# *SOCIAL AND ENVIRONMENTAL CHANGE AS DETERMINANTS OF ECOSYSTEM HEALTH: A CASE STUDY OF SOCIAL ECOLOGICAL SYSTEMS IN THE PATERSON VALLEY NSW AUSTRALIA*

BY

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## Declaration

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(Signed):
Alan Cameron Archer

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## Abstract

An environmental history approach is used in this thesis as a foundation for the analysis of the social and environmental changes that have occurred from the ancient past to the present within the Paterson Valley in New South Wales, Australia. The study examines the biophysical basis of the valley's ecological processes and then describes the influence of the activities of Aboriginal peoples and subsequent European colonisation on the landscape.

The study makes use of the various methodologies within social and ecological systems to assist with the analysis. It demonstrates the value of concepts such as complex adaptive systems, the adaptive cycle, panarchy and ecosystem health as ways of conceptualising complex transdisciplinary issues to reach conclusions based on temporal and spatial evidence. The complex relationships that the Aboriginal peoples had with the environment are compared with the various and rapid phases of colonial influences and processes.

The social dimension of the changes over time is examined particularly with respect to the Indigenous and European institutions and infrastructure that influence the landscape. A significant issue identified in the study was the changing influence of Western institutions on the ecosystem health of the Valley; from local to global. The implications of this on ecosystem health are discussed. The Valley's landscapes are divided into alluvial and non-alluvial, with the latter receiving the most attention in the study primarily due to its more extant nature whereas the alluvial rainforest has been virtually eliminated through extensive land clearing. The analysis of the non-alluvial landscape shows how important the Indigenous land management practices were in the maintenance of a complex mosaic of vegetation types specifically influenced by fire.

The impact of the removal of the Indigenous influences on the landscape and the imposition of European practices and processes have seen a major reduction in the

Valley's ecological complexity. The study identified processes and factors external to the Valley which are increasingly influencing it. Not all of these are detrimental but they result in the Valley's ecosystem health being more dependent on global events and processes.

The study demonstrates the value of the ecosystem health framework for conceptualising the Valley's ecosystems and the adaptive cycle for analysing and understanding their changes over time. These approaches provide an opportunity to identify pathways for future management of the Valley's resources.

## Abbreviations

| | |
|---|---|
| AA Co. | Australian Agricultural Company |
| ADB | Australian Dictionary of Biography |
| ASL | Above Sea Level |
| BP | Before Present (millions of years) |
| CMA | Catchment Management Authority |
| COAG | Council of Australian Governments |
| CSIRO | Commonwealth Scientific & Industrial Research Organisation |
| DC | Dungog Chronicle |
| DPI | Department of Primary Industries |
| ESD | Ecological Sustainable Development |
| HRA | Historical Records of Australia |
| HRGA | Hunter River General Advertiser |
| HRS | Hunter River Settler |
| ML | Mitchell Library/State Library of NSW |
| MM | Maitland Mercury |
| MM Sat | Maitland Mercury Saturday edition (weekly) |
| NC | Newcastle Chronicle |
| NH | Newcastle Herald |
| NSW | New South Wales |
| PWD | Public Works Department |
| QLD | Queensland |
| RFS | Rural Fire Service |
| RLPB | Rural Lands Protection Boards |
| SG | Sydney Gazette |
| SH | Sydney Herald |
| SMH | Sydney Morning Herald |
| SOI | Southern Oscillation Index |
| TA | Tocal Archives |
| T&CJ | Town and Country Journal |
| The Aust | The Australian |
| The River | Paterson River |
| The Valley | Paterson Valley |
| THN | Tocal History Notes |
| WC&IC | Water Conservation & Irrigation Commission |

## Note regarding References and Conventions

### References

These are recorded by the following means:

- Newspaper and other periodical references are fully cited within the body of the thesis and any abbreviations used are recorded in the above listing.
- Books, journals and other references are recorded in the References Cited list, where specific items are referred in the reference, a page number is provided within the body of the thesis.
- Web references are mainly recorded within the thesis and the majority have been accessed in late 2007. Where they have been accessed at early times, the date of access and download is recorded.
- Footnotes are used to a limited extent, mainly for a particular reference or clarification of issues raised within the text.
- The study has involved extensive background reading and a full listing of these sources is recorded following the references cited as Background References.

### Conventions

- The term ‘Indigenous’ is used to refer the era of time during which Australia was peopled by its original inhabitants.
- The terms ‘Aboriginal’ and ‘Aborigines’ are respectively used to describe the original inhabitants of Australia

## Introduction

I undertook this study because of my interest in environmental history and my urge to understand more about the Paterson Valley; how it had changed over millions of years and was still changing (Map 1.1). The study began with an accent on environmental history but it was necessary to adopt a much broader theoretical framework and analytical approach to gain the most from the gathered evidence.

I first came to Paterson Valley in March 1975 and have since worked in the Valley at Tocal College, Paterson. The College consists of several farms and at first I managed one of the farms, but from 1987 I have had the responsibility of overseeing the entire College farm in my capacity as Principal. Before I was appointed Principal I taught students (both youth and adult) a range of agricultural practices. In this teaching capacity I worked in association with local farmers.

Since my arrival at the College in 1975 I have also been active in many local affairs in the lower Paterson Valley and have come to know people and farms throughout the Valley. For example, soon after I arrived in Paterson I joined the Paterson Historical Society and became President; a position I have now held for more than 25 years. These experiences demonstrate that I have lived and breathed the Paterson Valley as a locality and have been part of it for most of my professional career.

My university studies resulted in an Agricultural Science degree specialising in Agricultural Botany and Plant Ecology. The interest in this area had been sparked because I grew up on a grazing property. I had been exposed to the concepts of land conservation through the actions of my father who had our family property proclaimed a Wildlife Refuge under the NSW Fauna Protection Act. The property was selected by my grandfather who then cleared it to raise finewool sheep. He was, however, mindful of the need when clearing, to leave trees for shelter, conservation and timber. As a member of a family of graziers, I felt part

of the ongoing history of the landscape: conservation was often a topic of discussion.

My first professional years were spent in the Top End of the Northern Territory seeking to establish intensive livestock grazing systems in these well watered parts of northern Australia and this included working with graziers on the wetlands east of Darwin examining livestock production systems, in particular those with water buffalo.

After relocating to the Paterson Valley and reflecting on my experiences in northern Australia, it seemed that the processes and systems that were operating in northern Australia were very similar to those occurring on the Tocal property and the Paterson Valley. My challenge in educating people about agriculture was to give an understanding of the actions that one could take to manage land that would be both profitable and sustainable. I had always felt that long-term profitability and sustainability were the same thing, so when speaking about family farms, the idea of sustainability was always seen as being synonymous with profitability. Over the years these concepts have developed further both in my mind and in the community's collective mind.

I have written a number of short articles, papers and booklets on the Valley's history and locality. This made me a researcher for the study as well as a research instrument, as described by Connor et al (2001). In this paper Connor and her colleagues examined methodologies for performing qualitative transdisciplinary research. As a result, I have made every effort to remain as detached from the evidence as possible, particularly when it comes to analysis and interpretation. I called on the expertise of a number of my colleagues to comment on the content of the study to ensure it was robust. While at times many matters were debated and continue to be debated, I feel that the local scientific and technical information particularly regarding the Tocal property has been thoroughly examined by others who have an extensive knowledge of the subject. Unless this type of examination occurs, the broader assumptions and issues raised through an environmental history study are flawed because of possible errors in the base evidence.

In my 30 years of recording local history, I had obtained significant local knowledge related to the Valley but that experience alone was clearly not enough for a study of this kind. Accordingly a strategy was put in place to obtain as much information as possible relevant to the past, present and future ecosystem health of the Valley. In 2003 the services of Technical and Field Surveys Pty Ltd were obtained to prepare detailed mapping information of the whole Valley with special reference to the Tocal site. A suite of mapping evidence was developed and used at strategic points throughout this study. The mapping evidence has become a fundamental element of the study, giving strong qualitative evidence for phenomena that can be or have been measured. Most of the maps are within the thesis, however, some appear in Appendix 1.

**Box 1.1 Paterson Valley and Tocal Facts and Figures**

Paterson Valley covers an area of 118,000 hectares and has an approximate length of 75km and approximate width of 17km. The River is 170km long, its main tributary, the Allyn is 90km long. The tidal section of the Paterson River is 31km and the aggregate length of the drainage network is 4,200km. The altitude of the land in the Paterson Valley extends to 1500m ASL and the areas of land in particular altitude heights are 0-10m 40sqkm; 10-100m 300sqkm; 100-200m 250sqkm; 200-300 200sqkm; greater than 300m 390sqkm. Much of the land dealt within this study lies below 200m however, clearing has extended it to at least 300m in some locations.

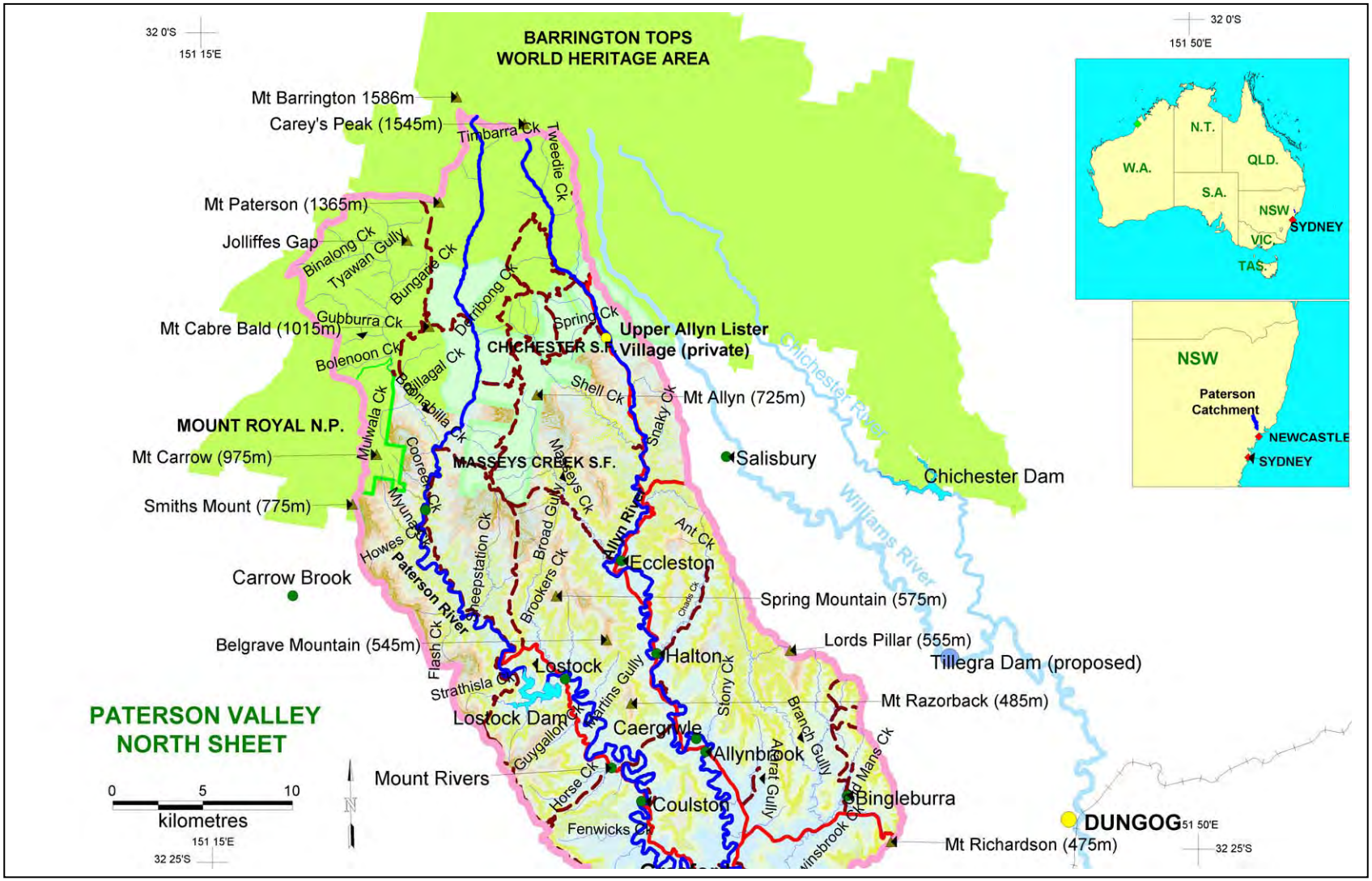
The Tocal weather station is located 32° 38'south and 151° 35' east and is 30m ASL. The approximate population of the Valley excluding the villages of Largs and Hinton is 2500, calculated from the estimated number of postal addresses in the villages and rural areas.

About 40% of the Valley is covered in forest; this has increased by 6% since 1972 (Land Sat Images 1972-2001) with the remained of the land being grazed pasture or arable.

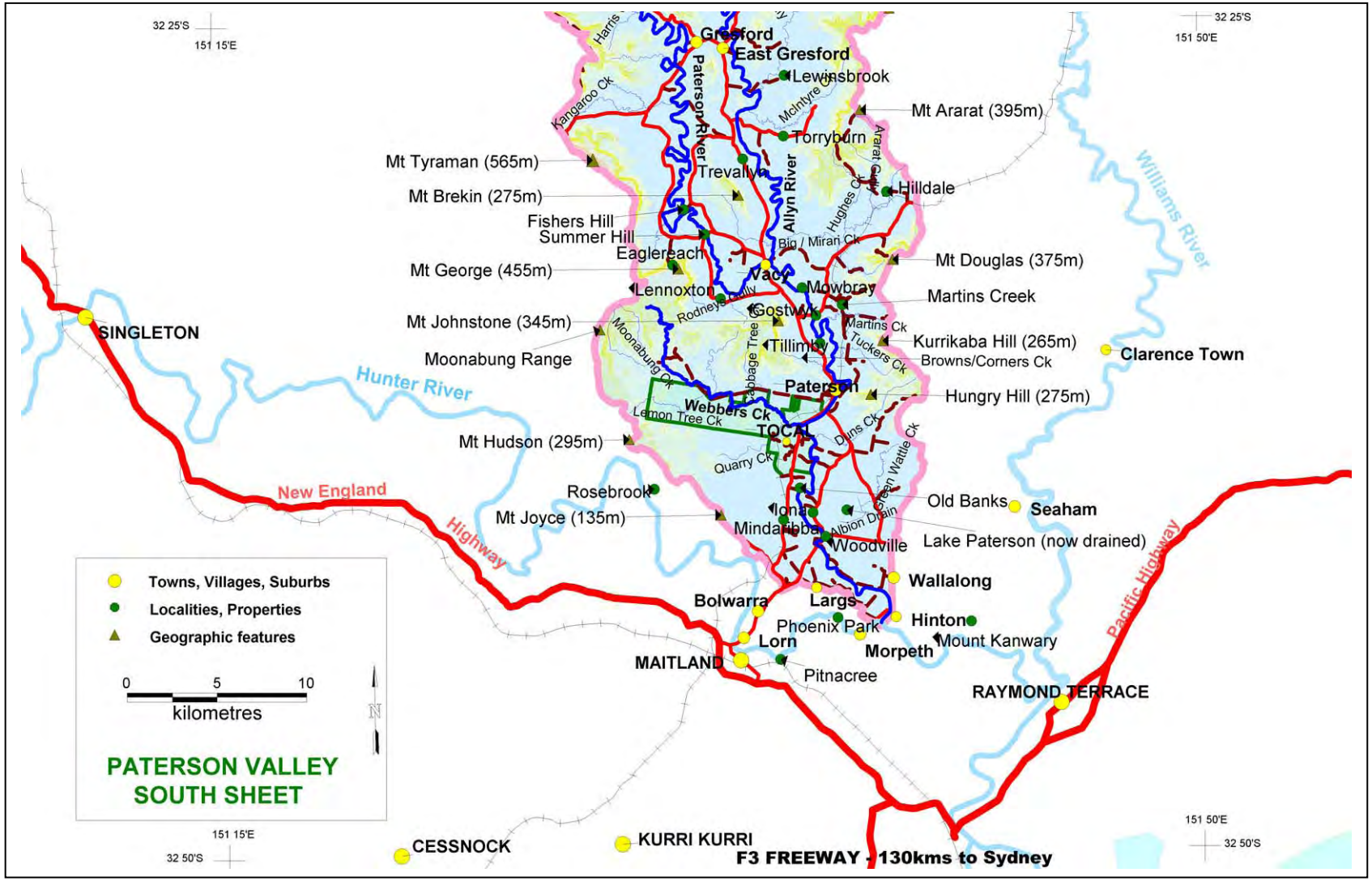
The Tocal property contains 2200 hectares of land lying in a 10km long strip west of the Paterson River. The property is 1-2km wide with a 6km frontage to the Paterson River, taking in much of the alluvial land of the lower Webbers Creek Valley. It has been subdivided into around approximately 150 paddocks including tree lots and livestock holding areas ranging in size from 0.1 ha to 247 ha, requiring 150km of fencing which includes 36km of external boundary fencing.

The property runs up to 1200 head of beef cattle including 550 breeding cows, 380 dairy cattle including a milking herd of 200, 120 horses and up to 500 sheep. It also contains a poultry broiler farm with an annual production of over 1 million birds. The dairy produces around 1.7 million litres of milk annually.

Map 1.1 Paterson Valley North Sheet



Map 1.2 Paterson Valley South Sheet



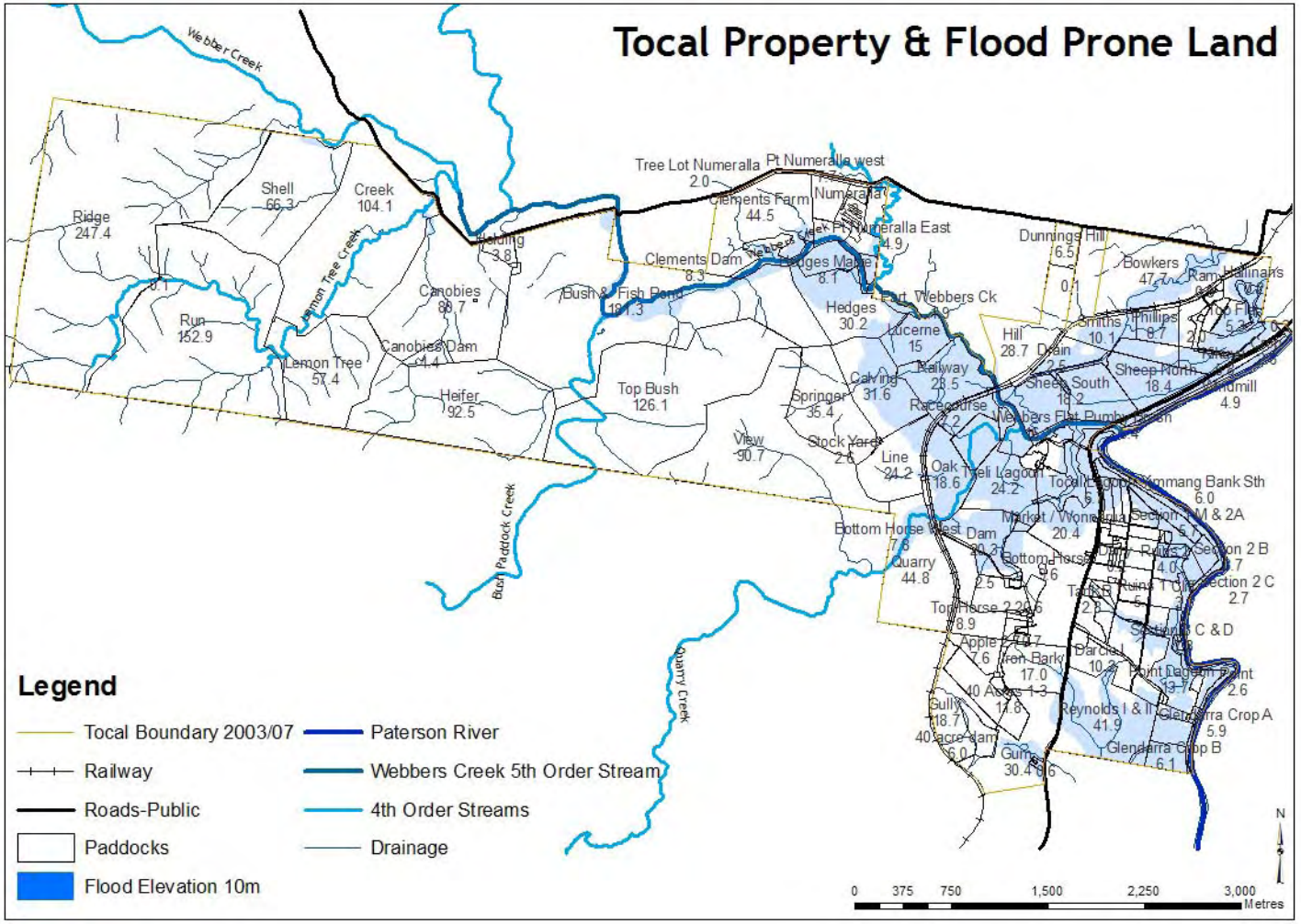
I have located every known government report associated with the Valley and I have reviewed each of them with respect to the ecosystem. Key examples of these reports are those associated with the Hunter River floodplain and floods, including Hawke (1958), Patterson Britton & Partners (1993, 1995, 1996). These have proved to be an invaluable source of quality technical information to incorporate into transdisciplinary research.

From the 1980s until the present, I have, as a member of the Paterson Historical Society, undertaken a number of interviews with elderly and/or former residents on their knowledge of the Paterson Valley. In some cases these were taped and in some cases information was immediately recorded from handwritten notes. These notes were then taken back to the respondent for checking and correction. In some cases the final interview document went through a number of drafts before the respondent was entirely happy with it. These interviews have been a valuable source of information on the environmental history of the area, even though most of the interviews had an overall local history emphasis rather than relating specifically to environmental history.

A wide range of written resources have been used to assemble the information for analysis in the study. Much has come from fellow members of the Paterson Historical Society who generously offered their information for this research but also local, state and national archives were combed for relevant references and sources.

Fortunately there are a number of works of art relevant to this study and these have been drawn on as valuable evidence written in an environmental history context. I have been very mindful in using works of art not to rely on them as the sole source of evidence for what the environment may have been like. For example, Bonyhardy addresses the issues of the proprietary of clearing in colonial NSW and how that impacted on the way landscape was depicted (Bonyhardy 2000:84-90). He indicates some artists deliberately omitted stumps from landscape paintings because their aim was to present a civilised image of the

Map 1.3 Tocal Property including flood prone land



colony. A civilised landscape would be ordered and tidy, not littered with dead trees, fallen timber and stumps. Semple questioned whether artists could be trusted to accurately portray past landscapes. After examining a range of colonial landscapes, Semple concludes that artists 'distort, omit, gloss-over, change seasons and moves things around, and of course, they have a licence to do so' (Semple 2005:8). All my interpretations of artworks have borne the above issues in mind.

As well I evaluated the integrity of written evidence against four criteria identified by Forman and Russell (1983). These are: is it a first or second hand observation? Could the statement be biased because of its purpose? What was the author's knowledge of the subject? What was the context of the statement? These criteria have enabled me to the select the most relevant and accurate evidence for the study.

The evidence on Indigenous land use has been based on all available records from activities known to have occurred in the Valley but given the limitations of this knowledge base, information has also been gained and extrapolated from other locations in Australia. In these cases it has been made clear in the text where the evidence had been sourced.

The thesis draws on a range of sources to provide evidence from which an understanding of the Valley's environmental history and processes can be deduced. Some of these are given in full to avoid criticism that evidence has been selectively quoted and to avoid any suggestion that the case mounted on such evidence could be flawed. I have discovered that one the most contested areas of environmental history is the nature of Australian vegetation pre 1750 – therefore evidence regarding vegetation is relatively more detailed compared to other evidence recorded. In Chapter 1 the principle that guided my research will be discussed – a transdisciplinary approach. To address this challenge, a very broad evidence gathering strategy was necessary but it became clear that there were some areas where valley specific evidence was not available. For example, information regarding fauna and vertebrate pests is limited and difficult to draw into any form of comparative analysis – compared to the information relating to

vegetation. There is enough generalised evidence to assume that the changes occurring in the valley mirrored those occurring elsewhere in Australia eg Marshall (1966), Rolls (1969). Therefore, when I refer to the reduction of biodiversity and complexity, I mean the loss of much of the fauna which I assume existed pre European influences. The social dimension was the other area where evidence was lacking, I have attempted to address this in Appendix 4 by including some poetry that relates to relevant issues of the day.

My interest in local history through the Paterson Historical Society was initially more from the point of view of the general local community, its families, and the history of buildings and properties. My interest in environmental history as an area of study was stimulated when I happened upon the book *Nature Contested. Environmental History in Scotland and Northern England Since 1600* (Smout 2000). While Smout's book is about a region very different to the Paterson Valley, there are many similarities and stimuli that caused my interest in agriculture and local history to converge. By chance while travelling in Gippsland I obtained *Forests of Ash. An Environmental History* (Griffiths 2001). My experience in northern Australia, Smout's Scottish environmental history and Griffiths' story of the mountain ash in Gippsland caused me to think that the story of the Paterson Valley needed to be told.

My interest was further stimulated by the work that had already been undertaken on the region's environmental history, in particular Knott et al (1998) and Albrecht (2001). These papers had examined important elements of the region but there was much more that could be done. This thesis represents an attempt to address such a need.

To expand the knowledge base needed for a more complete environmental history I have sought additional conceptual frameworks for analysis of the evidence that I gathered. Evidence gathering proceeded to search for relevant frameworks as I felt it was necessary to identify the scope of the evidence and the issues that were raised. I had been introduced to the ecosystem health approach at the outset of the study, so evidence gathering was based around the transdisciplinary methods utilised by this framework.

My overall research approach mirrors the concept of adaptive management as outlined by Berkes and Folke (2000:10-11) which saw me taking an inductive or heuristic approach, not based on traditional hypotheses but centred on an iterative process. Leads and issues were followed up as they arose, one led to another and the final position was not clear until all available evidence was to hand. The study did not commence with a series of preconceived ideas which had to be proven or disproven.

A study that covers such a long time scale and that examines the relationships between social and ecological systems creates both advantages and disadvantages in evidence gathering. On one hand it gives a broad scope of the identification collection of evidence and on the other hand, the restrictions of space to accommodate all available evidence means that not all that was collected, could be incorporated into the final manuscript.

Another important aspect of the research was the challenge of balancing the search for and subsequent use of qualitative versus quantitative evidence. In many cases either only one or other was available and there were very few cases where change could be reliably benchmarked over time. Perhaps the clearest example of benchmarked quantitative evidence has already been used; Box 1.1 provides evidence that the forested area of the valley has increased 6% between 1972 and 2001.

The thesis is split into three parts and eight chapters: Part 1 titled Order in the Valley includes Chapter 1: Theoretical Foundations covers the theoretical basis of the study; Chapter 2: The Basis for Resilience – The Biophysical Environment covers the geology and soils, the climate (excluding graphs of the data as they are in Chapter 7 which includes climate change) and a brief reference to vegetation. Chapter 3: The Indigenous Era covers the influence of the first wave of humanity on the Valley concluding with a detailed analysis of the issues associated with vegetation, particularly the Tocal property.

Part 2: Crisis in the Valley covers the second wave of humanity on the Valley – the European Era. Chapter 4: The Imposition and Development of European

Infrastructure and Institutions details how Europeans established themselves within the landscape with specific reference to social and economic practices likely to influence the environment. Chapter 5: The Exploitation of the Alluvial Landscape describes how Europeans quickly destroyed the rainforest and wetlands ecosystem and subsequent use of that land. Chapter 6: The Transformation of the Open Forest and Indigenous Grassland describes how this landscape has changed as a consequence of European land use. Also referred to as the non-alluvial landscape, it takes up the majority of the Valley land area and the study closely examines past, current and future land management practices in considerable detail.

Part 3: Review and the Future contains two chapters. Chapter 7 titled Taking Stock of the Evolutionary Dance of the Paterson Valley analyses the evidence gathered using the theoretical frameworks and methodologies described in Chapter 1. It also identifies the range of land management trends within the Valley and beyond relevant to the future. Chapter 8: The Future of the Valley briefly reviews the influence of Aboriginal and European peoples on the Valley's ecosystem health. It concludes by suggesting how the Valley's ecosystem sustainability could be ensured into the future.

# Part 1: Order in the Valley

# Chapter 1: Theoretical Foundations

> *Mr. Boydell was cultivating tobacco to some considerable extent, with a hope of being able to supply the colony; others who speculated on larger scale were ruined; for it soon turned out that it was impossible to compete in the cheapness with American tobacco* (Stokes 1846:320).

