by the client” being raised in the 1983 Report. The very nature of the relationship appears to cause difficulty in matters such as enforcement of regulations regarding forestry, pest eradication and land management.

One of the distinctive features of the administration of the Act has been the concept of a home maintenance area. Over time the definition has evolved from one which attempted to specify the particular area of land necessary to support a family unit (itself an evolving concept) to a more flexible one which took account of the wide variation of conditions in the Division by framing minimum and maximum sheep numbers for viability. Recently, the concept has been re-examined and suggested limits of 6,000 minimum and 30,000 maximum dry sheep areas have been proposed. The fluidity of the concepts of both limits and units of measurement is a reflection of the continuing experiment of occupation.

Another peculiarity of the Western Lands administration has been the policy of maintaining strict price control of all transfers of leases together with a right to veto any sale that the Commission deemed inappropriate. This insecurity has not encouraged long-term capital investments by lessees who may not find the investment reflected in the final sale price approved by the Commission. The 1983 Joint Select Committee found that “We consider that there is a connection between land price and land management, e.g. a high price may lead to land abuse.”

In the lower Lachlan, the operation of the Western Lands Act has been most noticeable in two ways: (a) subdivision of larger holdings, and, (b) restrictions on clearing and cropping until very recently. The aerial photograph (Fig. A31) taken in 1965 shows the landscape implications of this policy in the large, uncleared areas along the northern bank of the Lachlan in contrast with the small cleared paddocks supporting a range of different crops to be seen on the southern bank of the river.

Recent modifications to the policy of clearing and cropping in the Western Division have resulted in the expansion of clearing operations as for example, on North Whoey (Fig. LS18) where thousands of hectares have been cleared. This flexibility in policy has followed the development of new strains of wheat capable of growing in the drier conditions of the Western Division and is a new episode in the experiment of finding a suitable industrial base for the area. While some successful crops have been produced in those years at the wetter end of the local spectrum, the usual relative disadvantages of distance and climatic conditions...
unpredictability still remain. The ecological implications of widespread strip clearing are also being tested by this round of changes.

8.3 Land Tenure South of the River

On the south side of the Lachlan, under a different system of tenure, the reaction to the drought was in considerable contrast to that on the opposite side of the river. Rather than attempting to maintain the original system of land use by administrative changes as in the Western Lands jurisdiction, the strategy adopted to the south involved modification of the technological basis of the occupance. Diversification, closer settlement and an expectation of government services in the fields of transport and water conservation were the main thrust of the adaptive strategy in the area.

The township of Lake Cargelligo was a centre of population which provided a reservoir of experience and skills to the pastoral sector. The expansion of the role of the town to provide the infrastructure for a diversified agricultural industry was crucial to the direction of change.

Robertson's Free Selection Act of 1861 permitted areas of 160 or 320 acres to be selected from the original runs but the process was delayed in the lower Lachlan area by the isolation of the region and, later, by the reservation of 136,000 acres as a Gold Field following the discovery of gold in the town in 1873. This was lifted in 1880 and many selections were taken up on both sides of the river. A map of the Western Lands part of the study area in 1903 (Fig. A30) shows a web of small holdings along the northern side of the river at that time. All have since disappeared and are remembered locally only by the name used for some paddocks on the present properties, for example, on Hyandra there is a small paddock known as "Carnes" and another as "Conways." The small area of the selections and the distance from any market, combined as they were with a harsh and erratic climate, ensured that the selectors on the north side had no hope of success.

Conditions were marginally more favourable with regard to a slightly higher and more certain rainfall on the southern side of the Lachlan. This enabled some of the selectors there to hold their land through the testing establishment phase. A variety of crops have been grown on the farms ever since, so providing a pool of experience within the area. The freehold titles to the land also allowed greater flexibility to the farmers who were not so constrained with regulations as those on Western Lands leases. Finance was easier to obtain, sale prices reflected market values directly while experiment and diversity were encouraged.