**Introduction**

Lieutenant John Lort Stokes was from the HMS Beagle which had put into Port Stephens as a result of a violent storm on 5 June 1839. While the Beagle anchored off Carrington, the Australian Agricultural Company's settlement, Stokes took the opportunity to travel overland to the Paterson Valley. His journal described his visits to two large and well-known colonial Paterson Valley estates of the time.

The famous naturalist Charles Darwin was not on this voyage of the Beagle but it is appropriate to make the connection between what was happening in the Paterson Valley at this time and the developments in evolutionary theory put forward by Darwin. The Valley was also evolving, both in a biological sense and in a social one because it was being transformed from a purely local economy to one linked to the international economy. This is manifested by Boydell's struggle to compete with his Paterson Valley grown tobacco against cheap imports of American tobacco. No longer was the Paterson Valley a relatively closed economy; it was open to the rigours of competition with the rest of the world.

Darwin's theories are based on the concept of natural selection and continual adaptation within ecological systems. In parallel, this study is also about change and Stokes' observation emphasises that the Paterson Valley as we see it today has resulted from major changes including those in international economic systems.

This thesis attempts to combine a scientific and a sociological approach, in order to understand the social ecological systems of the Paterson Valley.

## 1.1 Eras of Settlement

Dover's *Australian Environmental History: Essays and Cases* classifies Australia's environmental history into three separate eras; Biophysical Australia, Aboriginal Australia and European Australia (Dovers 1994:2). I have adapted Dovers' eras to allow a closer investigation of the environmental history and to provide a basis for attempting to understand the past, present and future of the Paterson Valley: the European era now includes Colonial, State, National and Global eras. The Colonial era began with the arrival of Europeans and concluded at the time of Federation in 1900; the State era and its influences began with Federation and lasted until the 1980s (most of the twentieth century); the National era began in the 1980s and is the period when the National Government (also referred to as the Commonwealth, Federal or Australian Government) took interest in environmental management; in 1990 it merged with the Global era. The latter period is marked by an intensification of the impact of the influences of both world trade and global conventions on environmental management.

## 1.2 Concept of Landscape

Another useful aspect of environmental history is the concept of landscape and how it can also lead to an interpretation of the Valley. This aspect includes the importance of the idea of anthropogenic landscape, which challenges the traditional science-based learning but makes much sense when viewed against the processes and activities that occurred in a farming region. The Valley was divided into two landscapes for the purposes of analysis: alluvial and non-alluvial landscapes. The non-alluvial was much larger than the alluvial but the alluvial was the most agriculturally productive per unit area. The two landscapes have provided a striking set of differences that have been valuable in the analysis, when assessed over time.

The landscape is one of the categories Dovers (1994) suggested as a principle for environmental history. This study endorses the value of landscape but there are another two of Dovers' principles that have evolved in importance as the study progressed, namely complexity and culpability. There is more discussion on complexity later in this chapter.

An issue that continued to arise through the study was the culpability of past generations and its impact on the present (Dovers 1994:14-6)). It would have been easy to blame previous generations for the destruction of environmental complexity and take a judgemental approach to past actions. While this may be implicit in some of the assumptions, through this thesis it was not deemed productive to continue to apportion blame on previous generations. It was far more productive to understand what was motivating their land use actions from a local point of view and also from the broader national or global perspective. The study has tried to place land managers within the context of the pressures, influences and situations they faced. While it was impossible to be certain about all of these influences, it was important to understand them as much as possible within the constraints of the available evidence.

### 1.3 Ecosystem Health

To better understand how the future of the Valley may be driven by its past, I adopted the ecosystem health framework as described by Rapport et al (1998) as a means for analysis. Ecosystem health provides the foundations on which evidence can be assessed and analysed and it provides one of the logical steps for understanding the trends and processes in the study of environmental history which uncovered evolutionary changes in the Paterson Valley. Although there are many attractive aspects of ecosystem health, perhaps the most compelling is its holistic transdisciplinary approach, integrating both the social and physical sciences. Agriculture is an intersection of biophysical and social systems that aims to produce products and services for the community and so it is appropriate to analyse it within the perspective of ecosystem health.

Rapport describes the shortcomings of approaches to environmental management and the need for the transdisciplinary features for assessing or examining ecosystem health. The three disciplinary models which have driven environmental management to date are economic, ecological and engineering, all of which have disadvantages when it comes to addressing environmental issues (Rapport 1998a:9). The economic approach fails to take into account the concept of natural capital and the impact of today's actions on future generations. Economic approaches are only effective when all elements of an economic process are

accurately valued; something that is difficult to do when it comes to the environment. An economic approach to assessing ecosystem health does include humans in the equation but the traditional ecological approach does not. As Rapport argues *the focus of mainstream ecology is nature – without humans* (Rapport 1998a:12). Traditional thinking suggests that an ecological approach to addressing environmental issues would be sufficient, but because ecologists (and science in general) exclude humans, ecology alone will not be effective in resolving environmental issues. The third approach, engineering, also has limitations, mainly because its 'command and control' nature fails to recognise the complexity of environmental issues (Rapport 1998a:12). An engineering approach may often attempt to resolve an environmental issue by implementing a simplistic intervention (not necessarily low cost) only to find that the problem has been made worse or changed to be manifested in another form.

My adoption of the ecosystem health framework led me to taking a transdisciplinary approach (Albrecht 1998, Higginbotham, Albrecht and Conner 2001, Rapport 2003, Somerville and Rapport 2000) when seeking and accumulating evidence for analysis. It promotes thorough evidence gathering and assists in avoiding the pitfalls of omitting any elements important to the analysis of the environmental history of the Valley. Rapport et al (1998) suggested that the problems faced by human-kind are real world problems which are not confined to a domain covered by a single discipline; something which is particularly evident in a complex system like the Paterson Valley.

In reviewing the principles of environmental history Dovers suggests that *the environmental historian must be a jack-of-all-trades* (Dovers 1994:12). He also says that evidence gathering needs to be egalitarian using all available methodologies and sources. A transdisciplinary approach is therefore an appropriate way to undertake research into environmental history of a region. It reinforces the ecosystem health framework and is consistent with requirements of environmental history research.

## 1.4 Social Ecological Systems

The expanded environmental history and analysis of ecosystem health required ways of understanding complex social ecological systems. This led me to examine complexity theory and associated thinking. Principles and approaches of contemporary theories for the analysis of complex systems in a variety of contexts were reviewed. These included the *Chaos Theory* (Prigogine 1984), *Complexity Theory* (Byrne 1998, Kay 2000, Higginbotham et al 2001), *Resilience Theory*, (Walker et al 2006a, Walker et al 2006b), *Social and Ecological System Analysis* (Berkes and Folke 2000), *Panarchy* (Gunderson and Holling 2002) and *Ecosystem Health* (Rapport et al 1998). A limited review of literature about complex systems was undertaken to identify a useful way of understanding complexity and change within the context of environmental history. It was important that the study not just provide snapshots of the environmental history of the Valley but also show connections between the various eras to identify the processes and reasons for change. Ecosystem health was found to be valuable to use both on a spatial and temporal basis but an additional framework was needed to examine individual processes, localities, landscapes and industries. This combination of social and ecological processes could not be examined individually but required the holistic analysis of a complex system, to be referred to in this thesis as a social ecological system.

## 1.5 Panarchy

As a result of the limited literature review and analysis, the concept described as 'panarchy' (Gunderson and Holling 2002) was identified as the most appropriate system to use in examining the change dynamic within the Paterson Valley over time. Gunderson and Holling used the term to 'rationalise' the interplay between change and persistence (Gunderson and Holling 2002:5). That is, nature is both orderly and disorderly and prediction is limited but not impossible: *Our view is that panarchy is a framework of nature's rules…..*(Gunderson and Holling 2002:21).

Panarchy describes the evolutionary nature of linked adaptive cycles (see 1.5.1), which span space and time scales (Gunderson and Holling 2002:21). The word panarchy comes from the Greek god of nature 'Pan' who was also known to be

unpredictable and associated with chaos. The unpredictability of social ecological systems made them difficult to analyse using previous methodologies and frameworks. The term was coined as the antithesis to the word 'hierarchy' as hierarchy is associated with things literal and with sacred rules (Gunderson and Holling 2002:21) which is also consistent with the need to take a non-linear approach to researching environmental history. The restrictions of a linear approach would mean that the unpredictable, the transdisciplinary and the complex issues may be avoided as being too difficult to address within a linear research methodology.

According to Gunderson and Holling, panarchy provides a means to assist in understanding natural systems which are integrated with human systems. The attractive element of panarchy is that it focuses on understanding transformations in human and natural systems. Here is a way that the social and physical can be linked together in a coherent framework to analyse what is occurring through the Valley, whatever the time scale. Panarchy is a mechanism for understanding the changes in a transdisciplinary way without the dominance of a reductionist approach.

### 1.5.1 The Adaptive Cycle

A fundamental element of panarchy is the adaptive cycle, with panarchy being a way of conceptualising and then describing a series of adaptive cycles over time and space. The adaptive cycles of panarchy have a series of stages: conservation, release, reorganisation and exploitation, see Figure 1.1.

After the accumulated evidence was placed against the panarchy framework of Gunderson and Holling (2002:34) (see Figure 1.2), the adaptive cycle used in this study was modified so that it was more readily applicable to the Paterson Valley. The links between each new adaptive cycle were seen to be important because this study focussed on an agriculturally-based social ecological system over a long timescale. As a result inputs have been added to the cycle as well as outputs or products. Inputs include energy (particularly sunlight or fossil fuels), knowledge, technology and genetic material, fertiliser and any other input that would drive the

cycle. Identification of inputs will become clearer later in this chapter when the idea of attractors is discussed.

Figure 1.1 – Adaptive Cycle from Gunderson and Holling (2002:34)

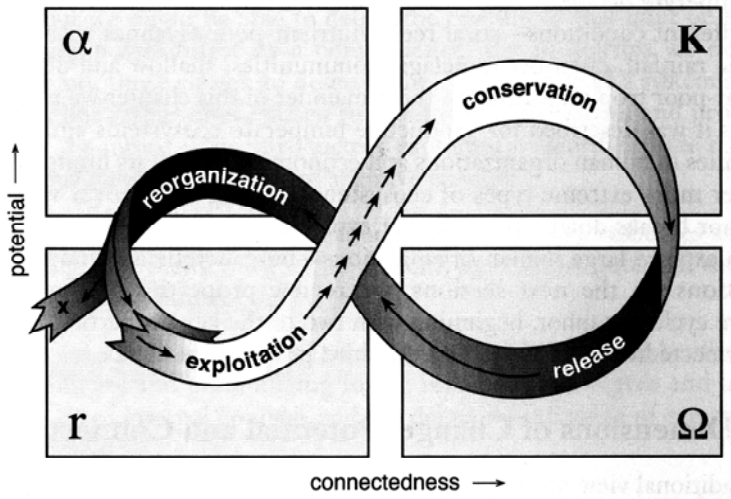
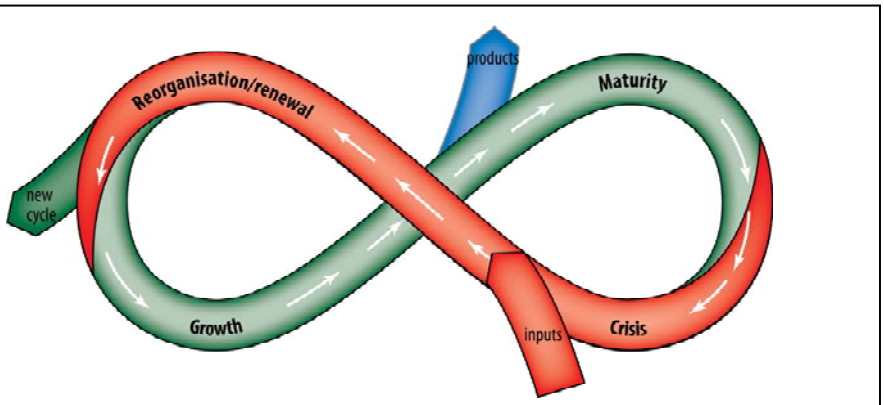



**Figure 2-1.** A stylized representation of the four ecosystem functions (r, K, Ω, α) and the flow of events among them. The arrows show the speed of that flow in the cycle, where short, closely spaced arrows indicate a slowly changing situation and long arrows indicate a rapidly changing situation. The cycle reflects changes in two properties: (1) Y axis—the potential that is inherent in the accumulated resources of biomass and nutrients; (2) X axis—the degree of connectedness among controlling variables. Low connectedness is associated with diffuse elements loosely connected to each other whose behavior is dominated by outward relations and affected by outside variability. High connectedness is associated with aggregated elements whose behavior is dominated by inward relations among elements of the aggregates, relations that control or mediate the influence of external variability. The exit from the cycle indicated at the left of the figure suggests, in a stylized way, the stage where the potential can leak away and where a flip into a less productive and organized system is most likely.

Figure 1.2 – Modified Adaptive Cycle




Other modifications have been made to adapt the cycle so as to make it more relevant to the study of the Valley. The elements of the cycle have been renamed:

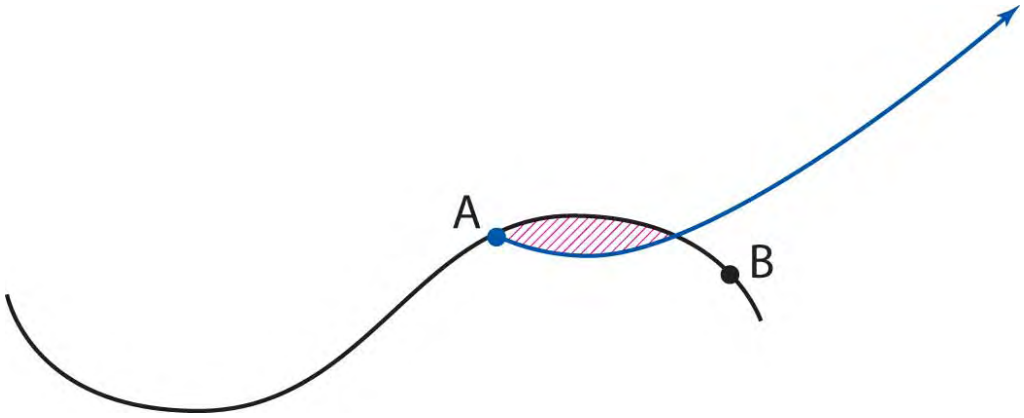
the exploitation cycle has been renamed *growth* because the cycles of social ecological systems in the Paterson Valley have a definite growth phase; the conservation cycle has been renamed *maturity*; then follows *crisis* (the original was termed *release*) and the last cycle *reorganisation* has links with the concept of *renewal*.

The adaptive cycle has been modified to accommodate the idea of products from the system, better termed by Costanza et al (1997) as 'ecosystem services'. Costanza et al identified and assigned economic value to the world's ecosystem services and natural capital. They defined ecosystem goods and services as the benefits human population derive directly or indirectly from ecosystem functions: goods are items such as food; services are activities such as waste assimilation. Costanza et al described 17 ecosystems and functions in the process (Costanza et al 1997:254)

The Valley has been the source of much food production during periods of both Indigenous and European habitation. During the Indigenous Era the impact of food production was much more benign than it has been during the European period. Agriculture is the broad way of describing food and fibre production during the European period. Agricultural production is a significant ecosystem service and has been driven by particular pressures such as markets (external) and resources (within) the Paterson Valley.

The mobius based illustration, which depicts the phases of the adaptive cycle, will be used to assist in illustrating the changes that occurred within and across various eras covered in the study. In each of the chapters covering a description and analysis involving people in the landscape, the mobius  is used to depict change within the social-ecological system. Through its use in this way, there is the immediate integration of all aspects of the social ecological system within the context of change. The background in these figures (4.1, 5.4, 6.1 and 7.6) changes from a dark green, representing the highest level of biodiversity and complexity, to lighter shades of green, to shades of brown – the darkest meaning the most degraded state of the particular landscape or of the Valley as a whole.

Figure 1.3 – Sigmoid Curve from Handy




Those organisations or individuals who do not see change coming move through the maturity phase and down the other side before they react to the change (Point B); at that stage it is much more difficult to change than it would have been earlier in the curve.

The crisis element of the cycle is important as it drives the outcomes for the next cycle. While one can debate where a particular cycle starts, an analysis of the Paterson Valley evidence suggests each cycle is preceded by a crisis, a tipping point, or need to solve a problem. The timing of that need is important and those who identify it early are often able to benefit from their actions. Handy (1995) postulated that the Sigmoid curve sums up how organisations and individuals change. Those that see a crisis coming will change early (point A) and start a new curve before they reach the top of the existing curve or maturity area, see Figure 1.3.

Handy applies this theory to contemporary organisational management and it can be applied to complex adaptive systems, particularly those of individual farms, farmers, industries or localities. Those who change their approach at point A are much more likely to survive and be resilient than those who do not make changes until point B.

### 1.6 Complexity Theory and Attractors

Complex adaptive systems are self organising and need to be studied from a wide range of perspectives (Gunderson and Holling 2002, Kay 2000, Walker et al

2006b). The idea of complexity is fundamentally situated within the laws of thermodynamics (Schneider and Kay 1995). Kay argued, along with Holling and many others in modern biology, that the idea of a forever stable climax stage of ecological succession has been abandoned. Fire, drought, floods, pests, new species and other disturbances produce a shifting mosaic of ecosystem succession in the landscape.

The adaptive cycle is a conceptual framework that enables us to analyse and understand changes in ways that were not previously possible. The modified adaptive cycle contains the facility to identify inputs and outputs of the system which influence its course and evolution.

Albrecht and Higginbotham (2001:56) use the term 'attractor' to describe a factor which influences the evolution of a system. Attractors cause an evolving system to move towards a particular end state. This study adapted the concept of attractors to describe the evolutionary forces that impact on the Valley. Attractors may be natural or human and can appear as 'surprise' versions of both.

In the case of the Paterson Valley there are three key natural attractors. The first natural attractor is the river and the associated gravitational forces which continually draw water and material from the catchment to the Valley floor. The second natural attractor is the climate which influences land use and agricultural production; this attractor is dominant during episodic events such as floods and wet conditions (see Box 2.1). The third natural attractor is the scleromorph population, which has successfully colonised the Valley for millions of years and continues to influence the evolution of the landscape. Scleromorph is a collective name for fire and drought-resistant plants including eucalypt, acacia and allocasuarina genera, see Box 6.2.

The human (Aboriginal and European) attractors associated with the Paterson Valley's social ecological systems include the humans and livestock they introduced. These human attractors have been key elements in the landscape for much of the Valley's existence. The various phases of human occupation and land use have clearly influenced the landscape. A study of a social ecological

system requires the concurrent analysis of the activities of humans within that system with that of the ongoing ecological processes.

The ‘surprise attractors’ are those which surprise the human inhabitants of the system because they arise in an unexpected way. Examples include a new pest or disease. A surprise attractor arises without warning and confronts the resilience of the individual, the farm industry or the locality. There can be no preparedness for such attractors and the responses by those affected reflect this. Surprise attractors may be natural or human-based.

Natural surprise attractors include episodic events such as droughts, bushfires and floods. While they are predictable in the long term, they should be treated as surprise attractors in the context of European occupation of the Valley. During the Indigenous era they probably should not be termed surprise attractors as the Aboriginal people had ways of dealing with and adapting to the episodic nature of the environment imbedded in their culture and lifestyles. During the European era such adaptation has not occurred with any sophistication and successive droughts, floods and bushfires are treated as surprises by the European communities. This has significant implications for environmental management and it will be shown later in the study that it is a point of differentiation between the Indigenous and European land use.

A number of human surprise attractors have driven the adaptive cycle and panarchy. One of these is new technology; examples include the advent of steam power, the internal combustion engine, electricity, machinery and more recently the microchip and Internet. Anthropogenic global warming might be considered another surprise attractor driving the system towards a very different kind of ecosystem.

A further human surprise attractor is the market for the Valley’s ecosystem services and products. An example of this was Boydell’s tobacco enterprise which Stokes reported in 1839. Stokes had observed that some who had grown tobacco were ruined by the cheapness of the American tobacco (Stokes 1846). Later in the thesis examples will be drawn from the evidence to demonstrate the

adaptive cycle working within the various industries and markets operating within the Valley.

## 1.7 The Tyranny of Small Decisions

The adaptive cycle is an iterative process which provides ecosystem services as well as impacts on the ecosystem itself. These impacts are often many small changes rather than a few large, more identifiable changes or impacts. As a result the many small changes may be difficult to detect or respond to, however, over time the cumulative impact of these activities is significant.

The impact of small changes over time is summarised in the saying 'death by a thousand cuts' which originates from a Chinese proverb and is common in the English vernacular. This concept was developed further by Kahn (1966) in the landmark paper *The Tyranny of Small Decisions; Market failures, Imperfections, and the Limits of Economics*. Kahn described the removal of a train service in the USA, the reasons for its removal and its subsequent impact. Odum (1982) took Kahn's concept of the tyranny of small decisions further and related it to environmental degradation. Some writers have recorded this phenomenon and also the consequences of the cumulative effects of incremental changes e.g., Nevill (2002).

An assessment of the changes and the reasons for them in the history and ecosystem health of the Paterson Valley lends credence to the reality of the tyranny of small decisions. Throughout the analysis of the evidence, examples will be used to demonstrate how the tyranny of small decisions becomes an important element in the continuity of the Valley.

## 1.8 Resilience

Rapport (1998b:27) identified vigour, organisation and resilience as specific ecosystem health criteria which are related to primary components of ecosystem health. The use of these criteria demonstrates how the health metaphor can be applied to social ecological systems. Each of these is discussed further in Chapter 7; however, the dominant criterion for ecosystem health assessment in this thesis is resilience. It is the ability of a given system to rebound from disturbance and has been identified by other writers as a core component for assessing social

ecological systems eg Berkes et al (2006) and Walker et al (2006b). Therefore resilience is used throughout this thesis as a way of examining and evaluating change within the social ecological system of the Paterson Valley, as defined by Walker et al.

> *Resilience is the capacity of a system to experience shocks while retaining essentially the same function, structure, and feedbacks, and therefore identity.* (Walker et al 2006b:7)

The adaptive cycle is a valuable model for examining the resilience of the Paterson Valley as it enables an assessment of changes to be made over time, in other words from one adaptive cycle process to another state in the cycle. In a non-resilient system this new state could present as ecosystem distress syndrome (Rapport 1998c:35) or show clear movement towards a new kind of ecosystem. The transformations described in the thesis demonstrate that the Paterson Valley has displayed a high degree of resilience in the face of intense exploitation by Europeans. Although resilience is a relative term and difficult to quantify, it is used in the context of other social ecological systems in Australia that have lost resilience and suffered ecosystem distress syndrome or its equivalent eg Allison (2003), Horwitz et al (2003) and Marshall (2005).

Some of these elements of resilience are based on the ecological integrity of the system, while others involve social and human aspects of the system. Throughout the study there are references to the factors that influence resilience within the Paterson Valley.

### 1.9 Institutions

The study has shown that in social ecological systems it is important to ensure that the impacts of humans are well recorded in the analysis. This study uses the concept of 'institutions' to encapsulate the human component of the Valley's social ecological system. Institutions, for the purposes of this study, are human-based cultural and structural influences on the ecosystem such as legislation, rules, organisations and property rights. Institutions could also manifest

themselves in the form of markets for products such as a regulated or deregulated price for milk.

### 1.10 Land as an Organism

The ecosystem health paradigm also fits with Leopold's view of land as being an 'organism', so the Valley for the purposes of this study is viewed as an organism in a metaphorical sense:

> *The land is one organism. Its parts, like our parts, compete with each and cooperate with each other. The competitions are as much a part of the inner workings as the cooperations. You can regulate them – cautiously – but not abolish them* (Leopold 1993:145-6)

Leopold argues that the land should be seen as one entity consisting of many complex relationships. Leopold's description was really a snapshot view of the land at a particular time. When this approach was extended over time, panarchy and the complex adaptive cycles provided a very strong means of analysing change. Placing an holistic approach of this nature together with the accumulated evidence provided a sound basis for the analysis of the Valley's sustainability.

### 1.11 Conclusion

The changing nature of the ecosystem health of the Valley is viewed as a social ecological landscape which features an interacting series of nested systems changing over time. Hence panarchy has been applied as a way of understanding the evolution of the Valley's landscapes. Panarchy enables an examination of the interconnectiveness and links between and within the activities of the Valley and the way in which these impact on ecosystem health. The idea of the Valley being treated as a continually evolving organism fits the concept of panarchy and the associated adaptive cycles over time.

To understand the Valley's environmental history in a temporal sense, the Biophysical, Indigenous and European eras were adopted from Dovers 1994 and extended. To differentiate the Valley in a spatial sense, it was divided into two landscapes, the alluvial and non-alluvial. The differences between these

landscapes are quite clear and the approach enabled an analysis of the Valley's social ecological systems to be undertaken.

As stated earlier, a number of approaches to support environmental history analysis have been applied to the study, in particular ecosystem health, panarchy and the adaptive cycle and finally the concept of resilience in association with social ecological systems. My study sees these approaches as complementary, which can be used further in case studies in environmental history. The next chapter will identify the biophysical influences which are the foundations of a social ecological system.

# Chapter 2: The Basis for Resilience – Biophysical Environment

> *Small settlers (chiefly those who had been transported to Newcastle when a penal settlement) occupy patches of ground along the alluvial banks of Hunter's River, for about a mile onward, when you come to a thick vine brush of the richest soil, through which the road winds, the ground becoming firm, and the country beyond it of the open forest description* (Cunningham 1827:79).

**Introduction**

Cunningham's description of the two main land types of the Lower Hunter is a good place to commence a study of the biophysical environment and its influences on the ecosystem health of the Paterson Valley. Cunningham was viewing the landscape as an agriculturalist and it was agriculture which was by then transforming the ecosystem health of the Paterson Valley. His interest in the soil is spread through much of his writing, as it is soil and water that drive agricultural production. The characteristics of the soil at any particular location are a result of geological influences and formation, along with the climatic regimes that have prevailed over time. This chapter therefore commences with an examination of the geology of the Paterson Valley then moves to the climate, soils and finally the vegetation. As a result of the information collected and analysed over many years, we are in a position to understand more about the natural influences driving the ecosystem health and resilience of the Paterson Valley.

The Tocal property is a microcosm of the representative landscapes of the Paterson Valley and is an ideal case study for most of the phenomena related to the ecosystem health of the Valley.

## 2.1 Geological Formations

Geological formations are the basic building blocks of a locality and its ecosystem health and resilience. It is contended that the resilience of the Paterson Valley is a result of its underlying geological formations. These are complex and a study of this nature can examine them in relatively little detail. Map 2.1 shows the geology of the Paterson Valley and Map 2.2 shows the geology of the Tocal property. A striking feature of both maps is the extreme complexity which is

imbedded in the geological formations. The complexity results in a diverse range of niches for soils to develop and plants and animals to evolve. The diverse topography of the Paterson Valley also enables a wide range of niches associated with slope, aspect and drainage, which again provides for a complex ecosystem, which, it is contended, is more resilient than one where there is less diversity and complexity.