The release of the "Federation" variety of drought resistant wheat in 1901 greatly expanded the belt of land that could support wheat. The main requirement was ten inches of rain during the winter months, a pattern frequently
shown in the local rainfall charts. Moreover, the sandy soils of the area were suited to the crop.

8.4 Technology and Infrastructure

Gold mining at Lake Cargelligo had brought to the town many people from Victoria. Jeans has pointed to "a greater wheat belt running from Spencer Gulf in South Australia through the Wimmera and Mallee of Victoria into south-central New South Wales." It was natural that the experience brought into the area by these people should form the nucleus of a new industry based on the efficient cultivation of wheat using the advanced technology already available in the southern wheat belt. These early ventures demonstrated that wheat could be grown in the hot, dry conditions, at least in the better years, and many people were eager to move into cropping. The question of a market for the wheat and the means of transporting the grain to the market remained matters for action. Pressure on the government to extend the railway line to the town so as to link it into the state network became vocal.

The effectiveness of government intervention had already been demonstrated to the town by the construction of the Lake Cargelligo water storage scheme, the first phase of which was completed in 1901. The construction stage of the scheme had provided work to about 300 local people and there was further work later. The scheme linked the lake to the river with a series of weirs, gates and channels that controlled the flow of water in and out of the lake. The project ensured greater reliability of water supply during dry periods and made irrigation possible. From the viewpoint of the town, however, it had the disadvantage that water was released from the lake to the river in dry times leaving the town without its greatest resource just when it was most needed.

While many settlers grew wheat as experiment and supplement, it could not become a commercial mainstay without an efficient transport system. Railways had expanded over much of New South Wales in the latter part of the nineteenth century and the main lines were complete by 1881 when the line reached Albury in what Lee has described as "a ferocious economic struggle" to "reclaim the trade of the district for Sydney." Branch lines were also constructed to transport the expanding agricultural produce to the ports.

At Lake Cargelligo, the worst year of the drought was 1902 when only 899 points of rain fell. The following two years showed small improvements and

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1905 registered 1694 points. The new Federation variety of wheat could survive at that level of moisture and had been grown successfully at Temora, so the pressure in the region for further land division was strong. A branch railway line then terminated at West Wyalong and local people mounted a campaign of deputations and lobbying to have it extended. The work was commenced in June 1913. After slow progress, mainly stemming from the financial constraints of wartime, the line to Lake Cargelligo was opened to traffic on 13 November, 1917, so bringing to an end the pastoral dominance of the area.

The following year saw the end of the First World War and the resumption of imports. Technological innovation soon followed with the widespread adoption of the internal combustion engine for transport. Efficient tractors also became widely available and larger ploughs and harvesting equipment soon followed. A new intensity of land use replaced the mainly grazing pattern that had been imposed soon after Oxley described the area a century earlier in 1817. Already the land had been changed in quite fundamental ways including plant and animal extinctions, soil degradation and rabbit infestation. However, there is little evidence that the new settlers allowed such considerations to blunt their optimism as a new wave of clearing and experiment washed over the landscape.

The complexity of the system was increased by the new technology as was the energy demand on the land. The potassium deficiency of the soil was countered by the application of superphosphate but the higher capital costs ensured a greater pressure for increased yields. The application of fertilizers carries the risk of upsetting the balance of the soil and of inducing acidity. Soils are degraded and yields fall, often inducing increased application of the chemicals. Similarly, the cost of agricultural equipment was high and farmers had to recoup their investment from high production rates. Overuse of fertilizers was a constant temptation and clearing of all trees to increase the area under cultivation became common.

As elsewhere in the country, a plan of soldier settlement based more on emotive considerations than realistic resource assessment was imposed on the Lake Cargelligo district. The majority of the settlers were inexperienced men with little capital so there was never any prospect of their succeeding in establishing themselves on the small, inadequate blocks allotted for the scheme. There are many local memories of the difficulties of the period, much of which overlapped the Great Depression, and finally a rural reconstruction scheme was introduced by the government in 1933 to relieve debts and consolidate holdings.