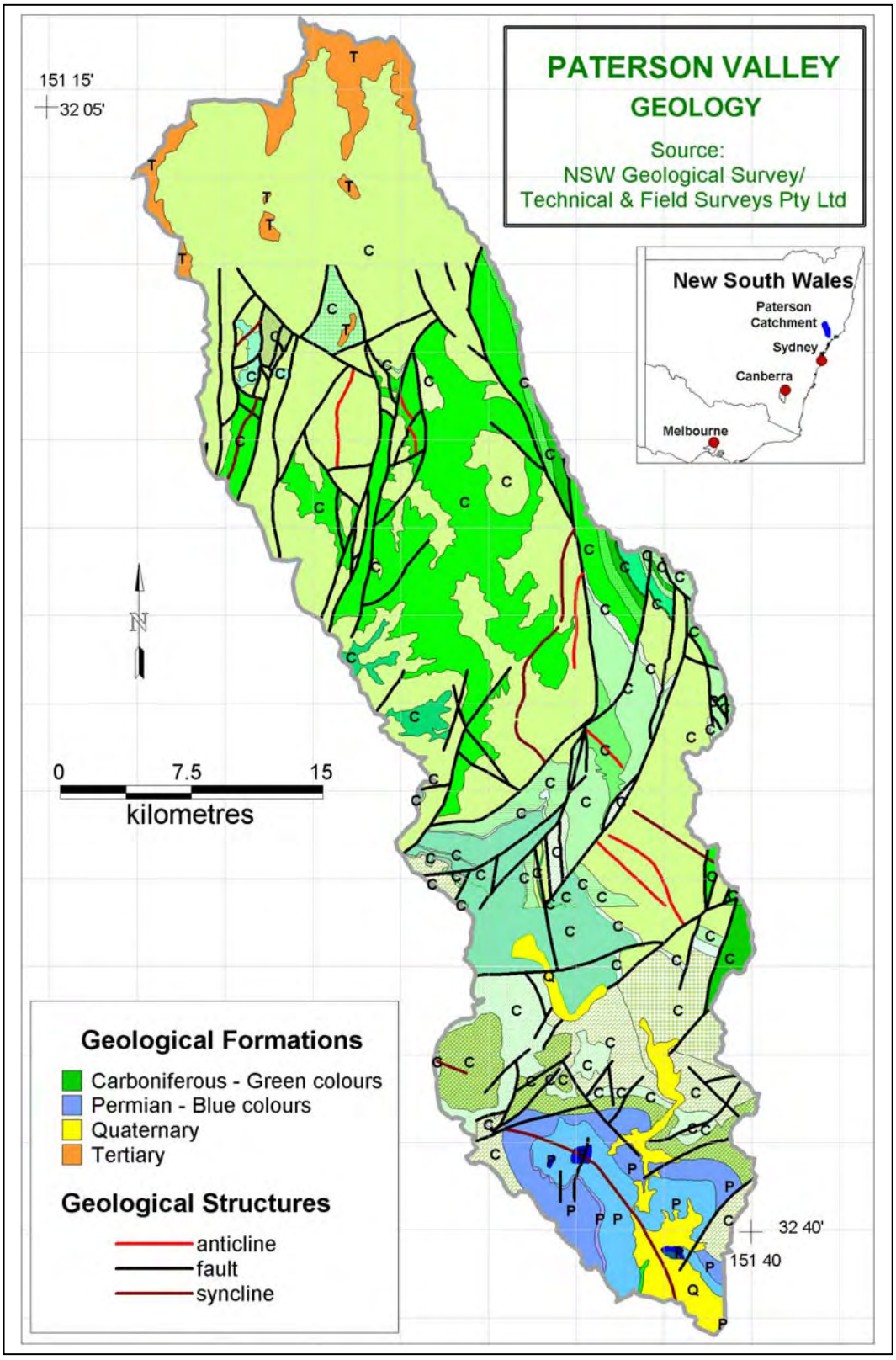
The Paterson Valley has received considerable attention from geologists dating back to the pioneering work of Edgeworth David which had commenced in 1886 (ADB 2007). In particular, two of Edgeworth David's students, Osborne and Browne undertook extensive work in the Paterson/Webbers/Clarence Town areas during the first part of the 20th century (eg Osborne and Browne 1921). This was continued by one of their students, Nashar (nee Scott, Nashar 1964)). Most recent work has been done in the Gresford area by Roberts (1961) and Hamilton et al (1974). The research has provided a sound basis to understand the geological and physiographic features of the Paterson Valley.

The Paterson Valley features can be attributed generally to four geological periods. These are the Carboniferous 275-355 BP, Permian 220-275 BP, Tertiary period, 11-15BP and Quaternary 15BP – Present (Nashar 1964). The majority of physical features of the Valley are the result of weathering, erosion and other geological processes, which have left a residual of Carboniferous material.

The Paterson and Allyn Rivers are two of a number of rivers that flow from the Mount Royal Range. The Barrington Tops or Mount Royal Range is a hub of high ground from which streams radiate to the west, south and east. The land of Carboniferous origin was part of the Kosciusko uplift (Osborne 1950). This uplift was one of the most significant elements in the geological history of the Paterson Valley.

The deeply dissected elements of the upper Valley are the result of erosive forces accelerated by rapid altitudinal changes from the peak of the Barrington Tops to the mid Valley area. A series of folds and faults have created today's landscape including the Colstoun (sic), Gresford and Ararat basins (Hamilton et al 1974).

Map 2.1 Paterson Valley Geology




The rock types in this section of the Valley are volcanic, silt stone, sandstone and conglomerates. They show the great complexity in the geological makeup of the

Paterson River Valley. These basins and other localities defined by landform have been major influences on developing a sense of place for those who live within the Valley.

For example, residents in the Hilldale area will identify with its basin-like formation and see themselves as having a different identity than those who live at Vacy or Paterson. The concept of sense of place will be further explored in Chapter 4.

Roberts (1961) studied and mapped the geology of the Gresford district to show the origins of the sedimentary rocks. There was a mixture of marine and non-marine sandstone in the Hilldale/Ararat area. The influence of the marine sediments has manifested itself in high salinity levels of Big Creek, which flows from the Hilldale region. Big Creek was recorded in the 1965 drought as having a much higher level of salt than similar streams elsewhere in the Valley (Wetherall 1993). It would seem that the saline levels in this stream are a result of the geological formation but probably exacerbated by land use practices. Any assessment of ecosystem health that relies on high salinity as an indicator of poor ecosystem health needs to be qualified by the salinity of the base geological formations that make up the catchment area for a particular stream.

The lower part of the Valley has been subject to extensive surveys in the 1920s of geological research associated with the development of the coal industry. The area most closely examined has been the upper Webbers Creek Valley; however, surveys have been taken from this region across to Clarence Town. Geology of the locality is detailed in the following papers: Sussmilch and Edgeworth David (1919), Osborne and Browne (1921), Osborne (1922), Osborne (1925) and Osborne (1927).

A review of the structural evolution of the overall region was prepared by Osborne in 1950. The coal of the Lower Hunter drew Edgeworth David and his students to study the region although it seems that the geologists were fascinated by the lower Paterson Valley resulting in them returning time after time to record the area's unique geology and physiography.

These detailed studies describe the complexity of the landscape and its geological formations. This complexity can be unravelled to provide an understanding of the geological processes and the resultant landscape.

The lower Paterson Valley, particularly in the region around Tocal, is the boundary between the Carboniferous and the Permian formation. It is a major division across this part of the continent and is the commencement of the geological formations that make up the Sydney Basin. In particular it is the sandstone-based landscape which overlays a quantity of coal. The coal-bearing geological formations are not currently known to exist in much of the Paterson Valley. The lack of identified quantities of coal in the Paterson Valley has been of great benefit in preserving its ecosystem health. The Valley is adjacent to some of the most productive coal seams in Australia. As a result coal extraction provides employment for people who live in the Paterson Valley.

The Tocal property straddles the boundary between the northern Carboniferous era geological formations and the Permian era formations in the south. These are bisected by Quaternary alluvium. While the boundaries are not clear the three influences have impacted on the land use of the Tocal property. Because the property is centred on Webbers Creek which runs west to east there is a useful cross section or catena across the property that passes through the geological formations from the Permian, Quaternary and Tertiary eras. Later in this chapter there will be a description of the Tocal landscapes based on this transect across the Valley.

An unusual but relatively common geological relic in the Paterson Valley is boulder beds also referred to as rock scree. These are isolated masses of large boulders on the sides of hills and in gullies. These boulder beds as described by Osborne (1922) are the habitat for fire susceptible plants and are most probably a refuge for wildlife in times of fires. One of the most accessible of these boulder beds is in Bush Paddock on Tocal at the site known as the Tocal Dry Rainforest. In this particular case both angular and rounded boulders are heaped in a mass across a small area of a hillside and support a range of plant species usually found

in rainforests. There are reports of similar boulder beds elsewhere in the Valley, and often the beds of some streams are made up of boulders of this nature.

Osborne (1922) suggests they are of relatively recent origin and quite widespread.

> *These rocks are found on the highest hills and lowest Valleys. The best development generally occurs as cloaking to the slopes of the small-stream Valleys, and the mouths of the streams. They have, in these cases been formed as talus masses and alluvial fans, cemented together, and subsequently cut into by the streams during periods of degradation. But they are not all confined to stream Valleys. On almost any gentle slope, masses of the rocks may be found, often in the process of formation. It was interesting to find that a conglomerate consisting of fragments of toscanite had developed on the dip-slope on which Hungry trig. Stn. stands, where the angle of the dip is 18°. The boulders are sometimes well rounded, but in the majority of cases only partially so, while some rocks are composed of completely angular fragments* (Osborne 1922:195).

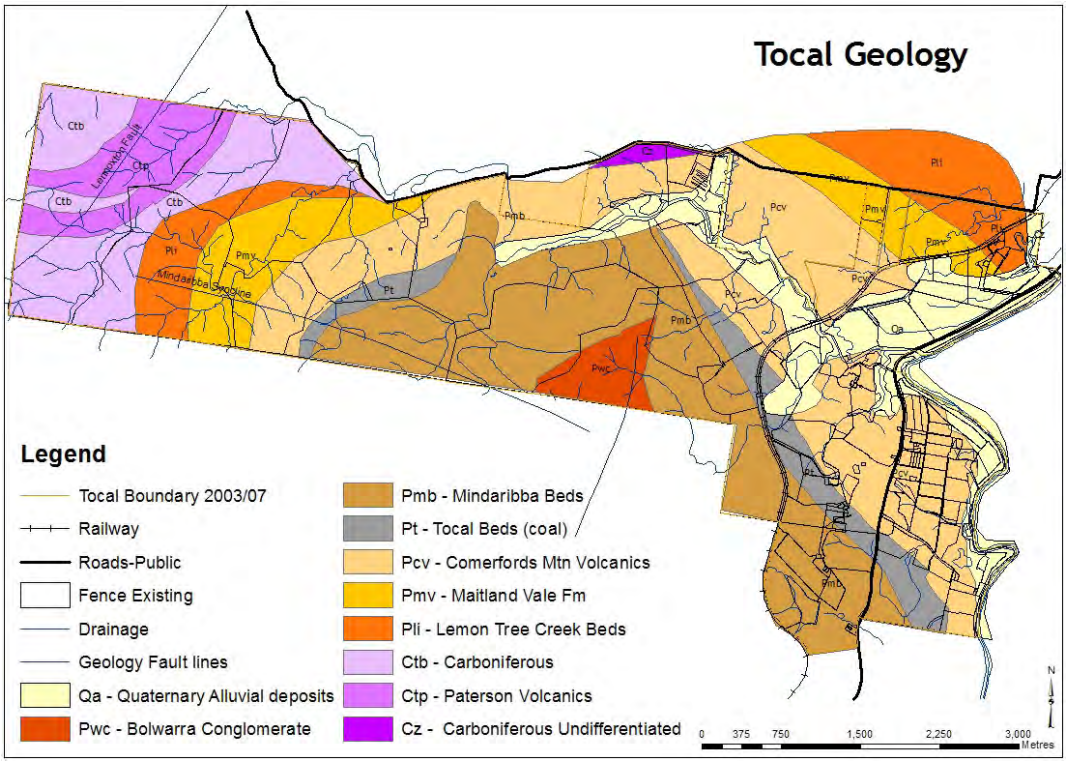
The Tocal Bush paddock boulder bed and dry rainforest is a fine example of a geological feature preserving a small plant community which would otherwise have been made extinct through climate change, see Figure 2.1.

Another boulder bed type formation is known to exist on Hungry Hill to the east of the village of Paterson. In 1927 this site became unstable and slipped further down the hill. The locals referred to the phenomenon as the 'blow up' and it is recorded in the Maitland Mercury:

> *… On Tuesday night, a loud explosion was heard and next morning on Mr T. Jordan's property between four and five acres of bush land presented the appearance of having been subjected to an earthquake. Tremendous boulders, hundreds of tons in weight, and earth were hurled up in places, in others there were huge subsidences and great crevices 12ft. deep, and almost equally wide appeared…* (MM 23/4/1927).

While boulder beds make up a very small proportion of the Valley's geology, their importance as refugia for fire susceptible species cannot be over-estimated. It is contended that they were also sites of considerable significance to Aboriginal people due to their unusual nature and the propensity for Aboriginal people to read the landscape and have a belief system based on that landscape. The boulder beds' unattractiveness to graziers meant that they were not cleared when nearby eucalypts were ringbarked to increase the land's grazing capacity.

Map 2.2 Tocal Geology




Miller (1985) describes the relevance of land and spirits to Aboriginal people:

> *The land of the Wonnarua not only held human and animal life. It was the home of spirits – spirits who were born in the Dreaming. The land was full of spirits. They had their own territories localised in rocks, trees, the river and its creeks, the mountains and gullies. Playful spirits darted in and out of rock crevices and chased each other through creeks or bush and hid in the shadows of large mountains* (Miller 1985:1).

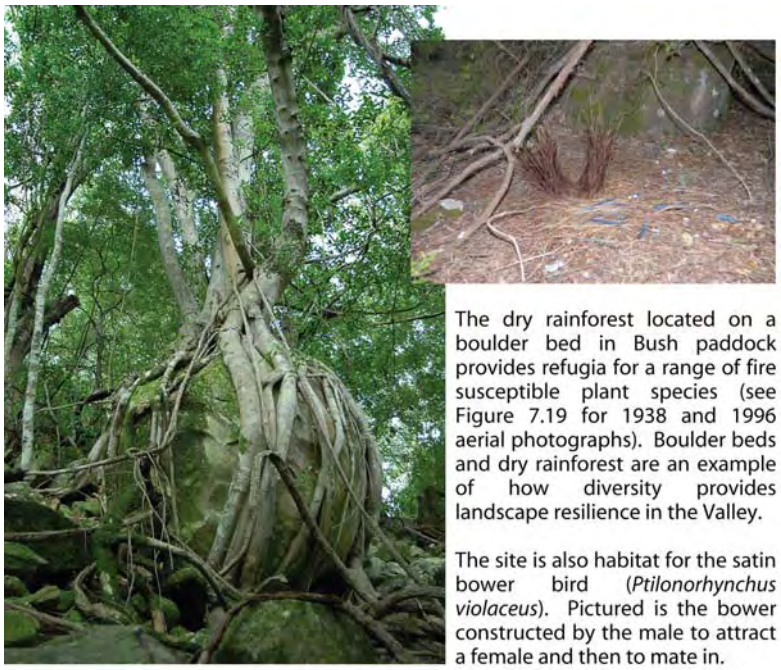
## 2.2 Formation of the Current Paterson Valley Landscape

The most recent geological material was deposited on the Valley floor during the Quaternary period. It makes up the most fertile and productive part of the Valley and has been the area most exploited by Europeans. An understanding of the formation of this landscape will be of value in understanding its total significance as an ecosystem and its future management.

The Quaternary period was marked by a significant variation in sea levels and as a result the alluvial farming soils of the lower Paterson Valley are of quite recent origin in a geological sense. The sea level changes are best summarised by White (1994):

*At 40,000 years ago sea level was 30-40 metres below today's level and descending. A slight rise between 35,000 and 30,000 years ago saw levels at between 40 and 45 metres lower than today 30,000 years ago. Then sea levels plunged to reach its lowest level of 150 metres below the present value at the glacial maximum of 18,000 years ago. A rapid rise accompanied deglaciation. By 9000 years ago sea level was at 20 metres below and rising steadily to equal the present day level at 6500 years ago. It continued to rise, peaking at between 5500 and 5000 years ago at between 1 and 2 metres above the present level, in what was a climatic optimum. Then it fell smoothly to its present level* (White 1994:p180).

Figure 2.1 Dry Rainforest, Bush Paddock Tocal



The dry rainforest located on a boulder bed in Bush paddock provides refugia for a range of fire susceptible plant species (see Figure 7.19 for 1938 and 1996 aerial photographs). Boulder beds and dry rainforest are an example of how diversity provides landscape resilience in the Valley.

The site is also habitat for the satin bower bird (*Ptilonorhynchus violaceus*). Pictured is the bower constructed by the male to attract a female and then to mate in.

The issue of particular interest regarding sea level changes and the Paterson Valley is the fact that they fell but then rose again between 1 and 2 metres above their present level. The lower reaches of the Paterson Valley are within the tidal limit and therefore the physiography and Valley floor was influenced significantly by both the sea level rise and then the fall to its present level.

Galloway (1965) studied the sub-alluvial landscape of the Newcastle area to ascertain the form of the drowned Hunter River Valley. While Galloway's study focussed on the estuary and particularly the sand dune areas to the north, it did identify the depth of the alluvial material that lies under the Lower Hunter Valley.

> *The true deep buried channel of the Hunter River is likely to pass eastwards near the northern end of Fullarton (sic) Cove and to be even deeper, probably over 300 feet where it crosses the present coastline. It is not known how far upstream the buried channel exists. At Maitland, 20 miles from the sea in a direct line and about 30 miles along the present Valley axis, the rock floor is still at least 45 feet below sea level* (Galloway 1965:99).

Galloway's research illustrates the impact that sea level changes would have had on the lower Paterson Valley. The estimate for the rock floor still being at least 45 feet below sea level at Maitland could be extrapolated across to the lower Paterson area. The flat Valley area and the nearby river terraces, termed 'The Paterson Plains' by the early settlers, are largely a recent Quaternary landscape.

During the period of low sea level, it is estimated that the shoreline must have been around 18 miles east of its present position (Galloway 1965:p101). The waxing and waning of ice sheets brought about the period of sea level change. There is some evidence to suggest that there was also some influence by local warping or regional depression of the coast. Regardless of the cause of the sea level changes, the subsequent results are important for the ecosystem health of the Paterson Valley.

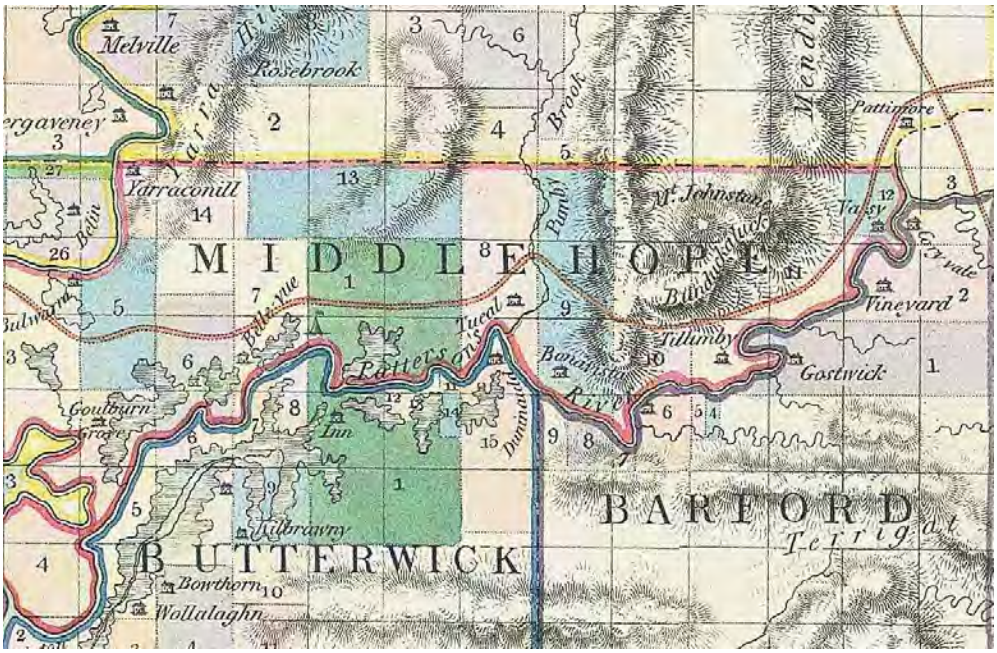
One of the most striking relics from the Quaternary period is the extensive wetland associated with the rivers and the Quaternary alluvium. These are well illustrated by Dangar (1828).

Dangar's map is the first official European map of the Hunter Valley and has some most interesting details associated with the environmental history of the lower Valley. In particular one should note the extensive wetlands on each side of the Paterson River downstream from Tocal. The large green patch in the middle of the map is what was known as the Church and School land and was the subject of the later map by GB White in 1831. The one mile square grid imposed by Dangar is evident on this map.

The wetland complex consisted of relatively permanent lagoons or water bodies along with expanses of ephemeral wetlands. For the purposes of this study the

terms ‘lagoons’ and ‘wetlands’ will be interchangeable as in some literature the phenomenon is solely referred to as lagoons before the word ‘wetland’ came into common use.

Map 2.3 Map of the Hunter River, Henry Dangar 1828




NLA

These lagoons and wetlands have been a source of significant biodiversity for the Valley but since European settlement have been transformed from their pre-European state, see Map 5.1. The permanent lagoons are usually associated with a more complex wetland system rather than an expanse of free water bordered by a grassland or woodland. The edges tend to be gradual which provide a much more diverse range of habitats.

Browne (1927) described how these lagoons may have formed. Browne’s description is based on lagoons at Gosforth on the Hunter River, which may be slightly different from the Paterson but the principles would be the same. Browne’s description coincides with what the author believes to be the genesis of the lagoons in the lower Paterson Valley.

> *One minor but interesting physiographic features calls for mention. At Gosforth itself and along the Maitland Road may be seen a number of elongated lagoons, more or less permanent, some 20 or 25 feet above the river-level: these sheets of water occur in the flat alleviated lower portions of creek-Valleys, and are separated effectually from the river by alluvial barriers breached in places by outlet gullies. It is considered that these lagoons have been formed by the creeks gradually damming themselves in the course of time. These have their greatest flow, indeed practically their only flow, during flood-rains, which is just the time when the river is the highest, and so the current of the tributary creek is slackened and deposition of the transported silt occurs, well back from the normal river-channel. Thus a silt-bank is gradually built up, which forms a dam to the creek, the base level of erosion of which is to all intents the flood-level of the river. The silt-bank deposited during a high flood would be breached by the creek during a subsequent flood of smaller dimension* (Browne 1927:275-6).

Browne's description probably requires further analysis to confirm this formation process, particularly in light of a period when the sea levels were above present levels.

Lying adjacent but slightly higher than the lagoons and wetlands are a series of river terraces; these are also important agricultural lands that have been extensively exploited since European settlement. There has, however, been no study specifically on the Paterson River terraces. Those of the Hunter in the region of Gosforth have also been described by Browne (1927). Browne's description on the Hunter may be slightly different to that of the Paterson because of the size of the Hunter River catchment compared to the Paterson.

The relief differences between the terraces are probably also greater on the Hunter, while the principles of their formation should be the same.

> *The high level alluvium is well exhibited as terraces along the Hunter Valley and its tributaries, particularly fine developments being observable in the bends of the river both upstream and downstream from the Hillsborough Bridge. On the left bank of the river, about three quarters of a mile upstream from the bridge, four of these terraces are well shown at approximate heights of 120, 75, 55 and 35 feet, respectively, above the river which is here about 50 feet above sea-level. On either side of the bridge there are three very distinct terraces at 55, 35 and 20 feet above the river, the lowest being subject to occasional flooding. A series of terraces is also well seen immediately north of the village of Gosforth. The highest deposit, about 120 feet above the river, occurs 50 chains*

*along the road north of Mr A McDonald's house; it is here, as elsewhere in the area, of fine gravel mainly, but contains abundant larger pebbles of red jasper and silicifed wood, as well as of black chert, quartzite, 'grey billy' etc. The red jasperoid rocks have numerous peculiar circular or sub-circular cuts or grooves on the surface. It is notable that most of the pebbles are of rock-types quite foreign to the locality, a fact, which serves to distinguish them from the pebbles of Kuttung conglomerate close by* (Browne 1927:248-9).

Figure 2.2 Lake Patterson (sic), Joseph Lycett

ML

The most significant wetland complex in the Paterson Valley was Lake Paterson, which was on the eastern side of the river and part of a wetland, which stretched from Iona, Woodville through to Wallalong covering virtually all the eastern side of the Paterson River within the flood plain. The lake was recorded by convict artist, Joseph Lycett who gives a good idea of the size of the wetland complex. The wetland has now been completely drained and to the uninitiated observer today there is no evidence of it remaining.

A detailed study would be necessary to fully understand the terracing adjacent to the Paterson River and its tributaries. They are, however, an important element in the landscape and provide biodiversity for the Paterson River.

Browne undertakes some analysis of the alluvial material and its aggregation. In describing a particular deposit, Browne alludes to the then current rate of erosion of the stream channels.

> *True, it is being in places eroded by the present-day small streams, but these are cutting into their own alluvium, here as elsewhere in the State, as a result of the deforestation and cultivation, and are most likely now eroding where they were aggrading their channels before the advent of the white settler* (Browne 1927:251).

This observation by Browne would suggest severe erosion was occurring in the streams he was studying. He suggests that erosion was taking place in locations that had previously deposited materials prior to European settlement.

Osborne (1927) gives a brief description of terraces on the Paterson River near Lennoxton and Summer Hill. Osborne is unsure of the origins of the terraces but puts forward two options.

> *The most important stream in the area is the Paterson River, but we are only concerned with the extreme margin of its Valley in this area. The physiography of the Lower Paterson has already been described by the writer in another paper, but it is interesting to record the presence near Lennoxton and Summer Hill of terracing along the Paterson. The exact cause of production of these is not known, and while they may indicate the occurrence of small uplifts late in the history of the river, they may be due to uninterrupted erosional activity* (Osborne 1927:98).

The River itself has been a major biophysical influence on land use by both Aboriginal people and Europeans within the Valley. The tidal expanse of water provided an effective natural boundary between the lands in the lower part of the Valley. In the next chapter the importance of this will be discussed with respect to the Aboriginal era. The navigable qualities of the River made the Valley appealing to the early European settlers and this feature resulted in the Valley's resources being exploited much earlier than those elsewhere in the Hunter.

### 2.3 Climate of the Paterson Valley

While the geological formations are the building blocks of the landscape, the climate has a major impact on the landscape's potential for resilience and sustained ecosystem health. It is therefore now appropriate to record what is now

known about the climate of the Paterson Valley. While all climatic records are only a relatively short snapshot of a locality's climate, this record is much more than early settlers knew of the Valley. The following information on the climate of the Paterson Valley comes primarily from the Tocal weather station with other records used where they are available and appropriate.

The Paterson Valley climate is dictated by a number of key features (Figures 7.1 to 7.5 in Chapter 7 record key features of the Paterson Valley climate based on Tocal/Paterson data). The Valley lies in the 32 degree south latitude which gives it a location on the Australian continent between the tropical and temperate areas. As a result, it receives influences from both. This gives a high degree of variation to the climate. Given its relatively high rainfall by Australian standards of approximately 800mm or above, it provides a buffer for droughts, which are not as severe as in lower rainfall areas. But floods and wet years are much more severe in their impact than in the drier areas of the Australian continent.

The great difference in altitude causes significant temperature variations throughout the Valley, particularly as the land rises to the Barrington Tops. This will be dealt with later in the section on temperature.

The closeness of the Valley to the coast also influences both its rainfall and temperature. The maritime influence from the coast tempers the extremes of temperature and also provides a significant source of rainfall. The airstreams affecting the Paterson Valley are described by Brouwer et al (2004). They include the equatorial, tropical maritime, southern maritime, tropical continent, continental and modified polar maritime. It can be seen that the Valley receives influences from most parts of the southern hemisphere. These have a significant effect on the Valley's ecosystem health and the way its resources are used for agricultural and other production.

The Europeans, upon arrival in Australia and subsequently to the Hunter, brought with them a wide range of plants and crop types from England and Europe. Given the climate of the Paterson Valley, many of these plants and crop types are at the limit of their natural or possible range. This is because the Paterson Valley can

have wet summers unsuitable for temperate species that grow in the northern hemisphere summer and are dormant through a cold winter. It has taken a long time for Europeans to fully understand the difference between the climate of Europe (northern and southern) and places like the Paterson Valley. The same limits apply to grapes, which again are adapted to spring/summer growth and a long dormant winter. While the vines do grow effectively in the Paterson Valley, they tend to have more problems for commercial production than in a climate more to their natural range with cold winters, wet springs and dry summers.

The average annual rainfall for the Paterson Valley ranges from around 800mm through to 1500mm (Bridgeman 1984). Bridgeman's atlas has notional lines drawn based on a combination of altitude, distance from the coast and available data. While the areas receiving 1800mm are very small it does show the great range of rainfall within a short distance. The most variable area of rainfall, which most influences agricultural production, is the region of low rainfall across the middle section of the Valley between Vacy and Gresford. Local knowledge suggests that a rain shadow area occurs in the vicinity of Summer Hill to Gresford, although no data is currently available to prove this. Locals often say that they drive home from town past Tocal and Paterson and it is raining, but by the time they get to Vacy or Summer Hill, there is no rain.

This part of the Valley is affected by the Brecon Range (Mount Breckin), lying between the Paterson and Allyn Valleys and the Mount Johnston Range, which runs past Mount George and Eaglereach. These ranges would have the effect of blocking rain-bearing airstreams.

The monthly distribution of rainfall is of particular interest. The data presented is a combination of that from Paterson and Tocal and indicates that the area has dry springs and wet autumns, which is conducive to some aspects of agricultural production but not those based on crops, such as wheat and grapes that grow in the spring and are harvested towards the summer/autumn. An examination of average monthly rainfall shows an interesting variation. The January average increases up the Valley and north, whereas the July average increases down the Valley south (Bridgeman 1984). The trend would exacerbated in the mid Valley

rain shadow area, particularly in the winter when the area is also subject to strong drying winds.

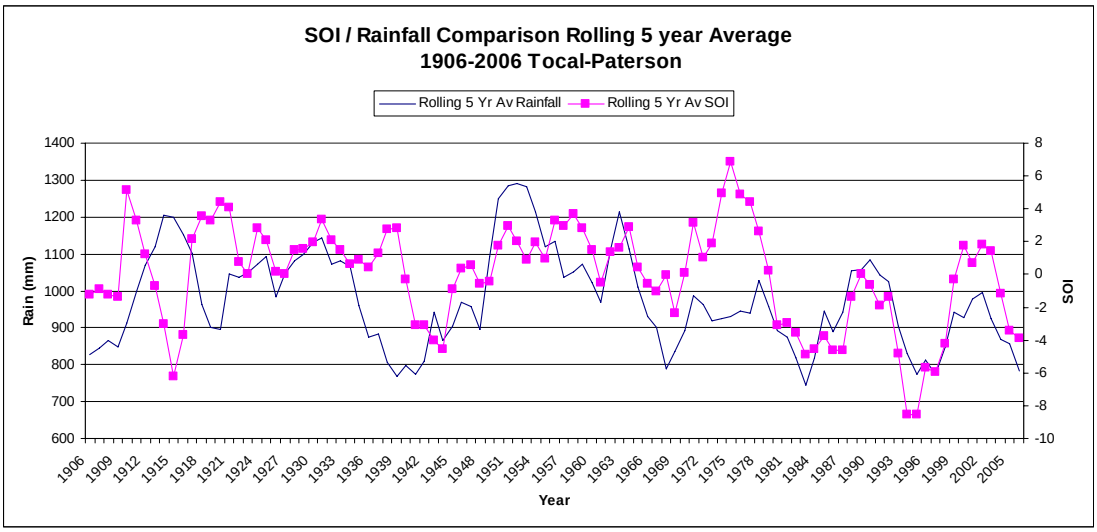
A recurring issue within this study is the episodic nature of the Paterson Valley environment. The variation of the rainfall both on a monthly, seasonal and annual basis is the key element of the episodic changes and variability within the environment. The Southern Oscillation Index can be correlated with the variation of rainfall in some of the Australian continent. The correlations with the SOI and the Paterson Valley environment are not as strong as they are for other parts of the country; however, the relationship is strong enough for it to be used as a predictor of rainfall, see Box 2.1.

Droughts and floods are strong influences on the way Europeans have related to and used the landscapes of the Paterson Valley. Evidence will be presented later in this thesis that the wet years have had a greater impact on land use than the dry years or droughts. In other words floods or wet conditions have been an attractor which has resulted in significant changes in land use and ecosystem health.

Droughts have been ameliorated to a degree by a range of features related to the Valley's location and ecosystem. Because the Valley receives over 900mm of rain on average, a drought will bring that back to around 400-500mm, so there is still a significant amount of rainfall and moisture available for land use pursuits. This is not to say that the Valley is not susceptible to droughts, but it does demonstrate that total rainfall for a drought year in the Valley will be similar to the average rainfall for other parts of rural Australia that produce livestock and plant products on a regular basis. The limitation for many agricultural pursuits is therefore soil type and slope rather than rainfall.

Lifelong resident of the Paterson Valley, Jim Somerville reflected on the droughts his family had lived through in the district:

## Box 2.1 Southern Oscillation Index




Source: Graphed from data www.bom.gov.au/climate/current/soihtml1.shtml

The term 'Southern Oscillation Index' (SOI) was coined by British scientist Sir Gilbert Walker, who observed that there was a connection between the air pressure on the east and west of the Pacific Ocean. When the pressure was high on one side, it was low on the other. He saw that this seesawing relationship was linked to changes in the weather on both sides of the Pacific. The SOI is calculated from the air pressure records of Tahiti and Darwin. A positive SOI occurs when the prevailing air pressure in Tahiti is higher than that in Darwin (La Nina), and negative when the Darwin figure is higher (El Nino). 'El Nino' is a Spanish term meaning 'Boy Child' which refers to Peruvian fishermen linking the birth of Christ to the appearance around Christmas of unusually warm ocean currents off the South American coast (leading to a low SOI). The converse is a 'La Nina' meaning 'Girl Child' referring to ocean currents are relatively cool (leading to a high SOI).

The consequences for Australia of the phenomenon is that El Nino years mean cooler ocean currents on the east coast of Australia and lower rainfall in many areas – El Nino years correlate with droughts in eastern Australia. This correlation varies with locations, but is the best predictor of lower than average rainfall. The link between the air pressures and changes in temperature of the ocean is not well understood.

Evidence presented in this thesis indicates strong links between the SOI and the social and environmental change and the ecosystem health of the Paterson Valley.

Sources: Sturman AP & Tapper NJ (1996), http://www.physics.usyd.edu.au/Ag/ElNino/ENsoi.html, http://www.bom.gov.au/climate/glossary/elnino.shtml

> *The 1840s were called the awful 40s. The Paterson and Allyn Rivers stopped running, and became stagnant. The blacks of the "Camyr Allyn" moved to the Barrington Tops area for better water. One day in April it was over 100 degrees. The 1902 drought inland, extended to this District around 1902-3. It was a bad drought, but my father told me it was nothing compared to the drought years from 1935-45, day after day of extreme heat and hot winds. One day it was 115 degrees in the shade. These were very serious years for us all. A depression and the Japs knocking at our Eastern Shores. With rabbits and stinkwort infesting the whole country. A fat beast becomes hard to find anywhere in the district. It took a good bullock to bring $20, old cows sold for $1.00 and bobby calves from 15 cents to $2.00 each* (Somerville 1988:2-3).

In this case, Somerville is recording local knowledge passed down to him on the 19th century droughts. His reflections of working on the farm from 1935-45 are taken in the context of the depression and the war. The difficulties faced by farmers around Vacy during this drought were extremely serious. The Vacy area and areas slightly north have a lower rainfall than other parts of the Paterson Valley, so the drought situation can be more significant there than elsewhere.

Somerville describes the movement of dairy cattle from the Vacy area either north up river or south east to the coast. Others apparently took them further east to the Williams River again, to seek feed in the lowland country, which may have received some showers.

> *DAIRY HERDS MOVED TO OTHER DISTRICTS – Towards the end of the 1902 drought, my father and the Dave Hipwell family took their dairy herds to Mr. Archinal's property at Eccleston and milked the cows there during the winter months. Mr Hipwell worked on Elmshall for the Cann family.*
>
> *In 1942 a number of dairymen from Vacy and Fishers Hill areas took their herds to the Raymond Terrace district, due to the desperate drought. Feed became unprocurable. Those left were organising to evacuate their cattle, as the Japs were expected to land at Port Stephens. A terrible time and an almost impossible task to shift all the cattle* (Somerville 1989:2).

The diversity of the Paterson Valley and its surrounding landscapes afforded a high level of resilience for humans living in past eras. Evidence is presented that demonstrates that during periods of severe drought and heat, the cooler Barrington Tops afforded a refuge for Aboriginal people, Europeans and their livestock. The complexity and diversity of the landscape provides opportunities for humans to

survive in more comfort than they would otherwise. The extensive lowlands to the south of the Valley also provided refugia for the dairymen with their cows and perhaps it was also attractive to Aboriginal people to move to these areas in dry times, but no evidence of this exists. In the chapter it will be argued that the Aboriginal population were largely sedentary in the Paterson Valley, however, there were nearby resources that they could use in periods of drought. This evidence strengthens the argument that they were a sedentary population as distinct from the conventional Eurocentric paradigm of them being semi-nomadic.

The converse to droughts are floods and the Paterson Valley and Tocal property are prone to serious and episodic flooding. The flood record for the Paterson Valley for the 19th and 20th centuries is relatively extensive and gives a good indication of the impact of floods on the landscape.

The explorers' records from Grant and Paterson taken in 1801 identify the propensity of the Valley to be flooded. The references relate to the Lower Hunter River as distinct from the Paterson but the two areas are contiguous.

> *Here the river still was extensive and wide, but the freshes had left their marks in many tops of trees not less from the source of the river than 25 feet perpendicular height* (Grant 1801:173)
>
> *The ground is low, and apparently subject to floods; the soil blackish, mixed with sand; the trees very lofty, mostly blue gum (Eucalyptus) and Casuarina. From the great quantity of driftwood all over this place, and the country for many miles being low and intersected with creeks, I am convinced that the floods here are much higher at times than what has ever been known at the Hawkesbury* (Paterson 1801:175).
>
> *From Schank's Forest Plains to the extent of our journey, the ground on both sides of the river is good soil, and where the banks are low there is abundance of useful timbers; indeed the cedar, ash and box are only found in low situations. The flood at this part of the river rises from 30 to 35 feet* (Paterson 1801:179)
>
> *Between Mt Harris and Mt Grant I think the country overflowed from the river, and no part not overflowed until the foot of the mountains; the ground from the mountains to the rivers is almost a continued reedy swamp; there are some spots of fine ground, but the least rise of the river must lay them under water* (Grimes 1801:414).

The observations of the explorers were confirmed by assistant surveyor, GB White who was in the Hunter in 1828 to undertake surveys for small settlers in the vicinity of Central Maitland. This was due to pressure from the settlers seeking land on the then reserve.

> *White always remembered the words Oxley had used when speaking to him of sites for future towns in the Hunter River district: '"I have known the Coal River since 1809. It is subject to severe inundations. You must be specially careful to select high land for such purposes. 18* (Wood 1972:246).

A full record of floods at Maitland's Belmore Bridge is listed by Walsh & Archer (2007). While the Hunter River has a very different catchment to the Paterson, this listing gives an indication of floods occurring in the district. It should be noted that a high flood at Maitland does not necessarily mean a similar-size flood in the Paterson; in fact it can be quite the opposite. For example March 1875 and March 1978 were the highest floods ever recorded in the Paterson but these were not significant floods in the Hunter River according to records from Belmore Bridge, Maitland. The extent of flooding on the Tocal property is shown on Map 1.3.

The Valley has what can be generally termed a mild climate, with no major extremes compared to other parts of Australia. The influence of topography on temperature is of particular interest and importance. The Valley has extreme altitudinal changes, often changing one or two hundred metres quite rapidly even on the one property. As a result cold air drainage is a major phenomenon throughout the Valley, with the higher country having a much milder range of temperatures particularly during the winter than the river and creek flats. The low-lying areas north of Paterson have a much higher incidence of frosts than do the areas south of Paterson because of cold air drainage and less of a coastal influence. The temperature data for Tocal has been collected at the Tocal weather station, which is 21 metres above sea level. Many times frosts are observed on the creek and river flats at Tocal but there are few at the weather station. The frost data for Tocal should be seen in this context.

The small patches of good soil on the higher areas of the Valley derived from Tertiary volcanics (for example Mount Douglas and parts of the Mount Johnston soil landscape) were used for many years for the production of vegetables in a frost-free environment. One important crop was tomatoes, which the coal miners used for their lunches. A number of farmers in the Paterson and related areas grew tomatoes in small plots on the ridges for the early market for miners. They would plant tomatoes in late July or August and have them on the market before Christmas. Altitude combined with cold air drainage meant that the chances of a late spring frost were low. They would often go to great lengths to protect the tomatoes from cold by lighting fires on the ridges as well, the smoke reducing the chance of any frost occurring. This small industry thrived until World War II when glasshouse production of tomatoes became common, putting these small growers out of business. The industry is another example of how the diversity of the landscape provided income resilience for farmers.

The incidence of frost can be a problem for revegetation of riparian zones. These zones by their very nature are located in the lowest part of a Valley and subject to cold air drainage and frost. Revegetation of Webber's Creek riparian zone at Tocal Homestead has seen significant losses of young rainforest trees to frost. One single intense frost may cause much more damage than a number of light frosts, which may have the effect of hardening young or susceptible plants. Heavy frosts are uncommon in the Tocal/Paterson area so locals recall occasions when frosts have been significant; memorable events occurred in the following years: 1940s, 1972, 1986 and 2002. A local indicator of the intensity of frosts is whether the Moreton Bay fig trees lose their leaves. A heavy frost will always produce this phenomenon. The Maitland Mercury regarded a heavy frost as a newsworthy event, as Paterson generally had mild winters.

> *July 8, 1893*
> *Paterson*
> *During the period that has elapsed since we last penned our report, we have experienced weather that is delightfully fine and clear. Morning after morning the sun has risen in majestic splendour, and at night has sunk to rest in the cloudless sky, leaving for a few moments a halo of glory resting on the hills ere the shades of evening have finally drawn the curtain o're our little village. J. Frost has favoured us with a number of visits of late, but on Monday morning last he gave an unusual display of*

> *his powers. Lacking time, we have not sought the opinion of the "oldest inhabitant", but everybody else agrees in saying that it was the sharpest frost that we've had for years. There was quite a quantity of ice about, and at Tocal the tanks were frozen, the ice being almost of sufficient thickness to support the weight of a child…* (MM 8/7/1893).

As one moves north up the Valley the intensity and number of frosts increase significantly, particularly on the alluvial landscape, which receives cold air from the surrounding hills and mountains. Land use practices in these areas can be very different to those in the most southern portion because of the increased frost intensity.

The other unlikely extreme event is snow and there are records that indicate snow has fallen on the higher parts of the Paterson Valley in the past. Instances such as these probably have little impact on ecosystem health and the environment.

The Paterson Valley is subject to significant seasonal winds. The windiest months are June to September, which also coincide with the driest period of the year. Winds have a negative impact on the agricultural production of the Valley as they occur when winter crops are in the middle of their growing season. Even with irrigation, windy conditions make it difficult for crops to grow and thrive.

The winds that occur on the Tocal property are funnelled down the Webber's Creek Valley and can be described as föhn winds. These winds are usually dry and often reflect the characteristics of continental air masses. They exacerbate the already seasonally-dry conditions impacting on the growth of crops, pastures and the regeneration of vegetation.

An early observation of the spring winds comes from Davidson who, to the best of our knowledge, lived on the Tillimby property at Paterson for three years and recorded details of farming in the Paterson environment in the 1840s:

> *The summer sets in in October, and wheat harvest begins in November. The weather then becomes exceedingly hot, and the heat is occasionally increased by the hot winds that blow from the north-west. These generally (I speak of what I have observed on the Paterson) blow for three days successively, with considerable violence, and do no small injury to the*

> *farmer: they are very dry, make the lips crack, and the skin feel as if about to crack; and should they come across a field of wheat just shewing the ear, they would blight it to a certainty. After expending their force for three days, they are usually succeeded by a sharp southerly gale, which is frequently accompanied with rain, and soon makes every thing not actually blighted look green again* (Davidson 1846:37-8).

Davidson's observations sum up the Paterson spring environment succinctly. The strong winds that occur during spring make the production of winter-based crops and pastures very difficult. The low levels of wind at other times of the year show that wind is not a major issue in these months apart from those of large storms and gales. The windy nature of some parts of the region and the relatively steep land makes it a potentially valuable place for wind-power generation[1].

There are many records in the Maitland Mercury of violent storms that have occurred in the Paterson area. One example of a storm incident in the lower Paterson area occurred during a flood in 1867. A freak whirlwind and waterspout went south across the floodwaters from Wallalong to Narrowgut, Phoenix Park and then the west.

> *….. a freak whirlwind and waterspout cut a swathe 100 yards wide from Wallalong through Narrowgut, Phoenix Park, and Bolwarra to Oakhampton in early May. In the process it drew up a considerable volume of water as it crossed the river near Morpeth, caused much damage to the farm of William Gill's friend and executor Mr Nancarrow, and blew the roof off the shed on the farm of Mr John King* (Lightfoot 1988:103).

An example of the type of storms that have occurred at Tocal over the years include one in 1905, which not only damaged property, but also caused injury to people:

> *At Tocal, Mr Darcy Reynolds had a very narrow escape of being fatally injured. With his father, Mr Frank Reynolds, and others, he was engaged in assisting to brand calves, when the storm suddenly swept down upon them. The roof was lifted off the branding shed, and in attempting to make his way to the homestead, he was severely jammed up against a fence by portion of the shingled roof. With difficulty the heavy material was lifted*

[1] Approval has been given (June 2007) for two wind turbines to be constructed by Green Power Pty Ltd on the Mount George Range west of Vacy www.dungog.nsw.gov.au/files/2203/file/BPJUN07.pdf). These turbines will supply to the NSW electricity grid.

> *off him, and Mr Reynolds was removed to the homestead. Fortunately no bones were broken, but his chest was very severely bruised as a result of which he is still confined to bed. When the roof was lifted off the building, one of the rafters hit Mr Bert Kidd on the head, and he was rendered unconscious for some time. Mr Frank Reynolds, the genial squire of Tocal, had a very narrow escape of being struck by the roof of a section of the yearling stalls, which was removed and carried – bodily for a considerable distance* (MM 20/11/1095).

The Tocal Homestead property has a record of severe storm damage and lightning strikes. The following quotation from Brouwer et al (2004) summarises recent storms at Tocal:

> *A particularly strong thunderstorm swept through a narrow band of the Hunter Valley on 4 December, 2002. It originated near Muswellbrook and Scone and moved rapidly down the Valley in a swathe that followed Webbers Creek. It hit Tocal in two distinct waves: first as driving rain, hail and wind at 12.30pm, followed 15 minutes later as a wind gale gusting up to 135km/h (anemometer readings). Hundreds of tiles from College buildings were peeled off in a north-westerly blast, causing damage estimated at $30,000. Trees on the College were broken off and uprooted, and at the Homestead, the renewed roof on the Slaughterhouse was blown away and a chimney on the Barracks was broken off.*
>
> *Tocal has been subject to severe lightning strikes. One the evening of 14 January 1994 a thunderstorm resulted in a lightning strike that hit the College's timber flagpole at the front of the College. The flagpole was shattered….. In January 2004 lightning caused extensive damage to the College computer network and telephone supply lines, disrupting communications for a week. A storm in February 2004 caused further damage to some of the College computers* (Brouwer et al 2004:71, 73).

The advent of sophisticated communication technology has made the community more exposed to thunderstorm and lightning impact. The above quotation outlines very clearly how one storm can disrupt communications for up to a week. It also demonstrates that while we try to insulate ourselves from natural occurrences, they will still impact dramatically no matter how sophisticated the modern technology.

The land forms of the Webbers Creek Valley cause air to lift as it comes in from the coast and become unstable. The Webbers Creek Valley, through its land forms, may be a location that is more susceptible to storms than others.

Windy weather and storms that occur in wet years also create an ecological knock-on effect in the area. For example, in June 1998 strong winds blew down a large number of trees across the lower Paterson Valley, again reducing the number of mature age eucalypts in the landscape. This was brought about because the ground was extremely wet from heavy rain and this combined with the shallow root characteristics of spotted gum and ironbark caused many mature trees to topple over.

Heavy storms result in very high intensity rainfall, which if occurring on susceptible soils, or concentrated in waterings will cause extensive soil erosion. Most soil erosion by water can be attributed to heavy storms with little erosion occurring when rainfall is less intense. Henderson (2000) provides data and an outline of rainfall erosivity for the rainfall figures at Chichester Dam. This demonstrates that there was a greater likelihood of high erosivity in the summer months, with 70% of annual erosive rainfall occurring in this period. The data and trends would be no different for the Paterson Valley.

Rosewell and Turner (1992) calculated rainfall erosivity figures for NSW. The index ranged from 750 to 9000 with the majority of the State being less than 3000. The Paterson Valley is estimated to have an erosivity index of between 3000 and 4000, with the higher index being in the upper moister regions of the Valley. The Paterson Valley is potentially an environment with quite high erosive effects from rainfall so this issue will be revisited later when an holistic view is taken of ecosystem health and landscape resilience.

So the likelihood of severe soil erosion occurring is much greater in summer than at any other time. Prudent land managers know this and avoid activities which may disturb the soil in these months. Unstable soil takes a considerable time to be stabilised by vegetation. Soil disturbed in other periods may still erode during these high intensity summer events.

### 2.4 Paterson Valley Soils and Soil Landscapes

To understand the ecosystem health of the Valley and the impact that soils have on this, it is important to understand the soils and their genesis. The Paterson

Valley soils are very complex. The information for this part of the thesis comes from Matthei (1995), Henderson (2000) and Laffan (2003). The factors affecting soil formation are important for their impact on ecosystem health. The four factors relevant are climate and time, parent material and topography.

The soils of the Paterson Valley vary greatly in age with the youngest soil such as Rudosol being the result of geological processes within the last 40,000 years. These recent soils have little profile differentiation compared with the older soils, for example Kurosol, that have profile differentiation and are more leached, making them less amenable to intensive land use.

The climate of the Paterson Valley has varied considerably over time and this has had its impacts on the soils. The relatively high rainfall of the Paterson Valley in Australian terms results in many of the soils being leached and in some cases waterlogged. The steep nature of much of the Valley combined with the high rainfall creates conditions for soil formation based on the natural processes of erosion and deposition. The advent of European land use speeded up these processes.

There have been various studies to try to determine the rate of soil formation. Soil has formed over an extensive geological time scale, a time scale vastly different from that in which Europeans live, operate and make decisions. The two bear no relation. Edwards (1988) makes the following conclusion after examining the rates of soil formation.

> *The evidence indicates that for all practical purposes the rate of formation of soil material from rock in Australia is so low that it can be regarded as zero* (Edwards 1988:140).

The only part of the Paterson Valley where there would be a net gain of soil would be on the alluvial plains at the base of the Valley. These plains accumulate silt from floods and this is consistent with observations by Sargeant (1990). The area of accumulation would be below the 10m contour, the region in which the floodwaters gather and would have time to deposit the material. This soil formation is to the detriment of areas upstream where soil has been removed. In

fact this phenomenon should be recorded as soil transportation and deposition rather than formation.

While there have been changes in soils during the eras of European land use, it should be noted that the timescale is much too short for any soil to be formed, but transportation and deposition have accelerated.

The alluvial soil landscape is generally quite uniform, however, away from the alluvial soils and river terraces to the nearby hills and mountains, the diversity of soils increases. This is due to the enormous mix of parent materials on which the upland non-alluvial soils have formed. The resultant complexity provides a diversity of ecosystems and the potential for a resilient landscape both from an agricultural production point of view and also in terms of nature conservation.

Much of the Paterson Valley is of volcanic origin but from rocks that do not naturally produce highly fertile soils. The volcanic material which forms most of the landscape (particularly the Valley rim and the division between the Paterson and Allyn Valleys) is most resistant to weathering. The soils formed from this material (for example ignimbrite, tuff, acid volcanics) are often shallow and infertile. There are, however, locations within the Valley where tertiary basalt flows have formed extremely fertile and deep soils. Mixed with this volcanic parent material in many places are sedimentary rocks such as mudstone and siltstone, which also lead to relatively impoverished soil types. The upland southern portion of the Valley, particularly to the south-west, contains Permian formations of sandstone and conglomerate, which also form poor soils with variable depth.

The floor of the Valley and riparian zone is a result of the accumulation of alluvial material, which is representative of the soils in the catchment. This is often a lightly textured and undifferentiated soil due to its relative recent age, particularly where located adjacent to a watercourse.

The very steep nature of much of the Valley's topography has had a major impact on many of the soils. The classifications used by Matthei (1995) and Henderson

(2000) in their descriptions of the Valley's soil landscapes are principally based around topography. Examples from these soil landscape studies are classified primarily through site and location, which really is a manifestation of topography.

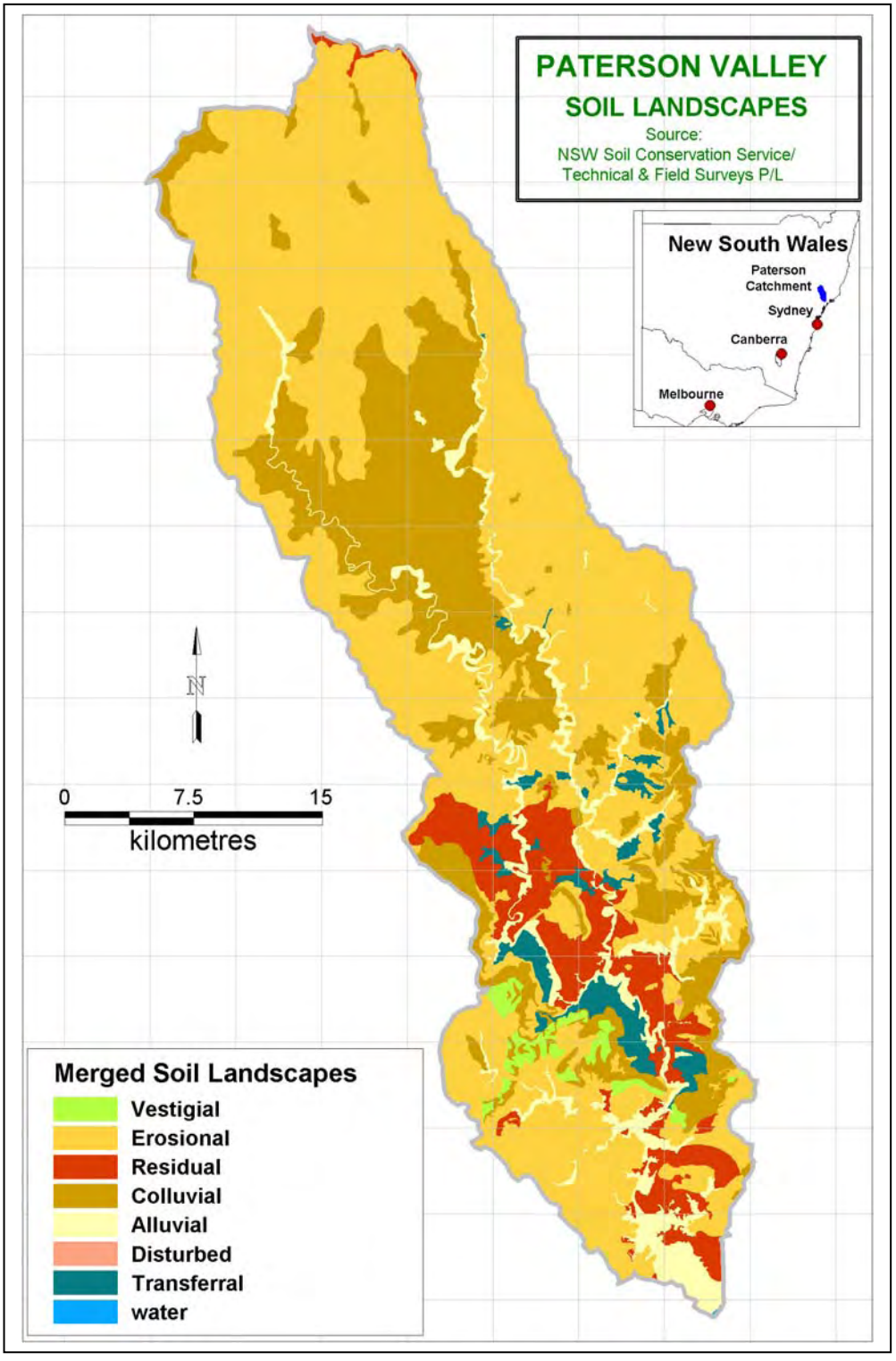
Soil landscapes are areas of land that "have recognisable and specific topographies and soils, that are capable of presentation on maps, and can be described by concise statements" (Northcote 1978 in Matthei 1995).

The system of mapping soil landscapes is a way of presenting particularly complex soil, topographic and vegetation associations. The usefulness of soil landscapes is that they place an emphasis on topography, a most important factor for land use. Soil landscapes are mapped according to common internal features, which differentiate them from nearby areas. They are given local names and a type location is used for reference. Soil landscapes are usually made up of a number of soil types that are common across the landscape, and often the result of the varying topography. The soil landscapes of the Paterson Valley are recorded in Map 2.4.