These official measures have been part of the government involvement in monitoring and maintaining the latest experimental occupation of the land. Other aspects include the growth of a range of rural regulatory bodies such as Pasture Protection Boards, grain marketing authorities, district agronomy services and pest control measures. All assist the individual farmers to maintain their production and provide information on new and emerging technology. Farmers in the area have always been quick to adopt new methods so the full
force of modern scientific farming has been applied to this marginal zone. The results have been mixed, as might have been predicted by the system models discussed earlier. In those years when high rainfall coincided with international demand for the commodities produced, huge crops earned high returns. More often, however, rain has not come at the optimum time, farmers have invested heavily in new equipment only to have the market collapse, or the unrelenting cycle of drought has fostered the boom and bust pattern established in the colony from the early years of settlement.

8.5 Water Conservation and Irrigation

Water management has also been an important aspect of land use. The control of the flow of the river to the lower Lachlan was a major step in the human management of the ecosystem. It also encouraged the use of irrigation farming techniques along the course of the river. The scale of irrigation, however, remained small until the 1950's when technical advances changed the position. Firstly, bulk state electricity services reached the area. This allowed the use of large pumps to lift the water in the quantities needed for commercial operations. Prior to this time many farmers had small irrigated plots, usually of five to ten acres, for garden and emergency use. Only properties with large capital backing, such as Booberoi, had been able to invest in irrigation on a scale that affected the dependence of a property on the vagaries of the climate. Secondly, modern electric pumps of greatly increased capacity became affordable. The petrol and diesel engines they replaced had been very limited in capacity. The huge furnace at Booberoi with its army of attendant wood-cutters and operators was only possible on a large and commercial scale. Finally, earth-moving equipment also increased in capacity. Irrigation farming requires substantial modification of the natural surface of the landscape and the small tractors previously available were impractical for this purpose.

Most properties in the lower Lachlan use irrigation as a supplement to their established grazing activities. Crops such as lucerne are grown for grazing, while oats are produced for storing in silos until needed as supplementary feeding or in droughts. Many exotic crops such as sunflower, safflower and barley have been successfully raised when market conditions were favourable, showing the flexibility of the farmers and the elusive fertility of the land under the right conditions. This occasional bounty encourages a resource perception that emphasizes the most positive end of the climatic continuum and regards drought as the exception rather than a normal part of the local experience.

The debit side of irrigation includes excessive clearing of treecover and the risk of salinity building up in the soil. The high capital cost also imposes pressure to over-fertilize and crop frequently. Recently, the concentration of nutrients in the rivers as a result of run-off from the farms had led to the
growth of toxic blue-green algae. Lake Cargelligo was affected by this problem several times in recent years, clearly demonstrating the continuing proximity of ecological thresholds.

8.6 The Catastrophe of the 1990's

The Western Lands Board was set up in 1901 to administer the lands of the Western Division which begin to the north of the Lachlan. The landscape implications of the policy and practice of this administration for the study region have already been pointed out. The financial constraints to the landholders have also been a factor limiting the adoption of new technology and encouraging overstocking.

Small areas of the pastoral leases have been sown to grain since the land was settled, especially for horse fodder and some supplements for breeding stock. With a marginally lower and less reliable rainfall than the area opposite, it was only in the 1950's that it became possible to produce wheat on a commercial scale in any but an exceptionally wet year. It was the development of new, drought-resistant strains of wheat by the scientific research laboratories that made this possible. Since then, much land in the zone near to the river has been cleared for cropping. While the pastoral industry has remained the dominant industry both in the lower Lachlan and over the Western Division as a whole, the area along the Lachlan has diversified its economic base to include both dry-land and irrigation farming. Storage of grain in on-farm facilities has provided a measure of drought protection and diversity has insulated some farmers against market fluctuations.

Despite this, however, The Sydney Morning Herald reports that "Disaster has struck the west of the state ... the Western Division is reeling under drought .. The land itself is threatened." The complex web of conditions that brought about this disaster are not only climatic but stem from the very system that was instituted to protect the land following the great drought of the 1890's. The policy of closer settlement combined with heavy grazing have proved disastrous.