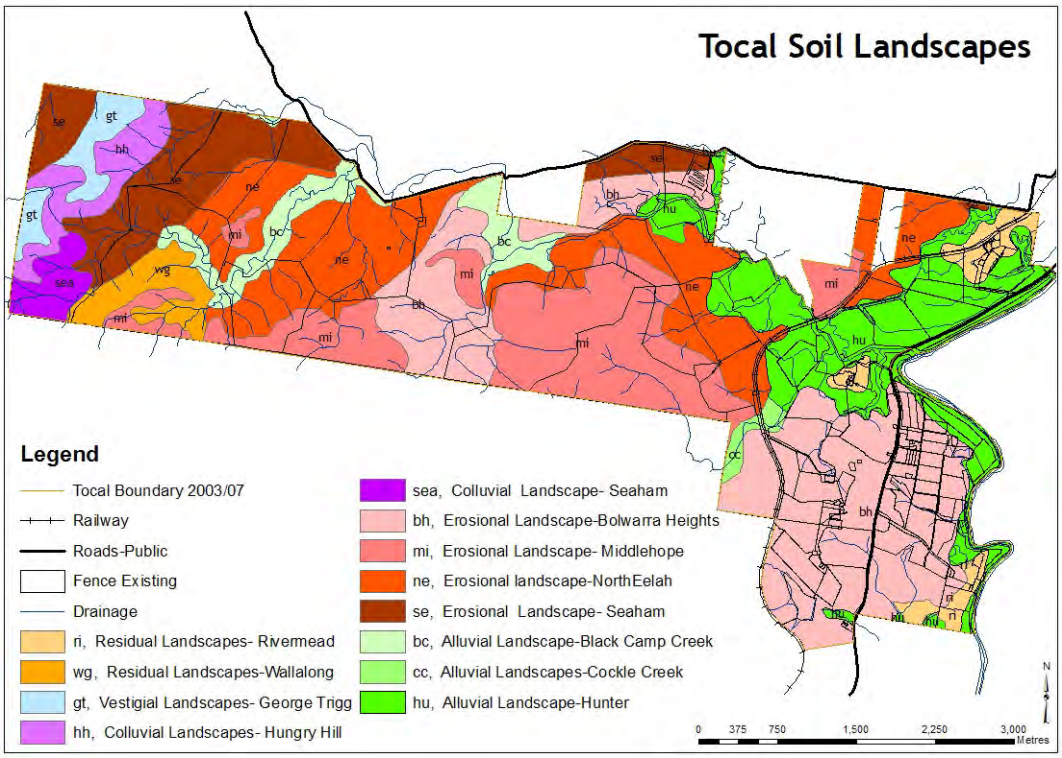
The next section will describe some examples of soil landscapes which show representative features of the Paterson Valley. A key reason for examining these in detail is to demonstrate the complexity of the landscape. Complexity leads to increased biodiversity which is a major factor in the ecosystem health of the Valley. In other words, the ecosystem health, its diversity and resilience are directly related to the soil landscapes. Ecosystem health cannot be understood unless there is a good understanding of the basic building blocks of the ecosystem; in this case, the soils.

Map 2.4 records the Valley's soil landscapes, however, it should be noted that this map is a consolidation from three maps prepared over a time period of nearly 20 years. The western portion of the Valley has been subject to a much different mapping regime than the eastern portion (Dungog and Newcastle 1:100,000 sheets) which has the more contemporary detail of the soil landscapes in the Valley. It is from this eastern portion that the following examples are drawn, ones which will show the diversity of the landscape and also the opportunities of the landscape open to European settlers.

Map 2.4 Paterson Valley Soil Landscapes



Map 2.5 Tocal Soil Landscapes




This study will be based around two broad landscapes, the alluvial and non-alluvial landscapes. The alluvial landscape is made up of two soil landscape groups, the Hunter, with an area of 24 square kilometres and the Paterson River, an area of 27 square kilometres, making a total of 51 square kilometres within the whole Valley. These are the soils that have been used extensively by Europeans for nearly 200 years and that created much of the agricultural wealth for previous generations. The non-alluvial landscape is more difficult to define. However, for the purposes of this study it makes up the remaining area of land, which is relatively conducive to grazing. It covers the remainder of the Valley floor and the lower slopes of the Valley's perimeter mountain sand consists of many landscape groups including Rivermead, Middlehope, North Eelah, Vacy, Gresford and a number of others. These are fully described in the 1:100,000 mapping surveys, Newcastle (Matthei 1995); and Dungog (Henderson 2000).

Tocal is a valuable site to study as it contains a representation of soil landscapes of the Paterson Valley and individual soil types will be used as a case study to demonstrate the complexity and diversity of the Valley's soils.

Before the Tocal soils are examined, it is useful to have an understanding of the concept of land capability. The NSW Soil Conservation Service have used a land capability scale of I to VIII for many years and this classification of land capability was applied to the Tocal property when it was first intensively subdivided and used as an agricultural college in 1965.

Table 2.1 Agricultural Land Capability Classes

| Class | Land Use | Management Options |
|---|---|---|
| **I** | Intensive cropping | Wide variety of uses – vegetables, fruit, grain, fodder, or sugar cane. No special soil conservation works or practices required other than maintenance of soil structure and fertility |
| **II** | Mainly cropping | Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotations |
| **III** | Mainly cropping | Structural soil conservation works such as graded banks and waterways are necessary, together with soil conservation practices as in Class II |
| **IV** | Mainly grazing | Occasional cultivation on better grazing land. Soil conservation practices such as pasture improvement, controlled grazing, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture, maintenance of good ground cover |
| **V** | Grazing | Nil or restricted cultivation for pasture establishment only. Practices similar to Class IV, together with structural soil conservation works such as diversion banks and contour ripping |
| **VI** | Grazing | Not capable of cultivation, less productive grazing land, can have saline areas. Soil conservation practices including limited grazing, broadcasting of seed and fertiliser, promotion of native pasture regeneration, prevention of fire and destruction of vermin. The maintenance of good ground cover is required. Some structural soil conservation works and stock watering points may be required |
| **VII** | Tree cover | Land best protected by trees. Includes very important habitat areas protecting biodiversity. Timber and honey production possible |
| **VIII** | Unsuitable for agriculture | Includes cliffs, lakes, swamps or other lands where it is impractical for agricultural production. May include water bodies used for irrigation |

Source: Gillespie & Brouwer (2007)

The rugged hills take up a large part of the Tocal property and the Paterson Valley and extend to what are legislated as Protected Lands under NSW legislation. These are steep slopes over 18 degrees and on the Tocal property, there are 82 hectares of land which would be classified as Protected Land. The soil types on the rugged hills are Tenosols or Lithosols. The example used for this study will be a Tenosol from View paddock. It is shallow, 45cm deep, until it strikes rock, and nearby areas are rock shelves with no soil on them at all. The soil is well

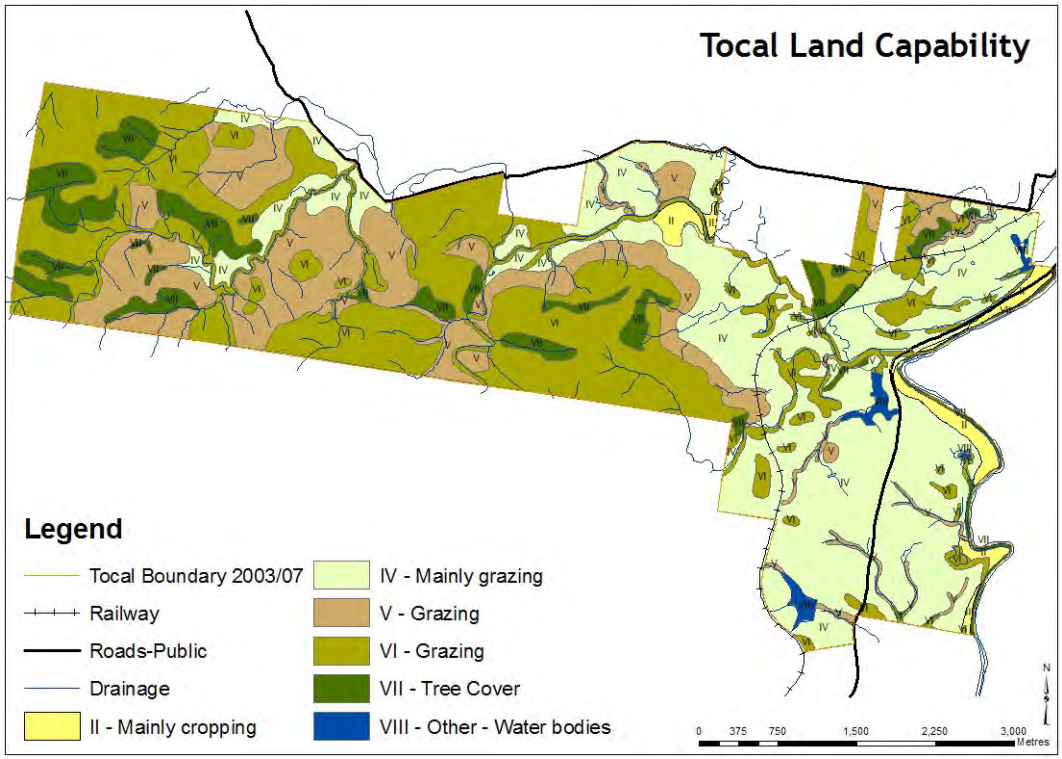
drained, however, its lack of depth and high gravel content makes it very poor at holding nutrients and water. These soils have limited use for grazing purposes and need to be grazed carefully. The land capability in this area ranges from V to VIII. The steep slopes leading from the sandstone cap or plateau to the gentle slopes below are subject to erosion unless managed carefully.

The gentle slopes are the most widespread and collectively the most productive elements of the Tocal property and the Paterson Valley. It is the gentle slopes that provide most of the grazing land apart from the Valley floor of former wetlands, terraces and river flats. The land classes are from IV to V. For the purposes of this study two soil types will be described which are indicative of this landscape. The first is a Dermosol as described by Laffan (2003:26); a very dark grey brown clay loam on the surface which goes to a deep yellow Brown, very dark heavy clay at depth. The soil has been derived from volcanic colluvium which means it displays favourable physical qualities for plant growth and has potential for high productivity. It is speculated that these soil types were probably indigenous grassland because they are cracking clay soils and are less likely to have trees on them. James Webber planted his first vineyard on soil similar to this example. The Dermosol responds well to pasture improvement and increased fertility, and when used and managed wisely, soil types of this nature will carry one breeding cow per hectare, which demonstrates very good productivity for unirrigated land.

The Tocal property's resilience and productivity as a grazing enterprise can be attributed to the significant area of Dermosols or similar soils, however, there are some downsides to the Dermosols which have been demonstrated over time on the Tocal property.

Firstly if Dermosols are allowed to become bare and are on a slope or small watercourse they can erode quite seriously and prior to 1965 there were a number of locations on the Tocal property where soils of this nature had degraded into serious erosion gullies. Because of their inherent fertility these erosion gullies were quickly ameliorated and now no evidence of them exists. Secondly, these soils are not effective for dam-building as the clay type does not effectively seal a farm dam made in a Dermosol. The water gradually leaks from the dam over time.

Map 2.6 Tocal Land Capability




Map 2.7 Tocal Steep Slopes and Protected Lands

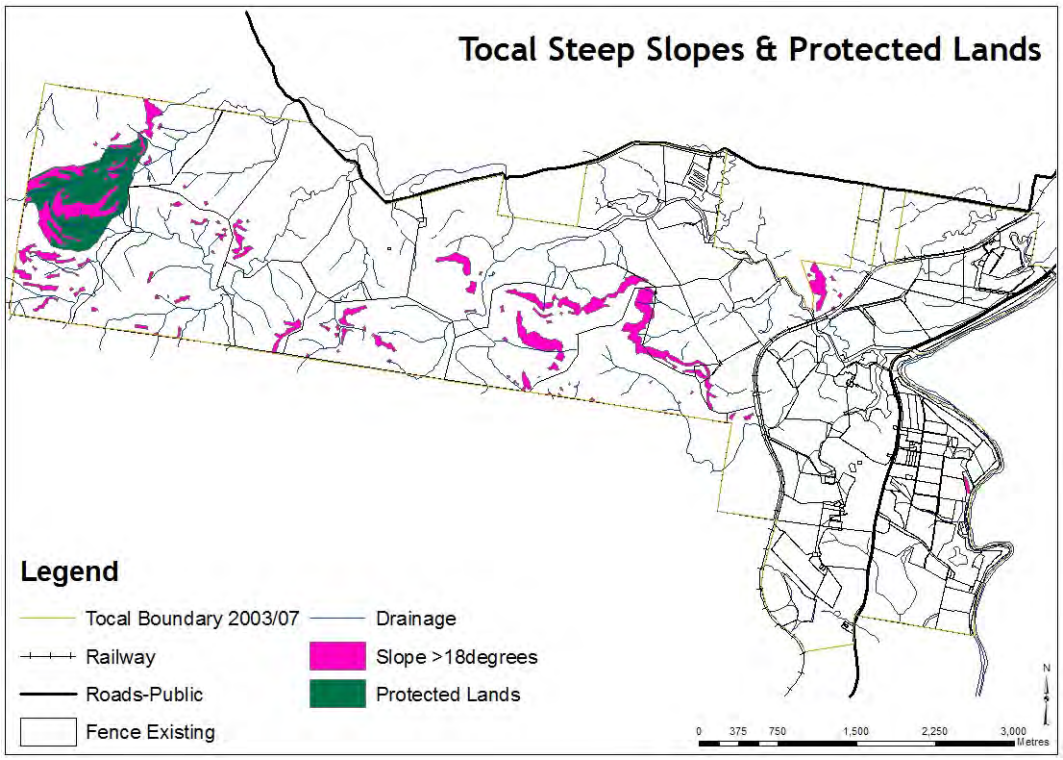
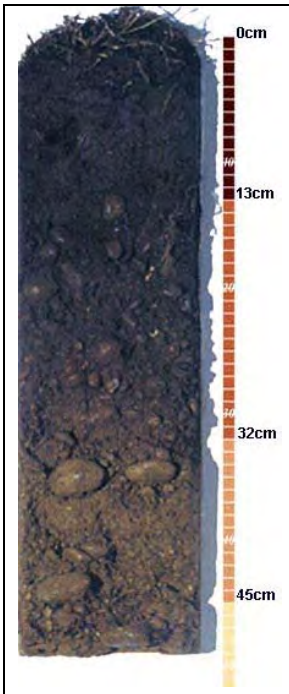


Figure 2.3 Tocal Soil Profiles – Tenosol and Dermosol

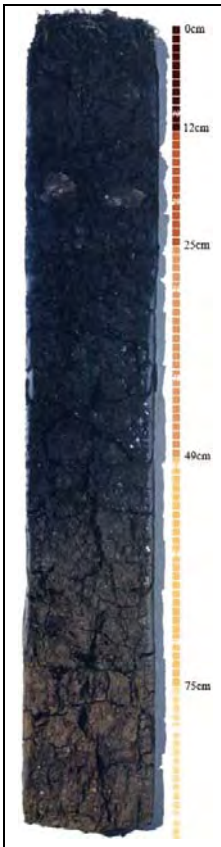



Tenosol
(View paddock)
Profile description
0cm: A horizon.
Dark brown loam. Slight gravel content, plant roots common, good drainage, hard surface soil, large piece of charcoal at 6cm, pH 5.5

13cm: B1 horizon. Brown sandy clay loam. Heavy gravel content, plant roots common, good drainage, pH 6.2

32cm: B2 horizon. Yellowish brown light medium clay. Heavy gravel content, massive structure, plant roots are few, fair drainage, pH 6.1

45cm: C horizon. Rock




Dermosol
(Calving paddock)
Profile description
0cm: A horizon.
Very dark grey-brown clay loam. with fine crumb structure. Surface soil hard. Plant roots abundant. Drainage good. pH 4.5

12cm: B1 horizon.
Very dark grey to black light medium clay. Slight amounts of angular gravel. Large angular fragments of volcanic rock. Cultivation has mixed the colluvial gravel with the soil. Structure is fine crumb. Drainage good. Plant roots common. Note large horizontal tree root at 21 cm.

25cm: B2 horizon.
Very dark grey to black heavy clay. Fine crumb structure. Drainage fair. Plant roots common. Burnt soil found at 30cm. pH 5.8

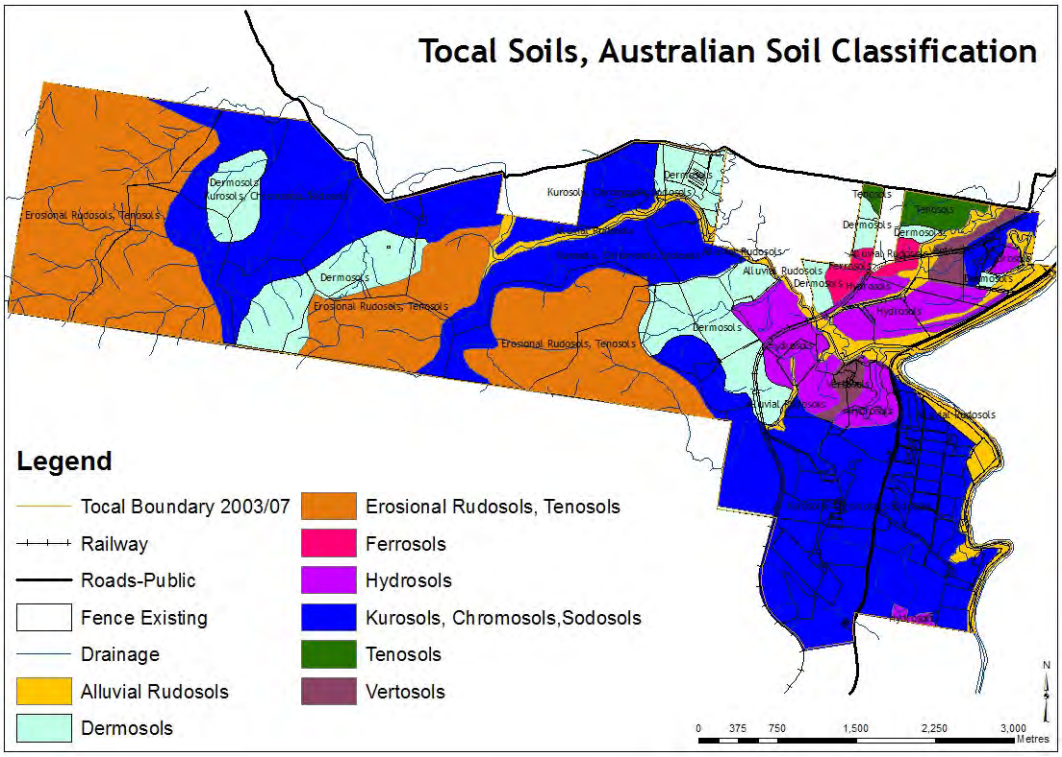
49cm: B2/C horizon. Dark yellow-brown and very dark grey heavy clay. Clay cracks when dry. Angular blocky structure. Plant roots common. Drainage fair. pH 6.6.

75cm: C horizon.
Very dark brown sandy clay with yellow fragments of deeply weathered rock. Note lime concretions up to 10mm diameter. Massive structure. 8mm horizontal tree root at 70cm. Few if any other plant roots. pH7.0.

The other characteristic soils on the gentle slopes are Chromosols and Kurosols. These are very similar in nature but do have technical differences when subject to soil classification. They are difficult soils unless managed properly, with sharp differences between horizon and are subject to crusting, hard setting and dispersion. In addition they have poor internal drainage and in their natural state are not conducive to good crop growth. When wet they have a low wet-bearing strength and collapse in wet weather, becoming very boggy (Laffan 2003), but are very effective soil types for dam construction.

The first example of a Kurosol is from Hedges paddock which is a dark greyish clay loam moving through to medium clay with depth, pH goes from 4.5 to 5.7 at 90cm. This particular soil location is flat and at one stage a lucerne crop was attempted but failed because of the inherent nature of the soil.

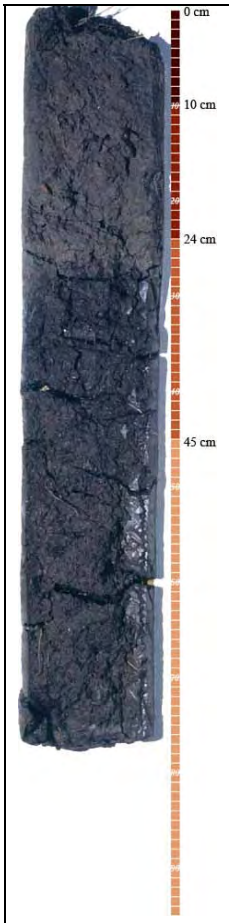
Map 2.8 Tocal Soils Australian Soil Classification




As the soil is poorly structured, acidic and has clay at depth, it is totally unsuitable for lucerne. The second example is a Kurosol from Tank A on Tocal dairy (Laffan 2003:12). The soil has been intensively used, limed fertilised and irrigated for many years and has a high level of organic matter in the horizon and pH of 6.2. The natural pH of these soils is 4.4.

Many of the Kurosols or related soils on Tocal and elsewhere in the Paterson Valley have potential for high levels of productivity if the right investment is made in them and they are well managed. The Kurosol in Hedges paddock is largely in an unimproved state compared to that in Tank A. The latter, through extensive investment of fertiliser, irrigation and exotic species is now a very productive soil and an integral part of the capacity of the Tocal dairy. It still has limitations such as being difficult to access when wet and having a lower water-holding capacity compared to the adjacent river flat, a Rudosol.

Figure 2.4 Tocal Soil Profiles – Sodosol and Rudosol

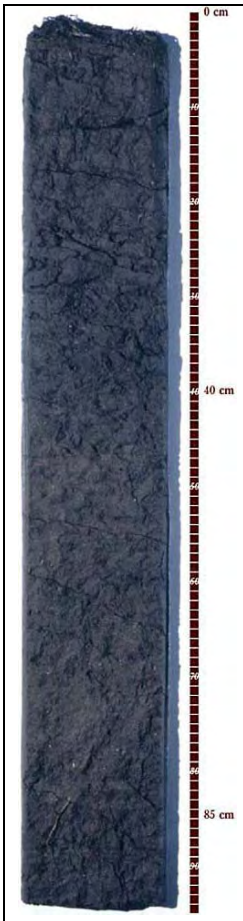



Sodosol
(Glendarra House paddock)
Profile description
0cm: A1 horizon.
Dark grey-brown loam with fine sand. Hard surface soil. Very poor structure. Plant roots common. Good drainage. Worm holes. pH 4.2

10cm: A2 horizon.
This horizon is pale when dry, hence the boundary is apparent only in dry soil. Texture changes slightly to sandy clay loam and there is a very slight gravel content. Trace of burnt soil at 15 cm indicating that a very hot fire has passed over the area in the past. Plant roots common. Good drainage.

24cm: B1 horizon.
Dark grey-brown heavy clay. Clay is impermeable and dense but cracks deeply when dry. Plant roots are common. Drainage is fair, possibly due to the sloping and slightly elevated position. pH 4.0

45cm: B2 horizon.
Dark clay with similar colour and texture to above. Clay shows moderate dispersion and this causes the tunnel erosion observed in the paddock. Plant roots are common. Tree root at 75cm. Poor drainage. pH 3.8 at 65 to 75cm




Rudosol
(Windmill paddock)
Profile description
0cm: Dark grey-brown loam. Abundant plant roots, well drained, pH 4.7

40cm: Dark grey-brown loam. Plant roots common, worm channel below 22cm, well drained, pH 5.9

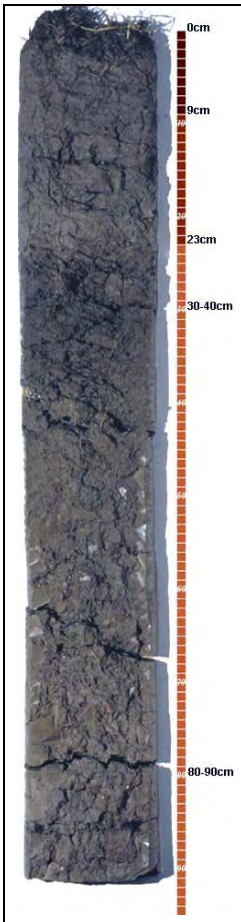
85cm: Dark grey-brown loam. Lucerne roots at 85-90cm, well drained, pH 6.1

Appendix 3 provides a more detailed explanation of how Kurosols have been made to be very productive but are still not as flexible for modern farming as the Rudosol from the alluvial flats. Today's productivity (and potential threats to sustainability) of the Kurosol is predicated on external sources of energy and fertiliser.

The old river terraces make up a significant portion of the lower sections of the Valley and cover much of the Valley floor from Paterson south. The example site for a soil profile is Glendarra House paddock, a Sodosol. Sodosols are traditionally very difficult soils to work with as they have a hard surface, poor structure and also a strong difference in texture between the A and B horizon. This results in a propensity for tunnel erosion whereby the soil is taken into

suspension and washes through plant root passages underground, creating tunnels. These tunnels then collapse and can result in erosion gullies. Sodosols such as this can be productive if managed correctly and have been subject to extensive use in European times. Much of the river terrace landscape has been extensively cleared and often cropped for periods until landowners have realised the limitations of the soil. The profile differentiation of these soils is due to their age compared to the relatively undifferentiated Rudosols which makes up the river flats and riparian zone.

Figure 2.5 Tocal Soil Profiles – Kurosol



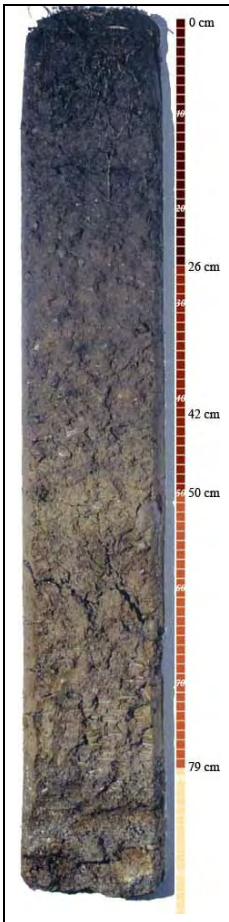

Kurosol
(Hedges Paddock)
Profile description
0cm: A1 horizon. Dark greyish brown loam with massive structure. Roots common, pH 4.5

9cm: A2 horizon.
Fe, Mn concretions to 5mm, colour and structure similar to A1, plant roots common, drainage fair

23cm: B horizon.
Greyish brown medium clay. Very large structural aggregates but not massive, roots common to bottom of profile, drainage poor, clay does not disperse

30-40cm: pH 5.2

80-90cm: pH 5.7




Kurosol
(Tank A paddock)
Profile description
0cm: A horizon.
Very dark grey-brown sandy clay loam. Slight amount of fine gravel. Trace of charcoal. Hard surface soil. Massive structure. Abundant plant roots. Earthworms found. Good drainage, the last three points are probably all due to the high organic matter content. Horizon probably brittle when dry. pH 6.2

26cm: A2 horizon.
Greyish brown soil with the same texture as above. Fine gravel content changes from moderate to heavy. Massive stucture. Poor drainage because of the dense clay underneath. Some plant roots. pH 6.1

42cm: A2 (bleached) horizon.
Light greyish brown sandy loam. Heavy content of fine gravel. Massive structure. Very poor drainage. Horizon prone to seasonal waterlogging. pH 6.3

50cm: B horizon.
Light grey-brown and yellow brown light medium clay. Trace of fine gravel. Few plant roots. Very poor drainage. pH 4.7

The last soil type to be described is the Rudosol from the alluvial river flats. The Rudosol example is from Windmill paddock, which shows a completely undifferentiated profile of dark grey brown loam with the only variation through

depth being pH, a low surface pH of 4.7 with pH at depth of 6.1 (Laffan 2003:40). This soil is the most productive of the Valley and on river flats is capable of supporting intensive land use activities such as annual cropping and vegetable production. It demonstrates resilience through its depth and physical qualities but this soil type also forms the river and creek banks of the lower Valley where it is vulnerable to erosion through flooding and slippage unless clothed with deep-rooted trees and vegetation.

We can get some indication as to how the soils looked to prior to European influences from past records and recent investigations.

Cunningham's observations at the beginning of this chapter referring to the firmness of the alluvial land which by implication means that the non-alluvial lands were not so firm; rather friable and spongy. This contention is supported by other writers eg Gale (2003:8) and Rolls (1985:4).

A small paddock of Tocal dairy adjacent to the campus and Tocal Road was fenced and livestock excluded in the mid 1970s. Since then there has been no livestock in the area and it has been left for the natural vegetation to regenerate. The soil is primarily a Kurosol type and its surface is soft and fluffy (Laffan 2003:32). An identical soil adjacent to the fenced paddock which has been open to livestock had a hard surface. In other words the Kurosol soil type has the potential to possibly regenerate its structure over time. From this type of observation and evidence from the literature we are able to build a picture of the type of environment in which the Aboriginal people managed the land and what was presented to Europeans when they arrived.

## 2.5 Vegetation

Prior to commencing a discussion and description of the vegetation around 1750, it is important to examine the influences which impacted on vegetation before the arrival of Aboriginal people to the Valley.

The vegetation of the Paterson Valley has been subject to many influences and evidence that will be assembled in this thesis demonstrates that the vegetation that

the Europeans discovered on their arrival was a product of Indigenous land management, along with the natural influences such as soils and climate. This chapter will therefore will provide very limited coverage of vegetation, even though the chapter is about the biophysical influences on the Valley. It is felt that it is more appropriate to deal with the vegetation of the Valley in association with the Indigenous era. As well there is limited evidence on which a local picture can be built on vegetation of the Paterson Valley in pre-Indigenous times. The evidence that has been used is extrapolated from other parts of the country. Much of this is from pollen analysis, which is limited by the longevity of various pollen types.

White (1986b) has summarised the known information regarding the earliest influences of important plant genera in the Paterson Valley. It seems the casuarinas were present around 60 BP whereas many grasses were not present until 50 BP and they were followed by the eucalypts about 35 BP and the most recent of these arrivals relevant to the Paterson Valley, the acacia around 25 BP. The success or otherwise of these various species would have no doubt been dependent on the subsequent climates which prevailed. The earlier species, many from 75BP were the conifers and broad leaf rainforest derivatives. These species are susceptible to fire.

It is difficult to be definite about the role fire played in the early development of the Australian landscape; however, it is clear it has been an important factor for millions of years (Pyne 1992). Its appearance was a function of climatic change and increasing aridity, which together resulted in the demise of much of the Gondwana rainforest and the rise of many of the species that occur across the Paterson Valley. Fire requires the right conditions of adequate fuel, dry conditions and something to start it. Prior to Aboriginal occupation lightning would have been the factor involved. The disappearance of the Gondwana rainforest saw the rise of a new class of plant, the scleromorphs (Pyne, 1992:5). The first to colonise the new arid environment were casuarinas, tough grasses and other scrubby scleromorphs. The botanical record indicates that about 34 million years ago the eucalypts appeared and commenced to quickly colonise the landscape. They were followed around 25 million years ago by the acacias, which

Pyne suggests arrived by sea. The dry climate and a fire regime favoured these species and drove the rainforest back into areas protected from fire which are moister than the normal parts of the landscape. Such areas occur in isolated pockets across the Paterson Valley.

**2.6 Conclusion**

This chapter has brought together the best available information on the biophysical influences on the Paterson Valley. It is contended that these influences have conferred a relatively high level of resilience on the Paterson Valley. The relatively mild climate with a high rainfall by Australian standards makes the Valley a favourable and relatively safe district in which to undertake agricultural activities.

The high rainfall in the upper reaches usually provides good flows in the river and maintains the Lostock Dam (which will be discussed in Chapter 7) at 100% capacity most of the time. The rainfall distribution is relatively even throughout the year but has a seasonal maximum during summer and autumn which can create problems for some enterprises.

A high variation exists across the Valley in soil types from very poor skeletal soils to fertile alluvial and non-alluvial soils which have been exploited by Europeans for agricultural pursuits. The complex nature of the Valley's landforms has created a wide range of localities which provide the residents with a sense of place and attachment to where they live. It will be demonstrated later that this, in turn, leads to a greater sense of collective action for the good of the Valley. The other element brought about by these discrete localities is the range of ecological niches which can act as islands of biodiversity refugia for species which may have otherwise been lost. The location of the Valley on the east coast of Australia and the large population centres nearby has advantages and disadvantages for its ecosystem health and resilience. On balance the location is deemed to be an advantage as it provides long term opportunities for wealth and employment for families who wish to live in the Valley. The steep nature of the upper reaches of the Valley making it a virtual cul-de-sac means that it will be protected from becoming a transport thoroughfare for future European exploitation. The

geological features protect the Valley from over exploitation because the upper reaches remain relatively isolated.

The other geological feature of the Hunter Valley which has enhanced the economic resilience of the Paterson Valley is the presence of the coal industry within commuting distance from much of the Paterson Valley. As a result, many families have been able to remain living on their family farm or near their families and gain employment outside the Paterson Valley. The next chapter will describe in more detail the influence of Aboriginal people on the vegetation of the Paterson Valley.

# Chapter 3: The Indigenous Era

> *Every remarkable point of land, every hill and Valley in the territory, has its native name, given, as far as can be ascertained from particular instances, from some remarkable feature of the particular locality – insomuch that the natives can make appointments in their forests and Valleys, with as much accuracy in regard to place, as an inhabitant of London in the streets of the metropolis* (Lang 1834:113-4).

**Introduction**

This chapter describes and analyses the links between the Aboriginal people and the landscape. It will be demonstrated that the Aboriginal people had a profound influence on the landscape and that when they were no longer dominant across the Valley and their influence was removed, the landscape changed. In particular, their influence was most clearly observable on the non-alluvial landscape.

## 3.1 The Arrival of Aboriginal People

It is impossible to identify exactly when the Aboriginal people arrived in eastern Australia but it is important to realise that their influence had been there for a very long time (when compared to European influence). In fact many Aboriginal people believe that they have always been in Australia: from the time ancestral beings in the Dreaming created the natural and social worlds (Attenbrow 2002:152).

By the time Aboriginal people came to the Paterson Valley the major geological landforms were in place. The Valley as we know it with ridges and mountains running to the north would have been as it is today. However, the base of the Valley and the estuary were not as we know them today, because these areas are where profound changes were to occur during Aboriginal occupation. The people adapted as the climate changed and they imposed their own changes on the landscape, changes important for their long-term survival.

## 3.2 Climate Change and Aboriginal Adaptation

As the surprise attractor of climate was imposed on the Valley and its Indigenous people, the adaptive cycle moved from crisis to reorganisation/growth. If we assume that the Aboriginal people had been on the Australian continent since 60,000 BP, we need to understand the climatic changes which occurred between then and the present. Figure 3.1 applies the adaptive cycle to the changing environment, which Aboriginal people endured for thousands of years prior to the influence of Europeans on the Valley's landscape.

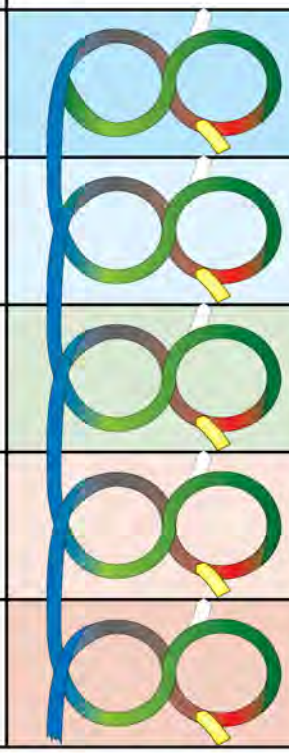
## 3.3 The Dreaming

Any study of Aboriginal communities and lifestyles will quickly lead to a discussion of the Dreaming. The spiritual links between the Aboriginal people and the land is best understood through the Dreaming because it is a way of conceptualising the significant changes that occurred to Aboriginal communities through the 60,000 years of climate change that Attenbrow describes.

The Dreaming is described by James Miller, whose ancestors lived in the Paterson Valley; at the commencement of his book, *Koori: Will to Win*.

> *THE VALLEY was always there. It was there in the Dreaming, though mountains, trees, animals and people were not yet formed. The river as we know it was yet to be born. Everything was sleeping. For some unknown reason there was movement. This movement stirred from invisible forces. It was not physical. Sky spirits were opening their eyes, eyes that had been sleeping in chasms of eternity. Some spirits recognised their belonging, others did not. Some fought, some slept on and others held council to consider, bargain, compromise and ultimately to create. Only after much time would the finished product be ready. The spirits interacted, shaping what was nothing into something. They gave life to the whole Valley. Nebulous forms began to take shape. Some forms flew, others crawled, hopped and walked, while gigantic forms were satisfied to stay in one place. Everything was ready. But something was missing from the Valley floor, something to sustain the life that was already created. After further interaction amongst the spirits the Valley floor parted and what was to be the keeper of life was formed. The river now flowed. The land was ready. Both man and animal descended from the spirits and moved over the earth. They were related to each other through interactions that had taken place in the*

Figure 3.1 Quaternary Changes, Climate Change and the Indigenous Adaptive Cycle

| Years BP | Adaptive Cycle | Features |
|---|---|---|
| 60,000 to 25,000 Pre Glacial |  | Climate cooler and drier. Sea levels lower, 2-3km east of present |
| 25,000 to 15,000 Glacial | | Cooler and drier. Sea levels low, coastline up to 20km east of present |
| 15,000 to 10,000 Post Glacial | | Climate warm and wetter. Sea level rise. Aboriginal people retreat inland |
| 10,000 to 5,000 Early Holocene | | Climate warm and wet. Sea level stabilising |
| 5,000 to 200 Late Holocene | | Climate and sea levels similar to present |

Evidence from Attenbrow 2002.

This figure summarises the changes that Aboriginal people lived through during their period as sole inhabitants of the Paterson Valley. The people used fire and this transformed the landscape: it became an anthropogenic landscape. Aboriginal land practices in the Valley evolved as a result of changes in climate so we have an excellent example of a social ecological system relevant for analysis using panarchy and the adaptive cycle. The adaptive cycle indicates a change occurring in the landscape, mainly through climate change (Attenbrow 2002) but also through changes in technology. (See Brayshaw 1986 later in this chapter). Little is known of the exact details of Aboriginal lifestyle changes but an examination of the temperature and rainfall evidence indicates that they had to adapt to significant environmental influences; a major part being the movement of the coastline which would have had an effect on the Paterson Valley. During the Quaternary the mega-fauna became extinct possibly around 35,000 BP (Flannery 1994:184), which would have been a significant change to the Aboriginal people. The word 'Dreaming' or 'Dreamtime' is a term used by European writers to describe what Aboriginal people refer to as 'creation time' (Arthur & Morphy 2005:19). The adaptive cycles give a basis for the understanding of the Dreamtime and suggests why there is such an inextricable link between Aboriginal culture, spirituality and the land.

> *dreaming. There was much to be learned. Laws that were made in the dreaming were passed onto man by the spirits. Man was thus made aware of these laws and passed them onto succeeding generations. Like a chain, the laws began moving across the generations. Answers to the great questions of life were there to be learned. The land held the key to life's secrets.*
>
> *Man was given the knowledge to read the land and for every rock, tree and creek he found an explanation for existence. He did not own the land, the land owned him. To know the land was to know life, for what better way of knowing life than to know the stage on which it was enacted* (Miller1985:1).

Aboriginal communities successfully adapted to climate change and its consequences. Their ability to survive was linked to their oral tradition and an ability to live conservatively in a difficult and changing environment.

The Dreaming, a culmination of panarchy through the ages as told through the stories, was a way of passing onto the next generation what had occurred in the past. Unfortunately there is little or no published detailed oral tradition from the Aboriginal people who lived in the Paterson Valley, however, Lang recorded the interest that Aboriginal peoples had in the night sky.

> *Naming the Stars*
> *We must visit him at his encampment in the forest, when the glorious constellations of the southern hemisphere have lighted up the Australian sky, and listen to him as he distinguishes the more remarkable group of stars by appropriate names, designating the constellation Gemini, for instance, as 'the blackfellow and his jin' (wife)* (Lang in Gilchrist 1951:350).

### 3.4 The Indigenous Calendar

Aboriginal people worked closely with and lived in the environment. They had no written record but an oral tradition along with their art and annual reminders from the earth and sky informed them about what to expect as seasons changed. These were the pointers that they used to live in association with the environment. Observations of climate and seasonal change related to survival. Woodford (2003a) records details of the indigenous calendar of the D'harawal people:

> *To Frances Bodkin, a traditional D'harawal Aboriginal descendant, the massive flowering of the Sydney green wattle 18 months ago was a terrible meteorological warning. According to the calendar of her ancestors, it*

> *signalled a meeting between the climate cycle Gadalung marool and the season Gadalung burara, bringing the harsh weather we are now experiencing. Ms Bodkin, a botanical author, teacher and traditional storyteller at Mount Annan Botanic Gardens, is one of the last people in the Sydney region who inherited tens of thousands of years of weather wisdom. She knows the city's six annual seasons and the 11-year cycle which determines what they'll be like……*
>
> *……...Every region in NSW would have had its own indigenous calendar. Some areas are known to have had as few as two seasons……*
>
> *In Sydney, says Ms Bodkin, there are eight phases to the 11-year cycle. They do not last for set periods but are based on subtle changes in the environment, invisible to all but the most observant. Gadalung burara is the hottest and driest part of the cycle and is indicated by the massive blooming of Acacia decurrens. Also gums begin to lose their leaves. When Gadalung burara coincides with January and February – traditionally know as Gadalung marool – there will be 'real trouble', Ms Bodkin says.*
> *Unless her ancestors began burning as soon as the wattles flowered they risked fires getting into the tree crowns* (Woodford (2003a)).

This information about knowledge of an indigenous calendar is of particular importance because the environment of Sydney is similar to that of the Paterson Valley. While it will be impossible to ever recreate fully a calendar based on Aboriginal observations for this area, it is important to know that there would have been one based on the observations of what was happening in the environment and no doubt what was happening in the night sky. The Indigenous calendar could have six or more seasons in it compared with the traditional European calendar (Llewellyn 2003:228). Llewellyn created a body of artwork called *Portraits from Nature,* ten works that collectively describe a local study area in the Lower Hunter over the cycle of one year. This work provides a metaphor to link nature with the annual cycle experienced by people living in the Valley.

The seasonal changes as demonstrated in regular natural occurrences within the fauna and flora of the East Seaham area have been researched by Kevin McDonald (McDonald 2004). As a result, McDonald has prepared a prediction of what will happen within the local environment in each month. The monthly structure is a convenient, Eurocentric and necessary way for recording this information but one can

envisage the same information being dissected into an Indigenous seasonal calendar for the area, see Figure 3.2 overleaf.

### 3.5 Nomadism or Permanence

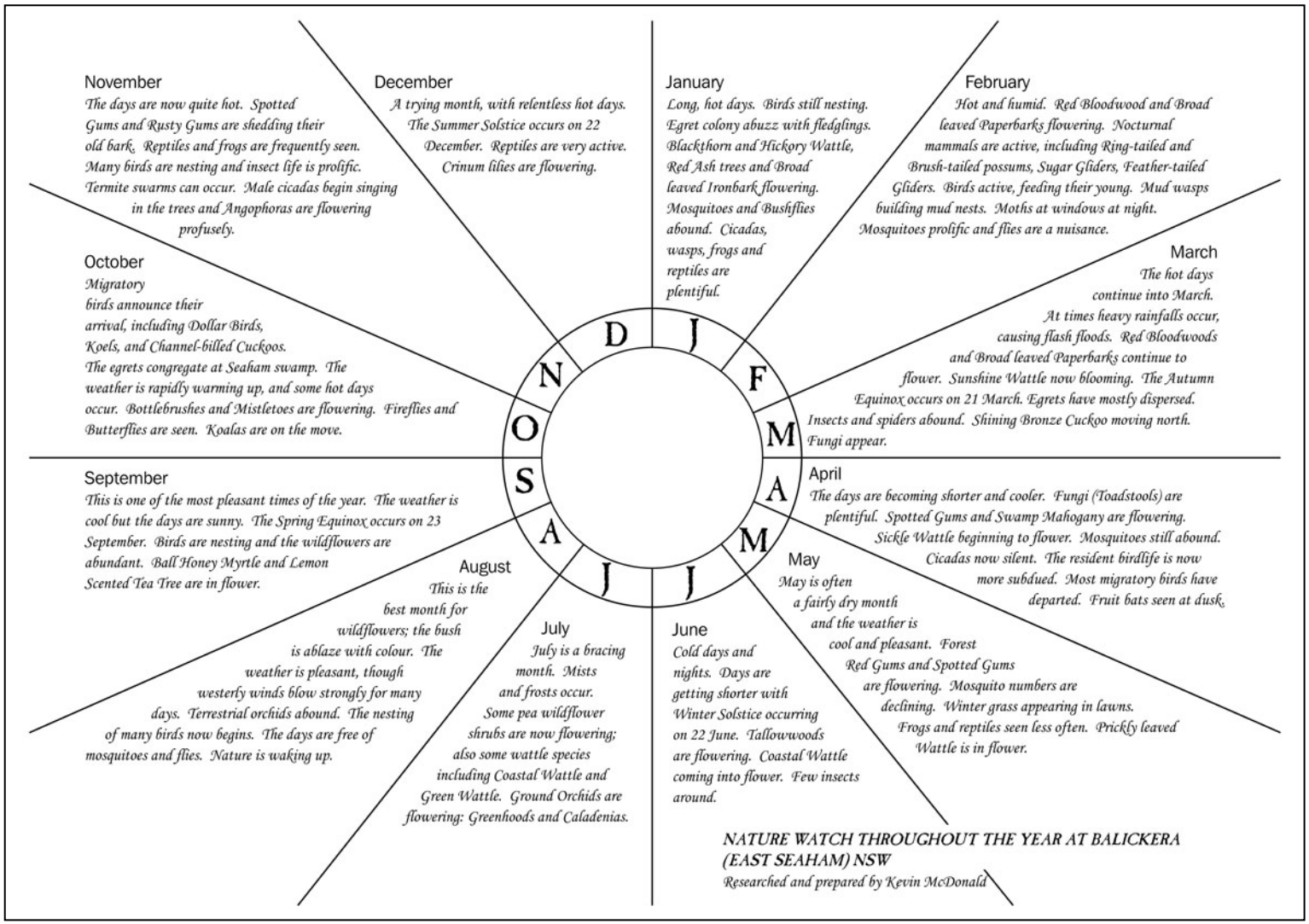
Aboriginal people lived in family groups or clans, with each group having a defined area of land. A collection of these groups constituted an Aboriginal nation. It is believed that the Paterson Valley Aboriginal people were the Gringai Clan of the Wonnarua people, however, this is open to conjecture (Sokoloff 2006:67-73).

Lang records a number of Aboriginal place names in the Lower Hunter area. For example the lower reach of the Hunter River adjacent to Dunmore (Lang family property) was known as Coquun. The lower reaches of the Paterson River were Yimmang and the Williams River was known as Dooriibang (Lang 1834:90). The lower Paterson locality now known as Phoenix Park was originally called Narragan (Lang 1834:95).

The locality name Tocal is derived from Aboriginal dialect Tugal meaning *big* or *plenty* (THN XV 2005:3-4), *plenty* giving the very idea of productivity.

Given the substantial nature of the lower reaches of the Paterson River as a physical boundary, the eastern area could have been part of another nation compared to the western area. In contrast, the conventional European view of Aboriginal people was one of nomads moving around the countryside. Most writers tend to confirm this perception for the people in the Paterson Valley and associated regions but it is contended in this thesis that nomadism may not necessarily have been the case particularly in an area so abundant with food and enjoying such a mild climate: such conditions would not necessitate migration (Flood 2006, 1989). Perhaps the Aborigines had to move around more after contact with Europeans because of depletion of their environment. If Aboriginal lifestyles in the area had been recorded prior to the influence of Europeans, the descriptions may have been very different.

Figure 3.2 Nature Watch Diary throughout the year at Balikera, East Seaham



Research at Lake Condah suggests that the Aborigines in this plentiful part of the southern coast of Victoria were more sedentary (evidence of stone dwellings) and had a lifestyle formed around the utilisation of eels (Builth, 2000,2004). These people caught eels in sophisticated traps and then smoked them in hollow trees. The eels were then traded with other groups. The impact of Aboriginal lifestyle and land use was therefore dependent on the location of land and its natural resources.

It is suggested that the lower Paterson Valley could support Aboriginal groups on a permanent basis year round and that there may well have been permanent or semi-permanent camps in these locations. The written record suggests otherwise, however, it is taken from observations made at least 20 to 40 years after the influences of Europeans on the groups.

Recollections by Scott, published in 1929, would have been the result of observations of local Aborigines well into the contact period.

> *There was never anything of permanency about a blackfellow's home. He did not plant his roots deep in the soil as does white man and his house was not constructed to withstand the ravaging hand of time nor to defy the fury of the elements. A few sheets of bark, leaning on a pole against a tree, served him as shelter through days of sunshine or nights of storm and rain* (Scott 1929:14).

Fawcett described how the Wonnarua people moved across their land and selected sites for camping.

> *They had no permanent settlements, but roamed from place to place within their tribal district in pursuit of game and fish, which was their chief sustenance, making use periodically of the same camping grounds, generation after generation, unless some special cause operated to induce them to abandon them. In choosing the site, proximity to fresh water was essential, some food supply a second, whilst a vantage ground in case of attack from an enemy was a third important impact* (Fawcett 1898a:152).

Fawcett's reference to the three reasons for site selection would seem to be quite sound. While there seemed to be very little antagonism between groups over land, there was antagonism for women and also ritualistic exploits. If we examine the

lower Paterson Valley, below the village of Paterson in the tidal zone of the river, one can select a number of sites that would satisfy Fawcett's criteria. Coincidentally these were all taken up and became sites for European farms and in some cases, grand homesteads. It is contended that the vegetation in the vicinity of these semi-permanent living sites would be vastly different from that some distance away. Aboriginal people made use of the bark from the eucalypts and melaleucas and other species for their shelter and dwellings. The structures were of simple construction and have been sketched by various early artists. There is no material evidence of any Aboriginal dwellings in the Paterson Valley nor are there any detailed descriptions of such structures. There are, however, various descriptions from adjacent Valleys and lands, which can be appropriately extrapolated to the Paterson Valley environment.

The three most relevant descriptions of dwellings for the Paterson Valley are by Cunningham, Dawson and Fawcett. Cunningham, who spent two years travelling in NSW, reflected on the dwellings in a number of locations with a focus on the Hunter.

> *In no portion of our territory have our aborigines made much progress in civilisation, and in none less than within some hundred miles around Sydney, those to the north (and those to the south too, if we may believe accounts) materially excelling our old neighbours. At Port Stephens, northerly, commences a better order of things among the tribes; something of a chieftainship being apparent, and all of them building comfortable huts of tea-tree bark, capable of containing a number of persons, which they clean daily* (Cunningham 1827:185).

Dawson's descriptions of Aboriginal construction of bark huts are more positive and sympathetic, probably because Dawson himself was at the time establishing the AA Co's at Port Stephens and in doing so had to construct some dwellings from natural materials. He was therefore gladdened when the local Aborigines offered to assist him in his endeavours. Dawson would therefore be very positive about the benefits of bark and its utility for shelter.

> *Before a white man can strip the bark beyond his own height, he is obliged to cut down the tree; but a native can go up the smooth and branchless stems of the tallest trees, to any height by cutting notches in the surface large enough*

> *only to place the great toe in, upon which he supports himself, while he strips the bark quite round the tree, in lengths from three to six feet. These form temporary sides and coverings for huts of the best description.*
>
> *In some cases I observed that the natives placed a forked stick slanting from the ground to the tree, (with the fork resting against the body of the tree), eight or ten feet from the earth, while the other end was stuck in the ground. Upon the forked part of the pole they mounted and performed their work in less than half the time that a white man could have it done it. I observed too that they used a stick, shaped thus*  *called the hornerah (which assists them in throwing the spear,) with which they peel the bark after having made the incision with their hatchets. The edge of this instrument is thin and sharpish at the flat end, and well calculated for the work.*
>
> *Having soon peeled all such trees in the immediate vicinity of the huts as afforded the kind of bark suitable for our purpose, the natives ascended the hills at the back of the huts, and were frequently seen descending in parties, with immense sheets of bark on their heads.*
>
> *These pieces being very supple in their fresh state, frequently covered the bodies of those who carried them more than half way down to the hips.* (Dawson 1830:19-20).

The third description of housing relates to the Wonnarua people. This was written nearly one hundred years after the arrival of Europeans and was based upon hindsight. It is a description of sites occupied by Aboriginal people whose culture and amenity had been destroyed by the presence of Europeans.

> *Their huts were exceedingly primitive ones of crude architecture and few materials. A couple, or three, forked sticks, a few straight ones, and some sheets of bark, stripped from trees growing nearby, supplied the requisites for the construction of their home. The forked sticks were thrust into the ground, and the straight ones placed horizontally in the forks. The sheets of bark were then set up against the horizontal poles in a slanting position, the bark of the structure being towards the windy point of the compass. The sides were frequently enclosed for further shelter, but the front was generally open. Before each one was a small fire, which was seldom allowed to go out, and which was used for warmth, or to cook by* (Fawcett 1898a:152).

A description of moving camp is recorded in Ryan; again it is a post-contact description with the Aboriginals carrying tomahawks, blankets and other utensils including a clay pipe (Ryan, 1964). An interesting aspect of this description is where

transport was only over a short distance and the tea tree bark was moved as well. Whether it was a typical procedure, which had been undertaken for thousands of years or whether it was due to the scarcity of good trees to obtain bark will never be known. The Paterson Valley people would have had a choice between various eucalypts and melaleucas for their bark. In general, the eucalypts would have been much larger and easier to build a shelter with but it would be heavier and difficult to move any distance. The melaleuca bark is lighter and would be easier to move from site to site.

> *Although the recognised extent of the tribal area was somewhat circumscribed, shifting camp was frequent, occurring about monthly, as game in the immediate vicinity became exhausted by the raiding hunters. It took several months to give each ground in the locale its turn, and removal was no great undertaking, as the sum total of the effects and equipment did not reach a lengthy catalogue.*
>
> *The female section of the campers bore the brunt of the transfer, with their overladen burden of contraptions, suspended by bands from their temples, the load enveloping head, neck and shoulders as they travelled single file through uncleared brush country to their next destination. Binghi as lord and master, almost unclad, proudly strode military fashion in advance with drawn spear in hand, a couple of boomerangs and as many paddymelon sticks (waddies) in his girdle around his loins, with a clay pipe in his headband; piccaninnies irregularly distributed amongst their progenitors.*
>
> *The kit of the camp was a slender outfit of opossum rugs crudely sewn together, a dilly-bag for the stowage of native 'notions' as the Yankees state, a headband of a dingo's tail encircling the massively wooled scalp for carrying light sundries.*
>
> *The inventory was much improved when the Europeans introduced the tomahawk, blanket, tin billy or pannikin, in addition to low-grade types of apparel. The firebrand was not forgotten and the vital spark was carefully nursed through rain or shine, for the darkies worshipped the wood-consuming agent.*
>
> *Rebuilding and refurnishing camps was not a serious undertaking with native race, and change of habitation was performed with little ceremony or difficulty. When the transport was over a short distance, the ti-tree roofing of the primitive domiciles was transferred to a new situation, as the filmy nature of the bark rendered its removal an easy matter* (Ryan 1964:155-6).

The removal of large slabs of bark from trees may have had a significant effect on the tree's future growth. To kill a eucalypt one has to cut through the bark and into the phloem and cambium, which are twin layers beneath the bark. The removal of the bark would not necessarily kill the tree but it would mean that that section of tree could not grow any more new bark. Dawson's approach for collecting bark was to cut down the tree to obtain the bark whereas the local Aboriginals were able to scale up the tree and remove the bark in their traditional manner which would allow the tree to continue to grow and provide habitat for wildlife, particularly the much loved food sources, possum and native bee.

### 3.6 Aboriginal Boundaries

Around 6000 BP Aboriginal boundaries would have changed because the coastline moved to the west from where it was (20km further east) to its present location – the cultural memory of such changes are in recorded in The Dreaming, see Box 3.1. Areas that could once have been occupied became inundated as the sea level rose; non-tidal streams became tidal estuaries and formed new natural boundaries. Davis and Prescott (1992) undertook a detailed study of Aboriginal frontiers and boundaries in Australia. The evidence they accumulated is from Northern Australia, however, the conclusions drawn from it can be extrapolated to southern situations. They conclude that:

> … *boundaries are most often coincident with geographical features such as watersheds, creeks and rivers or the perimeters of vegetative zones.*
>
> …*In the sea, extensive tidal channels are the feature most commonly used to define boundaries, particularly in areas of high tidal amplitude* (Davis and Prescott 1992:134).

If we apply the findings of Davis and Prescott to the Paterson Valley, we find that the natural boundaries would be based around the tidal reaches of the river, which are also associated with vegetation changes. As one moves up the Valley above the tidal zone, the boundaries would become those of the watershed.

Fawcett provides a clear indication that boundaries were important to the Wonnarua nation:

> *Their tribal boundaries were both well defined and clearly understood both by themselves and the members of their neighbouring tribes. So strictly were all rights and privileges understood that for one tribe to enter into the district of another in pursuit of game was considered an offence of great magnitude and a good ground for a hostile meeting* (Fawcett 1898a:152)

The location of the Paterson Valley makes it difficult to be precise regarding the groupings and kinship between its Aboriginal peoples. The Paterson Valley is a mixture of coast and inland because it contains a tidal estuary as well as rugged mountain ranges similar to that found for most inland groups along the Great Dividing Range to the western slopes.