The 1983 Joint Select Committee Report made reference to special difficulties resulting from the Western Lands Commission's policy of a close, personal relationship with its clients. In particular, "On numerous occasions the Commission has expressed this as a reason for not enforcing de-stocking orders, or ordering the eradication of noxious weeds and animals." The overall condition of the land was given lower priority than individual needs, so that it has entered a period of stress in poor condition.

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Like the 1890's a century ago, the 1990's have witnessed severe drought because of the appearance of the triple El Nino effect thousands of kilometres from the area. Those who asserted that climatic variation was locally based have been discredited and the region faces another ecological catastrophe. Once again the system was pushed to a point where rapid instability resulted from a land management regime based on faulty perceptions of capacity combined with climatic fluctuations that should have come as no surprise to experienced managers.

As usual, the human cost is high and the damage to the ecosystem is severe. A return to stability will depend on finding a sustainable pattern of land management. The recommendations of the 1983 Joint Select Committee included specific strategies for a land management plan based on sustainable stocking and scientific monitoring of the condition of the land. In particular the Report recommended that a new Act be drafted and that it should state "the aims, objectives and strategy for extensive land management ... to ensure—

(i) the long-term condition of vegetation and stability of the soils are maintained and improved; ...
(v) the protection, maintenance and enhancement of the environment of the Western Division."13

Despite this, little changed and there is still no policy in place for a sustainable strategy of land use. Perhaps it will be necessary to adopt a radical solution such as that reported to be proposed by Maher, a rangeland officer with the Western Division, in the Herald article of a "return to a nomadic grazing system."14 The irony of this outcome to the second great experiment in coming to terms with the landscape demonstrates the failure of the settlers and the administration alike to come to a realistic perception of the landscape they inhabit and manage.

14 The Sydney Morning Herald June 13, 1992, p. 35.
CHAPTER 9
Conclusions

The first and central concern of this study of the lower Lachlan region has been the capture of the available evidence still remaining on sites and in archives which may help in understanding the interaction of humans and the environment since Europeans first colonized the area.

There was some urgency to the study because of the increasing threat made to the fragile structures of the pastoral age by the spread and intensification of farming. Field recording is not just collecting and classifying, it is a response to ideas and itself stimulates further ideas as artifacts are considered in detail. Starting from a fairly simple position of recognizing the need to record the visible remains of a formative period of occupancy, the importance of context soon became obvious. These structures, so much a part of their surroundings that they often take on the contours of the land they stand upon, were evidence for a widespread cultural change. In trying to understand the function and role of a single woolshed one is drawn to consider the regional dynamic and from there to the relationship of the region to the colony as a whole. Because of the position of the country as a supplier of commodities to industrial markets, there is a need to consider the wider context in which the wool grown in this isolated area eventually came to be used. But time is finite and the distances in the Australian inland are long, so it was necessary to concentrate the field resources on the preliminary recording of the artifacts themselves for they form the basis of the study.

The emphasis of the field survey was on making a general reconnaissance of a region with a view to locating the remaining structures and then recording them in a preliminary way. More detailed work would have to wait for an analysis of the preliminary findings and the emergence of research questions from that process.

The study area is a large and isolated one where little research has been attempted for the colonial period, except for the work of the historic architect Peter Freeman, whose study of Riverina homesteads and woolsheds has provided a valuable record of some structures. However, the perspective of an architect is quite different to that of the archaeologist. My interest was in locating and recording all the woolsheds, his in the more interesting or aesthetically pleasing examples. Moreover, my concern was to reconstruct the sheds as working buildings, as factories for transforming a raw commodity into a product geared to an international market. Finally, the task of the archaeologist
includes relating the structure/artifact to the context in which it was built and preserved, for meanings are time specific. The emphasis of the survey was, therefore, on locating as many sites of the pastoral age as possible and making preliminary records. I make no claim that this is sufficient or exhaustive, and indeed hope that other workers will take up aspects that were outside the scope of this survey.