Paterson Valley Aboriginal peoples would have had access to the east and west and may in fact have been an area of group interchange, with the local people having an affinity in each direction. It would, however, seem that there is a stronger case for much if not all of the Paterson Valley to have an affinity to the Wonnarua inland group rather than the Worimi coastal group. Sokoloff (2006) examines the evidence regarding the Aborigines of the Paterson Valley and does not reach a conclusion either way as to their affinity with the Wonnarua or Worimi. The name Gringai is associated with the Aborigines of the area in particular the Dungog region. There is evidence that the Aborigines inland from the AA Company's base at Carrington on Port Stephens were a different grouping to those on the coast and this would suggest that the Gringai would have an affinity inland rather than to the coast.

Kabaila researched the Aboriginal pathways and movements in the high country of south eastern Australia, and identified song lines, which are a series of connecting pathways and points across the landscape (Kabaila 2005:7). The territorial boundaries were at certain points on the pathways where the dream time songs changed. The territories of each group were within two or three song 'hand-over' points. This means that Aboriginal territories were not separated by discreet

boundaries; rather they were within a series of pathways which were probably related to physical features of the land. The pathways or song lines were very important elements of the Aboriginal culture and demonstrated strong links between the Aboriginal lifestyle and the landscape.

### 3.7 Aboriginal Influence on Ecosystem Health

The question now arises as to how the Aboriginal boundaries and therefore variations of activities and customs across the landscape influenced the ecosystem health of the Paterson Valley.

#### 3.7.1 Totems, Trade and Travel

Aboriginal people had certain totems, customs and rituals associated with the environment, with various animals being totems for particular families within clans. Laws and practices were embedded within Aboriginal customs to avoid inbreeding. Totems and taboos are not the subject of this thesis but it is claimed that they influenced the way the land was managed. Totems were associated with taboos on the killing and eating of particular species by a certain group of people, which would have had an impact on the species diversity and ecosystem health of localities. The totems relevant to the Paterson have been recorded from the writings of Elkin, Bennett and Sokoloff. They are as follows:

> *…makan, lizard; wapara, male kangaroo; womboin, kangaroo; kula, native bear; wuran, goanna; wotu, opossum; natun, water; makun, padi-melon; palbu, kangaroo rat; baman, leech; kandwan, flying fox; bukan, bandicoot* (Elkin 1932:361).

> … *Black-snake, Black crow, Eagle-hawk, and Stingaree* (Bennett 1964:4)

> *A third type of totemism was the personal totem of the 'clever men', the karadji, who were older men with special supernatural powers. Their totems, such as spirit carpet-snake or spirit kangaroo, assist them in their clairvoyance and healing. These karadji were held in great fear because they were believed to possess supernatural powers, which made them capable of causing illness and disasters. However, their powers were used for the benefit of their own people. It was they who supervised the initiation of tribal youths into manhood* (Sokoloff 1976:103-4).

The influence of totems on land use and management could be profound. A group or individual who had a totem, which they protected for most of the time, would therefore occupy a territory in which that totem proliferated. Whereas in another territory where that animal or bird was not totemic, it could have been hunted and exploited. The case has already been put that there were different groups of people across and up and down the Valley, and so it is fair to conclude that different totems influenced the use and management of the Valley from one location to another. However, this is impossible to prove because the Europeans quickly obliterated the customary ways of the Aboriginals, which is particularly the case in the lower Paterson Valley where cedar cutting commenced soon after the establishment of a permanent settlement at Newcastle in 1804 (Turner 1973:2). At times different groups would meet for trade and ceremony and for these occasions the people would travel along defined routes, known as songlines. There are many records of materials being traded and bartered across the continent. McBryde, 1987 describes the exchange networks for Aboriginal people in the Ayre Basin. In this case it was exchanging the Pituri, a powerful narcotic with groups four hundred kilometres away, a journey undertaken in autumn. The Pituri would be bargained for red ochre cakes and grinding slabs and this would be undertaken at well-known exchange sites.

Woodford describes recent research in the Wollemi National Park.

> *It is also becoming clear that a series of dreaming tracks and song lines must have crossed the Wollemi. What the scientists are re-discovering is akin to a series of signposts marking the special places within one of the roughest landscapes in Australia.*
>
> *Brennan says the art is like a roadmap. 'they would have learnt songs about the country, and when you were at a particular spot, you would know the key motifs and key engravings that helped to understand the country'.*
>
> *Shaun Hooper, a Wiradjuri man and leader of the project, explains, 'all across Australia there's pathways people could use to move about the country. As long you knew the protocol and the proper ceremonies associated with each place, you could use those pathways'* (Woodford 2003b:30).

Threlkeld records that Aboriginal peoples travelled to feast on stranded whales in the Lake Macquarie area (Gunson 1974:55) which suggests that travel between the coast and inland was an accepted practice. There is evidence recorded by Dawson of trade between the coastal Aborigines and those in the Hunter region. Dawson comes across a group of Aborigines, one who has a tomahawk and he is curious as to how the fellow had the tomahawk and whether it was one associated the AA Company.

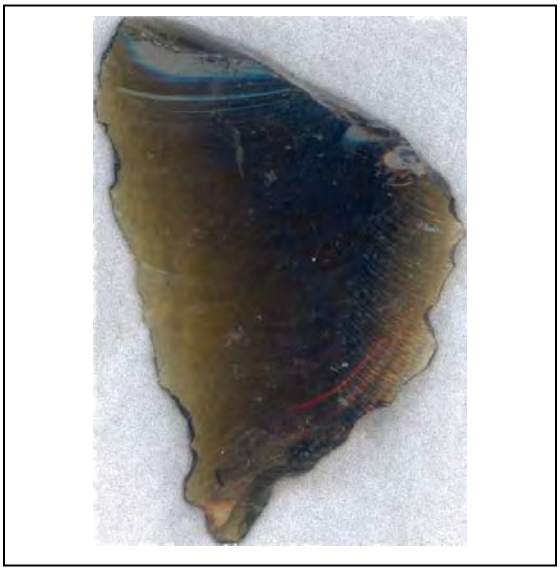
> *I wished very much to examine the tomahawk, to see if it bore the Company's mark; but I had some difficulty in getting him to trust me with it. I found it had no stamp upon it, and I could not therefore tell from what quarter of the country it had been received; but I have no doubt it was obtained from the upper districts of the Hunter's River or its branches. I understood from our natives, that exchanges of articles sometimes took place between coast-natives and those residing in the interior. Iron tomahawks, sea-shells, with which they scrape and sharpen their spear, and pieces of glass, which they use for that purpose whenever they can get them, were thus frequently exchanged for opossum skins, and sometimes for the belts of yarn ready manufactured, as well as opossum band of net-work, which they wear on their forehead when in full dress. This article is beautifully manufactured, and appears the more extraordinary; when it is considered that it is done entirely with the fingers, without the aid of a needle or mesh. The opossums are more numerous inland than they are near the coast, and this is the reason why such an exchange took place* (Dawson 1830:135-6).

It can been seen by Dawson's description that at this stage Aborigines were still making the most of their natural resources and adapting to European technologies and materials as best they could. They quickly found iron tomahawks and glass to be of value, and took advantage of new technology. In fact at one of the Tocal grinding grooves, a small piece of glass was found which would date back to the early contact period when Aborigines would gather broken glass and use it as a cutting instrument. This creative use of discards from European activity demonstrates the adaptability of the Aboriginal people to the changes that were being inflicted on them.

In order for trade to occur, travel routes would be necessary through the Valley. There is a school of thought that suggests that many of the original European travel routes were in fact those used by the Aborigines. These would have been clear tracks from reliable waterhole to reliable waterhole as well as traversing the different Valley

areas. An examination of Dangar's 1828 map (see Map 2.3) and other early maps of the lower Paterson Valley show a track known by Europeans as Binders Path going from just north of Woodville to Seaham. A branch also travels from the Paterson Valley over what is now known as Duns Creek and the ridgeline to the Williams Valley. It is contended that these were in fact Aboriginal trade routes and would have been burnt by the Aboriginal people to keep them clear. The use of fire in association with trade routes is confirmed by Jones.

Figure 3.3 Shard of Glass found at Tocal Grinding Grooves (approx 3cm long)



In order for trade to occur, travel routes would be necessary through the Valley. There is a school of thought that suggests that many of the original European travel routes were in fact those used by the Aborigines. These would have been clear tracks from reliable waterhole to reliable waterhole as well as traversing the different Valley areas. An examination of Dangar's 1828 map (see Map 2.3) and other early maps of the lower Paterson Valley show a track known by Europeans as Binders Path going from just north of Woodville to Seaham. A branch also travels from the Paterson Valley over what is now known as Duns Creek and the ridgeline to the Williams Valley. It is contended that these were in fact Aboriginal trade routes and would have

been burnt by the Aboriginal people to keep them clear. The use of fire in association with trade routes is confirmed by Jones.

> *To clear the ground: Both in western Tasmanian tea-tree scrub and in Arnhem Land grassland, the best way to clear a path is to set fire to the bush. This removes the undergrowth for easier travelling and also kills snakes and other vermin* (Jones 1980:15).

If we assume that the Aboriginal people undertook this type of management, the vegetation along this path would be much different to areas not too distant because such a path could be burnt on an annual basis. Therefore a land system traversed by a trade route could have a strip of ground across it, which had been burnt annually for thousands of years. The influence on the organic matter levels and other soil features would be profound and would in fact make that soil different to soil adjacent to it on exactly the same parent material and even slope and drainage patterns.

### 3.7.2 Impact on Landscapes

An analysis of the available evidence would suggest that Aboriginal people had much less influence on the alluvial landscape than the non-alluvial. The evidence indicates that greater use was made of the resources in the non-alluvial landscape associated with the eucalypt forest and grassland. Perhaps the use of fire by Aboriginal people determined the distribution of vegetation types. The alluvial landscape contains fire-susceptible species many of which were remnants of the Gondwana rainforest, which had covered much of the continent during part of the biophysical era. These moist areas did not support fire and did not burn. The only record relating specifically to the alluvial landscape and Aboriginal land use is a recollection by Memory in the Maitland Mercury:

> *So thickly did the timber grow, that it was often very difficult to proceed, and we were glad to avail ourselves of the wallaby tracks, which intersected the brushes in various directions. The strongest winds failed to disturb the calm whichever existed in them, and there the blacks spent the cold period of the winter, using the bark of the tea tree for covering their gunyahs and reclining on; which being very soft and warm, was admirably adapted for the purpose'* (MM 27/7/1877).

To understand the impact of Aboriginal land use on the non-alluvial landscape, it is important to clearly identify the significant role played by the use of fire. Pyne suggested that the Australian bush was still evolving when the first humans arrived (Pyne 1992:65-6). He contends that the dependence of Aborigines upon fire grew with the development of the Australian landscape resulting in a mutual dependence. In other words the species depended upon fire and the Aboriginal people controlled the fire intensity and frequency – the relationship is a fundamental element when we examine the various perturbations of the Paterson Valley and its ecosystem health. The whole operation of Aboriginal communities, their food supplies and relationship with the environment is hinged around fire. The studies from which we make assumptions regarding the Paterson Valley are not local but have taken reported observations in other parts of Australia which provide ample evidence to show how fire would have been a major determinant of the pre 1750 landscape of the Paterson Valley. Hallam (1979) provides a detailed analysis of the use of fire by Aborigines in Western Australia. Hallam analysed the early writings of many colonial observers and explorers and came to the conclusion that:

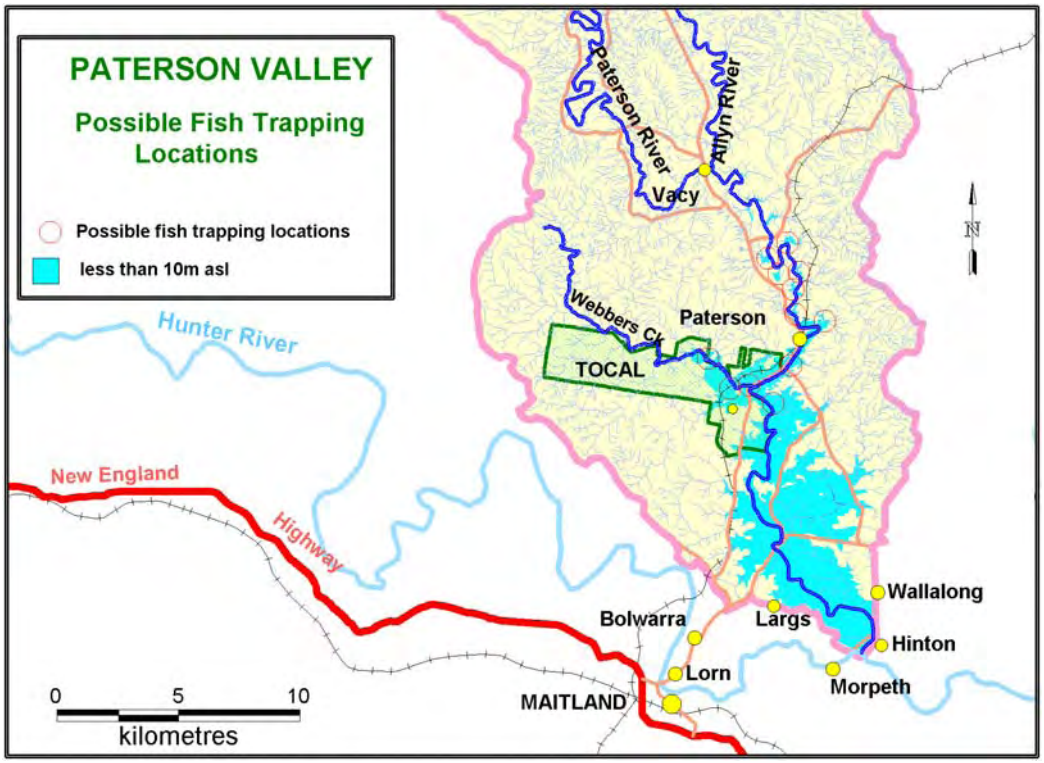
> *Such descriptions make it clear that burning, though the work of a comparatively small population, was impressive in scale, frequency, and undoubtedly in vegetational effects* (Hallam 1979:28).

The clearest description of the relationship between fire, Aborigines and the land was made by Sir Thomas Mitchell in his journal of an expedition into the interior of Australia. Mitchell reflects upon the Aborigines:

> *Fire, grass, kangaroos, human inhabitants, seem all dependent upon each other for existence in Australia; for any of these being wanting, the others could no longer continue. Fire is necessary to burn the grass, and form those open forests, in which we find the large forest-kangaroo; the native applies that fire to the grass at certain seasons, in order that a young green crop may subsequently spring up, and so attract and enable him to kill or take the kangaroo with nets. In summer, the burning of long grass also discloses the vermin, birds' nests, etc; on which the females and children, who chiefly burn the grass, feed. But for this simple process, the Australian woods had probably contained as thick a jungle as those in New Zealand or America, instead of the open forest in which the white man finds grass for their cattle, to the exclusion of the kangaroo, which is well known to forsake all those parts of the colony where cattle run* (Mitchell 1848:412).

Mitchell's predictions and observations have been shown to be very accurate and most applicable to the Paterson Valley. The primary vegetation of the Valley was open woodland and open eucalypt forest and perennial native grassland in various combinations. The absence of traditional Aboriginal lifestyle and activities had a dramatic effect on the landscape. The lack of regular burning resulted in thickets of eucalypts and other plants growing at the expense of the native perennial grassland. As a result, the open park-like landscape that the Europeans inherited from the Aborigines soon became a bushland thicket with a very different species profile and ecological attributes.

Map 3.1 Paterson Valley Possible Fishing Trapping Locations




### 3.7.3 Fish Trapping

There are many reports of the bountiful nature of the Paterson Valley prior to European settlement (eg Cunningham 1827:77-79). The abundance was brought about by having a tidal estuary fringed by extensive lagoons and wetlands. The tidal

limit would have extended up various creeks such as Webbers, Duns, Corners and Martins giving an opportunity for fish trapping to occur between the tides. Mathews describes how Aborigines caught fish using fish traps. This is a generalised treatment and does not directly relate to the Paterson area but one can extrapolate to suggest that this or similar practices occurred.

> *Catching pens or fish-traps, ngullaumgang, are made across narrow, shallow inlets on the sea coast or along the course of rivers. These are made by tying together bundles of tea-tree and laying them close together like a wall across a creek or narrow, shallow arm of the sea. These walls or barricades are slightly above the surface of the water. A gap or gateway is left in mid stream so that the fish can pass through, and when a sufficient number are in close, the gateway is blocked up by other bundles of tea-tree which have been prepared beforehand for this purpose. If the pool is large, one or more smaller portions of it are partitioned off in a similar manner, into which the fish are driven by splashing the water, and are thereby more easily caught by their pursuers* (Mathews 1904:253).

The Paterson Valley would have provided a natural resource for this type of fish trapping given the tidal nature of the lower reaches of the river. Plants such as commersonia, figs and others were available to make nets, the commersonia growing on the fringes of the rainforest and the figs within the rainforest (Laffan and Archer, 2004:26).

### 3.7.4 Cultural Land Use

The earlier descriptions of the Aboriginal impact on the landscape in this chapter are generalised and not site specific. There are, however, many site specific cultural activities that Aboriginal people undertook that impacted directly on the landscape. For example burials, treating sickness, meetings and ceremonies and making axes were each performed at specific sites within the Paterson Valley. Landscapes at these specific sites were modified by Aboriginal people but the Europeans walked into them and exploited them in the Colonial era.

The term *Aboriginal Axe Factory* was coined by Enright (1936:23) in describing the extensive set of grinding grooves in the bed of Green Wattle Creek in the lower

Paterson Valley; an area of less than 200 square yards including 150 places where axes had been ground.

Figure 3.4 Green Wattle Creek Grinding Grooves

This is the largest such site in the Paterson Valley however it seems that the bed of suitable sandstone extends across through Stradbroke, Tocal Dairy and the Tocal Homestead along which there are various grooves. Their existence infers some specialisation of land use, capitalising on the special qualities of the sandstone. There is no other site in the Paterson Valley, with this number of grooves[1].

The vastness of the Green Wattle Creek site suggests extensive use over a long time, as well as that the people camped in the area when they were grinding axes. The ability to sharpen axes on this particular rock formation may have been useful when trading with people who did not have such suitable rock formations in their own

[1] It is not fully clear as to whether these grooves were just used for sharpening axes or if they were used for grinding food. The literature suggests it was for axe sharpening, however, Aboriginal peoples used stones for grinding seeds and other fibrous material for consumption as food.

localities. It is likely that the area was kept cleared and well burnt for access and camping and that this impacted on the nearby vegetation: a significant result of the Aboriginal land use.

There were various conventions used by different groups of Aboriginal people for the disposal of their dead. Paterson Valley Aborigines had regular burying grounds, which had been used for generations and were considered sacred (Fraser 1883:228-9). Often a corpse would be carried many miles to a distant burying ground. A relatively shallow grave is dug and a friend of the dead goes down into it and tries it for suitability. The body is buried in the form a ball, knees to chin and tied up in bark. It is placed in this position while it is still warm, immediately following death so as to be ready for burial. The deceased's weapons and articles of clothing are placed in the grave. If this procedure was not followed, the body would be wrapped in sheets of bark and then placed in a hollow tree. Alternatively it was wrapped in bark and buried in a mound on the surface of the earth, covered with earth and grass.

The procedures followed by the Paterson Valley people would suggest that they had particular areas used for the burials of their dead. This would affect their management of that land and how they dealt with it, the land being considered sacred. The plant growth and overall vegetation in that vicinity would be quite different from others. There is no record as to how this land was managed or dealt with but judging upon the rituals associated with death and the concept of one returning to their own land, would suggest it to be of particularly high value to the group.

The Paterson River Aborigines had various systems of dealing with sickness. Many were associated with plants, herbs and other materials, which would be used to assist with the treatment of various conditions. Spider webs were regularly used in wounds to assist recovery. Fraser describes the earth bath used to treat people with a heavy cold:

> *They also used the earth bath for a heavy cold which other remedies had failed to dislodge; for a bath, they dig a hole in any loose moist earth which*

> *they can find, and place the patient in it, filling in the earth around him until it is up to his neck; he continues in the bath four or five hours, and during this time he shouts for pain; drinks of water are applied to him and a profuse sweat is produced. The strong recover but sometimes the patient dies from exhaustion* (Fraser 1882:227).

The loose moist earth, which Fraser refers to in this description of the earth bath, would probably be Quaternary alluvium, probably on the river or creek flats. This could be an area, which may be regularly left bare, or be part of a campsite, which the group used on a regular basis. Much of the Paterson Valley contains gravelly hard soils or heavy clay soils, both of which would be impossible to use for the earth bath. If this remedy were common, it would mean that the people had to be in the vicinity of this soil type to enable treatment to be given.

In keeping with the concept of the Dreaming and the relationship between the Aboriginal culture and the land, it is obvious that ritual would have strong links with the land and the environment. There have been extensive writings about Aboriginal ritual both in the Hunter and elsewhere through Australia. It is not the purpose of this thesis to examine the detail of ritual and Aboriginal spirituality, however, it is important to make the links between the ritual and the environment.

The most proximate and relevant description of Aboriginal ritual and ceremony for the purposes of this thesis are in the writings of Bennett who describes records made by Mr Boydell of Gresford:

> ***'A Gresford Bora'***
> *The following particulars relate to that portion of the Gringai tribe in the Gresford district and nearer to the Hunter, and were recorded by the late Mr Boydell. Describing the procedure of initiation he wrote:*
>
> *A large assemblage is called together to celebrate the ceremonies. The boy to be made a man is painted red all over and is taken to the centre of an earthen ring where he sits facing the track that leads to another ring about a quarter of a mile distant. The women, with their faces covered, lie around the large ring. An old man steps up to where the boy is sitting, and blowing in his face, bends down. Two other old men take him by the arms and lead him to the other ring where he sits down, all the time keeping his head bent and looking*

> *at the ground. The women now rise up and having sung and danced, to go away to another camp and take no part in the ceremonies until their termination. The trees that grow near both of the circles have been carved and the boy is taken to each of them. He looks at them for a moment, when the old men give a great shout. He is then taken away to a place some miles distant, still keeping his face to the ground, even when eating. Here a large camp is made and the boy learns dances and songs, and is for the first time allowed to look up to see what is going on. He is kept here in this manner for about ten days, being placed by himself in lonely and secluded places, while at night the men make hideous noises at which he must not show the least sign of fear on pain of death. After this time they take the boy to a large waterhole where they wash off the red paint and on coming out he is painted white. When the men return to camp the women are lying down by a large fire with their faces covered. The old men who took the boy away bring him back at a run towards the fire, the other men following, clattering their boomerangs, but not speaking or shouting. The men form a ring around the fire, and the old man runs around inside the ring bearing a shield (hielaman). At this signal the boy's mother or some other woman, comes out of the company of the women and taking the boy under the arm, lifts him up, rubs her hands over him and goes away. The fire has by this time burned down to red coals and the men, including the novice, extinguish them by jumping on them with their feet. The boy now camps in sight of where the woman are and is allowed to eat food which was forbidden to him, such as kangaroo, snake etc. The bull-roarer is called by the Gringai 'torikooti' and is used in these ceremonies. The young man is not allowed to marry until three years after the initiation* (Bennett 1964:14-15).

A special and important site is used for the ceremony commonly known as a bora ground. These sites would have been kept as special locations through generations of Aborigines and were deemed sacred within their customary practices. The interesting aspect of this ceremony is the focus of the people on fire. Fire is a key element within the ritual and the participants are actively involved with fire throughout the process. The other issue which is important to examine is the relationship between the people and particular foods. In this case the initiate is allowed to eat food which had been forbidden to him prior to the ceremony.

The technology of Aboriginal peoples was not static and changes in technology were part of the adaptive cycle. Brayshaw in writing about the Aboriginal people in the Hunter Valley describes the chronological phases of Aboriginal occupation in Australia on the basis of stone tools.

> *The prehistory of Australia is generally divided into three chronological phases on the basis of differing assemblages of stone tools (Lampert 1971, Mulvaney 1975). Pleistocene and early Holocene assemblages are characterised by large stone cores and flakes. Between 4500 and 5000 BP (before present), a variety of small finely chipped stone implements called backed blades (fig 4) (including geometric microliths, eloueras and Bondi points, which may have been used as spear barbs) occur as an additional component to the older industry in sites across the continent. The period from about 1500-1000 BP to the time of European settlement is marked by gradual reduction in the number of backed blades and other finely retouched pieces, and an associated proportional increase in the use of non-specialised small tools and quartz as well as organic less preservable raw materials such as bone, wood and shell for tool making. Regional variants of these assemblages have been documented, nevertheless the three phases are recognised in sites widely scattered throughout the continent* (Brayshaw 1986:98).

There is an apparent increasing sophistication of their implements and hence their effectiveness in exploiting and living in the environment. These changes in technology would have had a considerable impact on the ecosystems in which the Aborigines resided.

### 3.8 Mature Aboriginal Environment

The chapter to this stage is an overview of the relationship between the Aboriginal people and their environment. The people influenced their environment and their environment influenced them. Through a period of growth and adaptation they had reached a point of maturity, achieving a sustainable and dynamic balance with their environment. They had created a sustainable landscape within the constraints of the climate and their technology. It is at this time that the Valley could be described as demonstrating features of autopoiesis[2] (Maturana and Varela, 1980). The remainder of this chapter describes the mature environment created through the Indigenous era as it was presented to the Europeans on their arrival. The key features of the environment are the qualities of the soil and distribution of the vegetation.

[2] Autopoiesis – the process whereby an organisation produces itself. An autopoietic organisation is an autonomous and self-maintaining unity which contains component-producing processes. The components, through their interaction, generate recursively the same network of processes which produced them. An autopoietic system is operationally closed and structurally state determined with no apparent inputs and outputs (www.perpmc.vub.ac.be/asc/AUTOPOIESIS.html)

### 3.8.1 Soils

Although there are no clear records which specifically describe the state of the soils prior to European land use, there are some indicators and records which do provide a basis for extrapolation to enable one to arrive at some conclusion. It is contended that the non-alluvial soils were much softer and spongier than they are now due to the lack of cloven-footed animals, high levels of biotic activity, a different ecological regime involving perennial grasses and, in many cases, seasonal burning. The high level of biotic activity can be partly attributed to the great biodiversity and habitats that existed across the landscape prior to European agriculture, heavy grazing and, more recently, pasture improvement.

A wide range of sources has been consulted to build a picture of what the soils may have been like. Research by Gale at Tocal Homestead demonstrated that the original soils would have been much softer and spongier.

> *An alternative approach to determining the nature of pre-contact soils is to investigate those soils that have been preserved in their pre-European states. Unfortunately, impacts such as erosion, structural modification, vegetational change and alteration to soil water status arguably mean that hardly a single pre-contact soil profile survives intact anywhere across the nation. A rare exception to this generalisation comes from Tocal in the Valley of the Paterson River in central eastern New South Wales. Soil profiles preserved beneath the original (c. 1822) homestead are very friable, poorly structured and have weak aggregate stability, all features characteristic of high erodability. By comparison, the modern soils immediately adjacent to the homestead are well structured, strongly stable and of low erodability* (Gale 2003:8).

Eric Rolls in his various studies, travels and writings has built up a picture of what he felt the environment was like prior to European land use. While some disagree with Rolls' observations and conclusions his research in the context of the Australian environment spans a lifetime of field observations and literature research. He concludes:

> *The spongy original soil took in water quickly and released it slowly. Streams*

> *in all the better rainfall areas kept a fairly constant flow. Watercourses like the Mooki River in north-west New South Wales that explorers described as 'noble streams' now look like dry gullies for months or years at a time* (Rolls 1985:4).

Personal observations of soil in the native regeneration area at Tocal shows that soil under a regenerated native species situation has become extremely soft and spongy compared to that in nearby paddocks. Similar characteristics have been observed in a largely ungrazed area of Top Bush paddock where the soil is soft and spongy, a situation which has been enhanced by ants through recycling soil from depth. Other areas of the property also exhibit these features. The influence of organic matter was also noted by early writers in particular surgeon Peter Cunningham.

> *It is remarked in our light sandy soils here, that during moist and cloudy seasons the crops are liable to become over-luxuriant; while in hot dry seasons they are completely scorched up. This is owing to the friable nature of the mould admitting the roots to spread through it readily, in the moist seasons, in quest of food, while shaded by the cloudy weather from the strong action of the sun's rays upon it. The light friable soil gives out its nourishment quicker than heavy land; is sooner exhausted; and parts with its moisture more readily from having but little clay in its composition."* (Cunningham (1827:126)).