When recording the materials used in the structures, the likely sources as well as the economics and style were considered in the light of the transport links existing at the time and the local availability of suitable timber. Techniques of construction carried the mark of the cultural baggage of their builders. The simple but strong slab hut on Euabalong was a very basic structure, completed in a direct and austere way. Yet, in its separation of cooking area from living quarters it bears the mark of a European taste. Likewise, the accurate adze work and careful finish on the large drop-log houses at Wooyeo and Willanthry suggest the presence of experienced builders. Similar materials and methods were also used for many service buildings. It is thought that the technique developed near to the Murray River where the short but straight pines were in plentiful supply and provided a convenient way to fill in a timber frame. Gaps were often infilled with mud, and the historical architect Cantlon argued that it was only a matter of the proportion of timber to mud that distinguished the technique from that of wattle and daub construction. Cypress pines were abundant along the Lachlan and they were easy to work in contrast to the hard eucalypts. Whole logs were used, so there was no need to saw them and they were also more resistant to weathering when left intact. At a time when bush workers usually possessed great skill in working wood, the technique would have been quickly learnt once its advantages had been noticed.

The types of structures found by the field survey also raised questions not only about culture, especially in the homesteads, but also of occupance. Why, for example, would anyone build a woolshed on such a large scale as Wooyeo or Coan Downs so far from any support network. The context provided many suggestions of economic links to markets for the product of the annual wool clip. The pattern of land use was also a matter for study in order to understand the way the woolsheds functioned, for the isolation of the area imposed a need for self-sufficiency and storage. The work-flow within the woolshed was traced and found to be a spare, efficient and practical one which controlled the flow of prepared sheep in one end, to the shearing board, where the wool was converted into a product for distant industrial markets. Classing, packing and storage of the product was also smooth and continuous. Some sheds had extra refinements to assist the work flow, such as the raisable gates at Uabba and Naradhan, or the many and various loading devices such as hoists, pulleys, skids and platforms. The perspective of archaeology was valuable here because the interest was in the building as a functioning unit with links to a larger industry.

Changes over time were also a concern of this study. Patterns emerged
from a comparative study of the woolsheds, with the early small and improvised buildings giving way to large, expensive and planned sheds that reflected the expanding market and high returns of the time. The biography of individual structures also revealed the changing economic fortunes of the industry through expansion and the adoption of new technology such as steam engines and mechanical shears, followed by contraction of the market, neglect, partial use and recycling as farm storage.

A glimpse of the social fabric was revealed by the study of the homesteads. The centre of life in this isolated area, the homestead revealed much about the origin, aspirations and attitudes of its owners as well as the technical skills of the people who lived and worked there. The study located homesteads over a wide range of the social and economic strata. Generally, a strong relationship was found between the scale of the property, its proximity to permanent water, and the resources used in the homestead. My emphasis was on identifying the spatial relationships within and between buildings and in establishing the time sequences of construction. In the earliest houses, there was a detached kitchen area, probably for safety and comfort in the hot, dry climate as much as for maintaining a social distance. Many of the homesteads included sufficient rooms to have housed servants in the family area but no systematic study was made of the social use of space. This is an aspect that would repay investigation.

Likewise, the role of women was only touched upon lightly. The obvious divisions of space were noted with sitting rooms, service rooms and special-purpose rooms such as nurseries and school rooms being identified where possible from owner reports, fittings or equipment in situ and other physical signs of habitation. The sample size is rather small, thirteen sites in all, so that it would be impossible to generalize about social matters on the basis of the remains alone. However, by comparing and contrasting the spatial relationships within and between the homesteads with those of a known date and function elsewhere, a useful expansion of the field may be possible. Some written records survive from the later stages of settlement in the area and these augment the record. Overall, however, women remain almost invisible in the early phases of settlement along the lower Lachlan. With the more established conditions of the 1860's, the trail widens a little as larger and more comfortable homes were built with the space and facilities for a family presence. Assumptions about the presence and status of women, however, could be rash at this stage as single men of wealth and education expected comfort as their circumstances improved.

To seek the traces of women only in domestic space is also a troubling concept which may be a preconception about Victorians not appropriate to the colonial frontier. It is quite possible that there were women present from the earliest phase, but that they assumed roles and lifestyles indistinguishable in the record from that of the men present, if there were indeed men there. The Mrs. Foster who is well remembered for discovering gold beside Lake Cargelligo, left no occupation trace in the burr-cutters camp where she cooked and lived
with her husband. It is only the accident of the gold that has cast light on her presence.

After considering the architecture of the lower Lachlan, certain features emerged as typical of the area though not unique to it. All the homesteads are single storeyed. Three have a pisé section and two are of brick, while the rest are of timber in various techniques. There are few materials from outside the area except for the ubiquitous galvanized iron, and this encourages an austerity of form. The early and universal adoption of the verandah was a sensible response to the climate, made possible by the traditions brought by the settlers and the materials available locally. The need for ample storage space was imposed by the isolation and is to be seen in both domestic and work areas. Store rooms abound in the homesteads and associated service buildings while sheds to store fodder, equipment and spare parts dot the surrounding area. Woolsheds also included capacious areas to store wool until transport could be arranged. The need for self-sufficiency also encouraged the growth of a group of other structures surrounding the homestead, usually of simpler construction and materials, for staff housing, storage, work and recreation. Perhaps the common bond among homesteads both large and small is choice of site. All are located as near as possible to a permanent water supply and all have elaborate and extensive water storage facilities.

Those differences found between the stations and also among the structures on particular properties seem to reflect individual differences of taste and resources more than any particular cultural or ethnic differences among the settlers. Of the first wave of graziers in the area, few details are known except the names on the leases which are exclusively Anglo-Celtic. There is uncertainty about the construction date of the first structures, so it is difficult to link the surviving buildings to any individual or group. There is no evidence to suggest the presence of any particular minority group that may have brought a recognisable building tradition such as, for example, that imported by the German settlers in South Australia. The gold rush brought a more varied group of people to the area, but it was in 1873, long after the first homesteads were complete and the local style of austere comfort had taken shape. There are traces in the documentary record of Chinese ring-barking teams, but they camped during the course of the contract. Chinese gardeners are also mentioned in station records and local newspapers but no structures were found that could be related specifically to such a group. On the stations they probably occupied standard station accommodation or else flimsy buildings that have been lost, possibly in the regular flooding of riverside sites.

The structures located and recorded during the field survey are one aspect of the culture which established itself on the fragile plains of the lower Lachlan in a brief period of expansion. The previous inhabitants had maintained a hunter-gatherer culture for at least 40,000 years using a subtle range of fire management and nomadic subsistence, but they were quickly supplanted by
the new settlers. The industrial technology, new diseases and determination of the new arrivals pushed the Aboriginal people from the better areas. The migratory patterns of the animals they hunted were disrupted and the whole basis of land use was changed.

The land use methods of pastoralism were presented in detail because they were important to the subsequent problems that became apparent during the great drought of the 1890's. The settlers had brought a set of expectations and applied them without much local testing, producing some unexpected results. The process of learning about the local environment and fitting the strategies of production to the reality of an arid and variable region is a central interest in this study. The development of pastoralism depended on a technology of fencing the runs to confine the stock and minimize the need for labour, combined with water conservation techniques to ensure a year round supply of water. This changed the underlying patterns of plant growth as continuous grazing all the year prevented regeneration and the concentration of animals near water sources led to local erosion of the soils. Moreover, it encouraged the spread of introduced species. Plants spread by flood along the watercourses, by being carried by animals especially along stock routes, by accidental inclusion in seed grain as well as by wind and bird. There was a vigorous campaign to eradicate the indigenous wild dogs which preyed on the helpless sheep but other species established themselves with even greater impact. The green blowfly had arrived with the European settlers and found the heavy concentrations of sheep suited it well. The spread of the hybrid rabbit from its base near Geelong is a particularly dramatic example of colonial expansion.

Culture shapes the landscape on which it depends. To approach the complexities of the interaction of the settlers with the environment they colonized, I introduced the concept of an ecosystem and a formal model of the environment. Historical archaeology, by its nature and history, uses such tools to study past human behavior as revealed by spatial forms in both individual places and wider regions. The human-land relationship through time leaves a characteristic signature on the landscape and this is itself an artifact open to study. It was well established that the previous occupancy of the land had been a nomadic hunter-gatherer subsistence system using fire as its major tool of environmental manipulation. Long term exploitation of animals often alters the age and gender composition of the herds but does not change the underlying demand on resources. Favoured species of plants can also be encouraged by this type of occupancy but the scale of such change is kept small by the low population densities. Simmons model of energy flow in ecosystems demonstrated that the energy demand put on the ecosystem by such an occupancy was very low in terms of the flow of energy into the system from the sun which was then stored in green plants. The arrival of the pastoralists was to radically rearrange the energy load on the system.

The technology imported by the pastoralists was an industrial one which
redirected the flow of the available energy, that is the material stored in plants, into the world economic system. Only a small proportion of the total energy which the sun radiates onto the earth is captured by the process of photosynthesis but it is on these plants that the whole pastoral system depends. The economic rationale of pastoralism was the efficient production of a bulk export commodity, so the resources of the peripheral areas became linked to the central economies of Europe where the raw materials produced in the colonies fed into the factories for secondary processing. On the lower Lachlan, the European pastoral system increased the flow of energy through the ecosystem with its management techniques. Especially at times of stress, such as during drought or when falling prices encouraged heavy stocking, more energy flowed out of the system than came into it from the sun and photosynthesis. Pastoralism then drew energy out of the capital of the system by consuming the perennial grasses as well as the annual growth. The settlers were not aware of the risks they were taking as they were still in an early stage of learning about the environmental limitations of the area. The drought of the 1890's was a sharp lesson.

While the settlement phase in the area lacks written evidence, there are considerable documentary sources relating to the period of the drought. The one that I found most useful for this study were contemporary journal and newspaper accounts of conditions, the station books of Hunthawang which are now in the ANU/ABL collection of the AML&F Co. papers, and the Report of the Royal Commission into the Western Lands written in 1901. The local, state and official sources combined to present a graphic account of the collapse of a system with details of its human and environmental dimensions during and after drought.

Interpreting the archaeological record often depends on abrupt endings. The documented collapse of the first experimental land use provided an appropriate case study to apply the mathematical model of catastrophe theory. Here the model charted the collapse of a particular system but it could also be applied to other archaeological situations, especially those involving a transformation of land use. Renfrew has already written of some of the implications for the use of mathematical models in cultural transformations and it may offer a useful tool in settlement studies.

The response of the settlers after the drought was on both the individual and group level. Perception of the land had been modified by experience and farmers sought to introduce safeguards such as irrigation and diversification as they re-established themselves. The official response saw changes in land tenure, the building of large water conservation schemes, the provision of transport and communication links and a growing net of government regulation and control. The feedback loops established by this process have proved partially effective in maintaining the agricultural use of the land but new limitations have emerged with salinity, toxic algae and soil degradation problems. Conditions in the Western Division, north of the Lachlan, have once more reached a crisis point.
as the measures implemented after the great drought prove to be ineffective in establishing long term stability in the ecosystem. The process of coming to terms with the environment is still in a very early and experimental phase, so the formal model of an ecosystem provides a framework for approaching the emerging chains of adaptation and landscape adjustment.
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The journals were first written during Budd’s retirement during the 1914–1917 war. They were destroyed in a house fire and then re-written.

The Journal is held by the Lake Cargelligo Historical Society, which published some extracts from it in a series of short excerpts in The Lake News during 1968 and 1969.

Theses