The nature of the soil environment is described further in the following quotations from Cunningham:

> *Mr. Ogilvie possesses here six thousand acres, consisting of alluvial flats and lightly-timbered forest land backwards, bounded by a moderately high ridge. A plain of fifty acres of rich land (without a tree upon it) is situated in the middle of the grant, overlooked by a beautiful swelling hill, equally clear, of the finest sort of garden mould, and covered with luxuriant grasses* (Cunningham 1827 :81-82).

The key element here is his reference to the garden mould, which obviously is the accumulated organic matter on this plain. This would have had a very spongy nature as one traversed it. It is clear that the state of the soils at the commencement of European land use was different to the present. They have been transformed through various stages of land use and this transformation continues, albeit at a slower rate.

Gale (2003) concludes that the transformation occurred very quickly, a suggestion supported by Rolls (1985). The real transformation probably occurred within the first few years of the introduction of cloven-footed animals and intensive land use. The development of the various forms of European agriculture continues to transform the Valley's soils.

### 3.8.2 Vegetation

The Valley's vegetation was also transformed by the earliest European land use, so we again turn to early records to ascertain what the vegetation may have been like at the moment of the beginning of European impacts. It is important to note that the evidence provided by these early writers should be taken in the context of the times. Some records were prepared in order to promote the agricultural potential of the landscape whereas others were largely generalist, layperson descriptions to build a picture of the environment in which the writers had found themselves.

The state of the vegetation prior to the influences of Europeans is a strongly contested issue (See Ryan et al 1995, Benson & Redpath 1997, Flannery 1998). A picture of the Valley's overall vegetation will be drawn from evidence in this chapter, however, the analysis and evidence sources for the likely pre 1750 vegetation for Tocal is contained in Appendix 2.

The first records of the Lower Hunter were gathered from Lieutenant Colonel William Paterson's exploration of the estuary and rivers in winter 1801. The expedition resulted in reports from Paterson, Grant and Grimes.

> *July 1.- This day we concluded ourselves 12 miles higher up, as the banks of the river are very low and swampy, we fixed upon the first dry ground for our headquarters, where we bought a small tent hut, thatched with grass which grows luxuriant. Here is an extent of country for about three miles to the southward with several lagoons and rather low,but except on the banks of the river not subject to floods. The soil in most places is good, thinly interspersed with fine lofty trees. This I named Shanks' Forest Plains in honor of Captain Shanks, the projector of the Lady Nelson, a gentleman much interested in the*

*prosperity of this colony. The wood generally known by the name cedar does not abound much in this place.*

*July 4. - Having fixed on Shanks' Forest Plain as our place of rendezvous, in the neighbourhood of which is a large lagoon reported to be 9 miles across, and as the weather was very variable, I thought it better to convince myself of the nature and extent of this large sheet of water as described, and supposed to be the source of the Paterson River, than to undertake a larger journey towards the mountains until the weather became more favourable. About a mile higher up the river is a deep creek to the right, which from its direction gave us every reason to believe that it had communication with the lagoon.*

*July 5. – We dispatched the boat with three men up the creek while we proceeded by land in expectation they would be able to join us. After travelling about 3 miles, and passing some ponds with quantities of wild ducks in them, but exceedingly shy, we had from the top of a rising ground a view of the large lagoon, and was much disappointed in its appearance and extent. It is merely a chain of large ponds, and forms several small islands covered with reeds. The circumference may be 12 or 14 miles, but no part of it is 1 mile broad.……..*

*……To-day we heard some natives and saw a new canoe on the banks of the creek where we expected to have met our boat. From what I observed of trees cut down by the natives, which must have been with a much shaper edged tool than what their stone maga is, and from their shyness, I have little reason to doubt that some of the European deserters are among them. The country around this lagoon is tolerable soil, and certainly affords food for the natives. The surface is much grub'd up, particularly where roots of fearns, orchisis, and a species of arum grow, which had nearly been fatal to some of our people.*

*Later in the evening the boat returned but could not find any communication the creek had with the lagoon. The men said they had seen very fine trees of cedar and ash.*

*July 10.…… From Schanks' Forest Plains to the extent of our journey, the ground on both sides the river is good soil, and where the banks are low there is abundance of useful timbers; indeed, the cedar, ash, and box are only found in low situations* (Paterson 1801:450-2).

Paterson's description of the vegetation is reasonably clear and shows the variation that occurred across the Lower Hunter flood plain. It should be noted that what Paterson refers to as Paterson River is in fact the Hunter River. Shanks' Forest Plain is somewhere between East Maitland and West Maitland and the creek they travelled up is most probably Wallis Creek. Paterson's

description of the Maitland vegetation does not present it as being particularly impenetrable or difficult to move through, however, other descriptions will be very clear on the extent of the vine forests. Paterson also ascended various hills during his travels and it would seem from those writings that they did not have a lot of timber on them.

**Box 3.1 - Changing Vegetation Descriptions**

It is necessary to define what is meant by some of the descriptive terms for vegetation. Over the 200 years of written European records of Australian vegetation the use of words has changed.

Rolls, 2002 explains what is meant by forest in the journals of early writers such as Lachlan Macquarie and others.

*Where he refers to 'forest' he does not mean heavy timber; he means grassland dotted with big trees. The early colonists went back to the early meaning of 'forest' as the cleared land between the city wall and wood, where only those trees too big to cut down were left standing (*Rolls 2002:86).

Wentworth, 1824 describes the land of the Hunter. His description of the forest land confirms Rolls' observation that forest land in a colonial context is very thinly dotted with timber.

*The high-land, or to give it the colonial appellation, the forest land, is very thinly dotted with timber, and equal for all the purposes of agriculture, and grazing to the best districts of Port Jackson* (Wentworth 1824:78).

The various descriptions of the vegetation and natural forests will be covered in detail within the vegetation chapter. There are various descriptions of the grasses which grew through the forest land. Rolls sums them up most succinctly in the following quotation.

*The original grasses were mostly deep-rooted perennials that grew in distinct clumps. They had to be deep rooted because of the nature of the topsoil. Oat grass, Themeda australis was the principal grass of both the coast and inland* (Rolls 2002:5)

The forest landscape was an easy landscape to move through for transport purposes and also to assess the value of the land. While much of the forest land had quite poor soils, other parts were rich basaltic soils.

Given this definition it is felt that the evidence from the environmental record suggests that the majority of the vegetation in the non-alluvial landscape of the Paterson Valley was open woodland or woodland. There is little evidence to suggest any of it was forested apart from what may have been refugia or sites not influenced by Aboriginal burning.

The ability of the Tocal property to be so productive with grazing animals in its first 12 years of operation suggests that it was extensive indigenous grassland and there must have been few trees limiting the growth of the grass (Archer 2007).

> *'We breakfasted about nine miles further up on a rising ground of brush and swamp. The ground appeared open, the grass luxurious and long. I travelled a mile and a half on this sort of ground, and came to a pleasant rising mount which afforded an extensive prospect. It was covered with long luxuriant grass and very large trees of different kinds: some rocks are interspersed on its top, with plenty of water at hand. The land here is high above the source of the river. Here is plenty of land for agriculture. The soil is black, but mixed with a sort of sand or marley substance. However, its natural productions warrant it fit for anything. A creek that boats might lay in clear of violent floods runs along the foot of the mount. The cedar grows here in plenty about the sides of the river, so that there is plenty of wood and stone with water, and ground much preferable to any I have seen in Sydney for agriculture. This is the first spot for cultivation we have yet met with since we left the ship that is desirable about the waterside. The evening brought us up to the Colonel, where we found them in a comfortable hut and a good fire. This place might be nine or ten miles further up. In the morning the Colonel and Dr. Harris in his boat, and Mr. Barrallier and myself in our small boat, proceeded up the river to a mount, similar in productions and soil to the above described, but much higher and of greater magnitude. The view was extensive and picturesque, as it commanded a great extent of country'* (Grant 1801:407).

Grant's description is very clear, describing the land close to the river growing cedar but with grassy plains, which, he felt, were suitable for agriculture. The long luxuriant grass and very large trees suggest that this was open woodland. It would also suggest it is not alluvial land but land above flood limit which was to later become grazing land.

> *Schanck's Forest Plains, above the New River.*
>
> *The water rises on the banks a great height, as appears from the rubbish left on the trees, and the country for about half a mile back is full of lagoons, or swamps covered with reeds, which are bounded by moderate high hills. The ground is good between the river and hills; but much lower than the bank in most places so that the country is under water before the banks of the river are generally overflowed, and there are marks of the flood a considerable distance up the hills at the back, which are of a light sandy soil and covered with small ironstone. The grass is very fine except at the top of the hills, which are in general covered with an ironbark scrub. The vallies (sic)are wet, and marks of heavy torrents running down them. The timber on the low ground is principally blue-gum and apple-tree. Near the banks of the river a great quantity of large cedar, vines of different kinds, and plenty of curradjong; but the cedar and curradjong are more plentiful up the new river than any other part. On the high land blue-gum and ironbark trees are almost the only timber growing* (Grimes 1801:414-5).

Grimes' observations are similar to Paterson's and Grant's, however, he does indicate there is some ironbark scrub. This is consistent with reports elsewhere in the region, which suggest there is open woodland, and nearby there was also closed forest or scrub. Grimes' reference to blue-gum probably means spotted-gum. The site Grimes described is possibly a transect from the Hunter River near Pitnacree up to East Maitland.

The next records of vegetation in the area are in evidence presented to Commissioner Bigge in 1820, which provides details of the exploitation of certain timber species of the Lower Hunter including the Paterson Valley (Turner 1973). Key species were red cedar, flooded gum, pine, rosewood and a number of other rainforest species.

Surveyor Henry Dangar was next to collect information and records on the Lower Hunter and he published his report and map on the Hunter River in 1828 (Dangar, 1828). His reports are categorised on a parish by parish basis, and he makes some reference to the quality of the vegetation but with an emphasis on agricultural potential.

> *BARFORD.*
> *The lands of this parish are generally desirable for grazing purposes; but they are not, however, sufficiently rich to induce the new settler to pitch his tent here.*
>
> *MIDDLEHOPE.*
> *The remaining land of this parish, is inferior hill land. The Church and School Estate is desirable, though inferior in some degree to that of Butterwick, and has the same advantages of navigable water* (Dangar 1828:14).
>
> *HOUGHTON.*
> *The lands of this Parish are elevated, but affording good vallies (sic), and generally a fine grazing district* (Dangar 1828:16).

Dangar's description probably applies to land that had not been alienated by settlers in each of the Parishes. In the parish of Middlehope and Barford the best land had already been taken up. For Dangar to describe land as being valuable for grazing

strongly suggests it is open woodland rather than a closed forest. He would not be recommending land to settlers that needed to be cleared before it could be productive.

Andrews (1989) reviews the surveys of the land between the Hunter and the Manning in the period 1824-1834. This covers the explorations of Dangar, Florance, Ralfe and White. Without going into the details of these various expeditions it would seem obvious that the country must have been quite open for these survey parties to proceed on the paths they took. For example Dangar travelled from Scone, north crossing the heads of the Mooki and Peel Rivers, and then across the Great Dividing Range at Hanging Rock and down to the coast to Harrington Inlet. Other surveyors undertook surveys from this area south to the Williams Valley. Andrews' analysis indicates that thick brushes at times obstructed them but these were associated with watercourses and the moister areas. Their other chief problem was the precipitous nature of the country rather than the vegetation. Today, such a journey with bullock wagons would be impossible due to the regrowth of the eucalypt forest. This evidence strengthens the case that most of the landscape was open through which a bullock dray could pass providing the topography allowed.

Peter Cunningham also travelled through the district. Cunningham's reports of the vegetation are generally positive and his account of the Paterson area is also in this vein:

> *The alluvial banks of Patterson's (sic) and Williams's Rivers are heavily timbered, but the forest land behind is open, grassy, and every way suitable for pasture without cutting down a single tree. An estate of one thousand acres here, in a very trifling degree improved, was lately knocked down at public auction, in Sydney, for 580 pounds or 2680 dollars, ready money* (Cunningham 1827:77).

Cunningham's description confirms other evidence regarding the land back from the river being largely open woodland. His reference to the alluvial banks also confirms both earlier and later descriptions of what we now call the rainforest component of the lower Paterson Valley. Travel in the Lower Hunter to Paterson and Singleton in

the mid 1820s is recorded by an unknown writer with the nom de-plume XYZ (Grantham 1999):

> *A ride of four miles through the forest brought us to the Old Branch, or Patterson's [sic] River, a change much for the better; the land being equally good, and a large space of country on both sides of the water cleared and under cultivation* (Grantham 1999:17).
>
> *I was surprised to find the road so good from Molly Morgan's to Patrick's Plains. Excepting a few blind creeks, which though very narrow are very steep, a coach and four might run the whole distance. It is good open forest country,* …(Grantham 1999:29).
>
> *A coach and four horses might be driven through most parts of this open country without any fear of obstacles; indeed, the character of the scenery is so incidentally similar to the most admired parks of England, that had a barouche and four, with outriders, been driven past, there would have been nothing incongruous, or even remarkable in it, so exactly suited is this country for the equipage, and the equipage for the country* (Grantham 1999:42).

This writer was obviously impressed with the open nature of the country and referred to it as being similar to parts of England. This park-like concept was a way an English investor could be sold the virtues of the colony making it worthwhile for him to come to Australia. While the park-like description is not always used by writers it is a useful way of conceptualising what was meant by forest.

XYZ's observations were in the mid 1820s, only about five or six years after the land from Maitland to Singleton and Paterson had been completely alienated from the Aboriginal people. The changed management regime had therefore had not had time to affect the density of the vegetation. Later writers will have a very different view on the land between Maitland and Singleton.

> *Previous to my visiting Australia, I had often, amongst other wonderful things, heard it stated in London, by the near relative of an old established settler at Camden, that the country was so thinly timbered, as to require little expence (sic) and trouble to clear it for the purposes of agriculture. I found, however, the fact to be the reverse of this statement; and although certain classes of rich soils are not heavily timbered, yet the first class, which is the*

> *deep vegetable soil called brush, on the banks of the rivers, is, of any land with which I am acquainted either in England or abroad, the most expensive and troublesome to clear.*
>
> *The timber is exceedingly large, tall, and thick, and the ground is encumbered with creeping vines, and a species of brushwood peculiar to those soils. The hardness of the wood too every where, does not admit of a man's chopping down a tree in so short a space of time as in England, where also an expert woodman would grub trees of the same size in much less time than in New South Wales* (Dawson 1830:392-3).

Dawson had come to Australia and worked as the Superintendent of the AA Co so he viewed the landscape from a utilitarian or agricultural point of view. His description confirms others regarding the land on the banks of the rivers and he also confirms that some of the non-alluvial landscape is not heavily timbered.

Another report is by Baron von Hugel.

> *I got up at first light to have a look round, but over a great distance on this side of the Hunter River every single native shrub and tree had been destroyed, whereas the other side was one mass of the most luxuriant vegetation, quite impenetrable on account of the creepers.… …my guide took me to the great fig tree.… …The fig tree, Ficus macrophyllus, is indeed a giant. The trunk is particularly weird and sections of it, perhaps 10-12 feet thick, run down into the earth like wings from a considerable height. Its trunk shows many traces of attempts to cut it down, and one of these wings was being used as a pigsty. It owes its continued existence entirely to the difficulty of felling it. The planters in Australia have no great feeling for natural beauty* (von Hugel 1834:375-6).

This report by von Hugel from his travels through Maitland in 1834 gives a clear indication of the vegetation to the north of the Hunter River. By the time von Hugel had got to Maitland the settlers around Wallis Plain had obviously made their impact. The land however to the north probably on the Bolwarra Estate was still intact. The impenetrable nature of the vegetation comes up in various writings from time to time, a great contrast to open forest of the uplands. The reference to the creepers is of particular interest as these are an added dimension to the biodiversity of the rainforest and its ecosystem health. Other rainforest regions have clear under storeys and do not have the creepers, vines and similar vegetation which seems to have constituted the

Lower Hunter rainforest complex. The changes brought upon this vegetation by European exploitation were very rapid and dramatic. Von Hugel's description exemplifies this out by making it clear that the two sides of the rivers differed markedly by the condition of the vegetation during his visit.

Rev John Dunmore Lang, an inveterate traveller as well as brother of the owner of Dunmore at Largs summarises the state of the vegetation in the lower Paterson Valley in this description.

> *My deceased brother's grant which he named Dunmore, as a mark of filial affection towards a revered relative still alive, to whose Christian principles and uncommon energy of character I shall ever be under the strongest obligations- consisted partly of a belt of heavily timbered alluvial land, extending about a mile and a half in length along the windings of the river, which at that part of its course and for several miles higher up is both deep and broad-sufficiently so indeed for the largest vessels-although towards the ocean, which is about forty miles distant by water, there are shallows which a large vessel could not get over. Beyond the belt of alluvial land, there are two large lagoons, nearly parallel to the course of the river –the frequent resort of innumerable wild ducks, and occasionally of pelicans and black swans. The beds and banks of the lagoons consist of the richest alluvial soil; the rest of the farm being good forest pasture-land, very lightly timbered* (Lang 1837:92-3).

His intimate knowledge of his brother's estate and its potential are well recorded in his writings. The Dunmore Estate is very similar in many ways to the Tocal property but it has much less land distant from the river than on Tocal. Lang's description will be used as a major reference further on in this chapter when the vegetation of Tocal is mapped to circa 1750.

Another writer who reported on the vegetation of the Valley and related areas was James Backhouse, a Quaker missionary. Backhouse travelled from Dungog to Paterson in 1843, some 20 years after the settlement of the region by Europeans.

> *7th mo. 9th. After attending to some subjects of importance, we took a walk into one of the luxuriant woods, on the side of the Hunter, such as are termed Cedar Brushes, on account of the colonial White Cedar, Melia Azedarach, being one of the trees that compose them. Eugenia myrtifolia and Ficus*

> *Muntia, are among the variety of trees in these brushes. The former resembles a large, broad-leaved Myrtle, and attains to twenty feet in height; its fruit, which is now ripe, is about the size of a cherry, but oblong and purple, with a mixture of sweet and acid. Ficus Muntia is spreading Fig, growing as an Apple-tree. Where its branches touch the ground, they root, and send up erect shoots, forming a succession of trees. The insipid fruit, which is about the size of a Gooseberry, is sometimes produced from the bare trunk and boughs, as well as from the leafy branches, giving the tree a very unusual appearance. These Cedar Brushes are also thick with climbers, such as Cissus Antarctica, the Kangaroo Vine, Eupomatia laurinae, a briary bush, allied to the Custard-apple, but with an inferior fruit, and several Apocineae* (Backhouse 1843:397)
>
> *19th. We proceeded down the Wilson [sic] River, to Dungog, where the site of a town is marked by a small, weather-board Court-house. The brush by the side of the river is very rich, and ornamented by numerous, fan-leaved palms, Corypha australis, some of which are about sixty feet high. On leaving the river, we passed over a hilly country, of poorish soil, clothed with open forest and thin grass, to Wallaroba, where we were very cordially received, by a settler and his wife,…*
>
> *20th After a wet walk of ten miles, over hills and flats, of open grassy forest, we reached a little settlement, called Paterson, consisting of a few houses, on a river of the same name, and were kindly entertained by a settler whom I had met in London,…* (Backhouse 1843:402).

Backhouse's description of the vegetation around Dungog on the river and the hill country as being open forest and grassland is consistent with other observations. His observations closer to Paterson are also interesting as they are the only ones relating to that part of the Valley. All the other evidence collected for this study of colonial vegetation records is from Paterson south. Backhouse takes in the area north east of Paterson to Hilldale and on to Dungog. It is interesting to note that even in 1843 it was still recorded as an open grassy forest.

The next colonial record is not from the Hunter Valley but the North Coast. It is obtained from surveyor Clement Hodgkinson who undertook a survey of the coast from Port Macquarie to Morton Bay in 1845. The land that Hodgkinson travelled through – a mixture of hills and coastal valleys – bears many similarities to the Paterson Valley and Lower Hunter. A study of his records confirms many of the

observations by earlier writers associated with the Lower Hunter and Paterson regions. It is on this basis that Hodgkinson's evidence is useful:

> *The alluvial brushes on its banks are now frequently superseded by park-like forest ground, verdant rocky eminences, and luxuriant grassy flats of the greatest richness, lightly timbered with Apple trees (Angophora lanceolata,) whose gnarled branches, and light green foliage, resembling that of the English oak, render it the most picturesque forest tree in Australia. Several small tributary streams now begin to join the river. The first we meet, on the south side, is Dongai Creek. In the narrow Valley of this stream, the land is of the richest quality possible, consisting of a narrow border of alluvial flats, covered with broad-bladed grass, growing breast high, and with a few large blue gum trees scattered so far apart as to offer no impediment to immediate tillage. All the squatters on this stream have, in consequence, brought patches of ground under cultivation. Dongai Creek is hemmed in on both sides by fertile ranges, well clothed with grass, and lightly wooded; apple trees being the predominating trees on their lower slopes. The scenery is often very pleasing; the ranges rise in the smooth round cones, and their sloping sides, covered with bright green verdure, contrast strongly with dark glistening green of brush vegetation which invades some of the hills* (Hodgkinson 1845:14).

> *This tract is various, but generally broken into a pleasing undulation of hill and dale, and consisting mostly of what is called open forest, by which is meant grass land, lightly covered with good timber, and free from the perils of inundation* (Hodgkinson 1845:7).

> *On leaving Brinben I passed over several miles of good grassy undulating forest country, of park-like aspect, and rich soil, and watered by several fine brooks, the largest of which was the Dingo river(sic), a tributary stream of some importance flowing into the Manning. I now crossed some fertile grassy hills, very lightly wooded, and rode past several sheep-stations. Having, at length, entered the brush of the Manning, I crossed over a ford near the Gloucester river (sic), which joins it on the south side. The scenery was very beautiful here. The surrounding ranges of hills were all either very lightly wooded and grassy, or else covered over with brush timber and entangled vegetation. Most of the park-like hills rose in round conical summits, and were probably composed of clay slate; whilst one heavily wooded range, on the south bank of the river, was crowned by huge masses of rock, overgrown with creepers, and resembling the ivy-clothed battlements of some ancient fortress* (Hodgkinson 1845:89).

Hodgkinson's observations and records confirm what we understand the Lower Hunter to be like prior to the arrival of Europeans. The mixture of brush, grassland,

open forest and in some cases thickets of other vegetation would seem to be the norm in this region. While Hodgkinson may have exaggerated the details of the land because he was surveying it for the government, it is still clear there is much open country and woodland across the region. Hodgkinson's reference to one area, which was crowned with huge masses of rock, creepers etc, could suggest a site of some Aboriginal significance. We are fortunate to have a number of colonial images, maps, sketches and paintings of the Paterson Valley environment during the first 20 years of European settlement. These provide an excellent guide to many aspects of the area's vegetation. Joseph Lycett, a convicted forger, worked for a period on the Paterson River. He sketched a view believed to be from the Woodville-Seaham Road, about half way between the Butterwick Road turn off and Woodville. This great expanse of water was then named Lake Patterson (sic), see Figure 2.1. Evidence of this Lake is on Dangar's and other maps shows an extensive reach of water populated with numerous groups of birds as well as a wide range of riparian vegetation. There are open spaces of grassland as well as thickets of trees, brushes and other vegetation forms.

The plan of the church reserve of Paterson's Plains undertaken by George Boyle White, Government Surveyor provides intricate detail of the land from the southern part of Tocal through to Lemon Grove and Old Banks on the Paterson River, see Map 3.2. It shows the extent of the wetlands (in these cases referred to as lagoons) and the differentiation of the brush land from the upland and grazing land.

White also differentiates between land that is good for grazing only compared to land that can be cultivated or grazed. This map was used to assist with the preparation of the Tocal pre 1750 vegetation map.

White describes areas as grassy ridges and grazing forest land as well as areas that are thickly timbered, but in general his descriptions refer to land as forest land. This would confirm the description of forest land as being open woodland, an environment that a settler can immediately commence to use for grazing.

Figure 3.5 Paterson River, Robert Russell 1837

NLA

This painting of the Paterson River in 1837 gives a good description of the vegetation at that time. It would seem that the large cedar trees have been removed leaving the stark appearance of the white trunks of flooded gums. This and other paintings by Russell indicate the large number of flooded gums that grew along the Paterson River.

Figure 3.6 Mr Wilson's Farm, Paterson River, Robert Russell c1837

NLA

Fully cleared elements of the alluvial landscape are well represented by Russell in this painting. It is interesting to note the thick vegetation on the internal curve of the river, which one could suspect is now the land adjacent to Tucker Park in Paterson. This painting may well have been rendered directly opposite the Paterson Village looking to the north west. It is difficult to discern the vegetation on Mount Johnstone, but later photographs show that much of this range was cleared of vegetation by 1900.

Figure 3.7 Mill at Trevallyn, Conrad Martens c1837

Courtesy of Peter Walker Fine Art, Adelaide. Private Collection

This is one of few illustrations that give an indication of the vegetation in the mid Paterson River Valley. An elaborate farm was established at Trevallyn by George Townshend in the 1830s and included a water-powered flour mill (Sullivan 1997). The water colour shows the size of the trees adjacent to the river and the remnant vegetation following clearing for agricultural purposes. The riparian zone is in many ways virtually destroyed even at this early age. The remnant eucalypts and possibly cedars are clothed in vines, possibly cockspur.

Map 3.2 Plan of Church Reserve of Paterson Plains, GB White 1831


ML

## 3.9 Tocal Vegetation

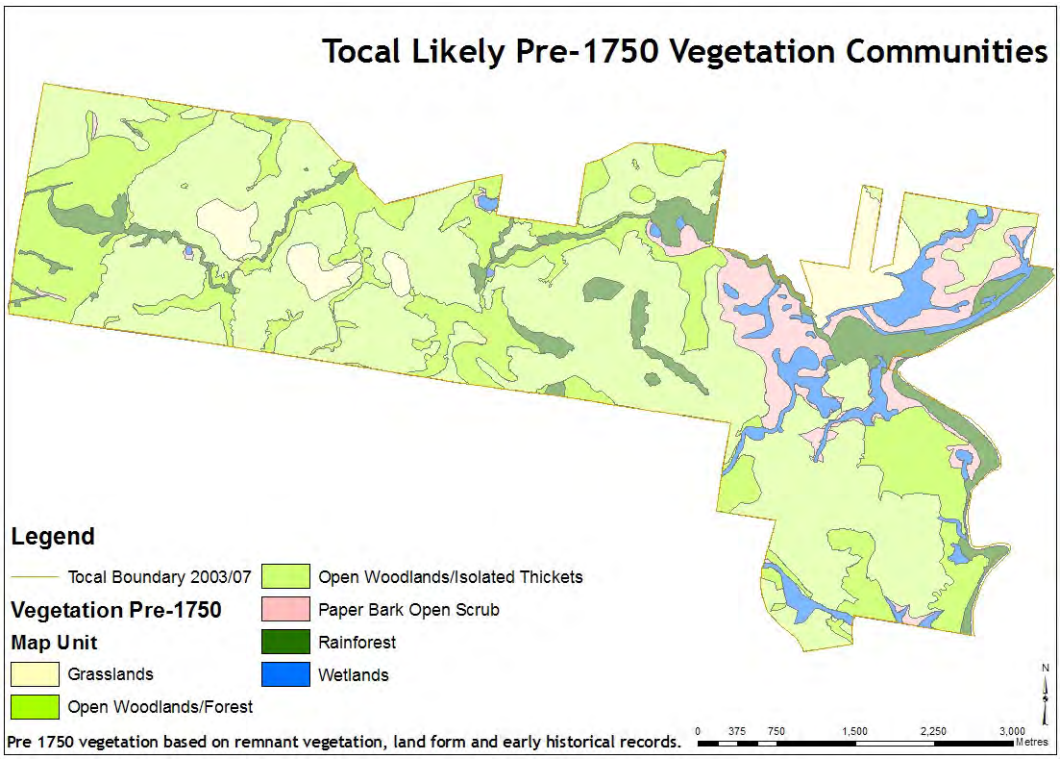
A localised study of the Tocal property has been used to create a map to indicate how the vegetation of the Tocal area may have looked prior to influences of Europeans. An analysis of Tocal's vegetation as it may have been prior to 1750 is contained in Appendix 2 along with the resources consulted to create the map. It is necessary to be aware that the map which has been created is based on a range of evidence but is still a matter of speculation.

A principal feature of the map is the amount of open forest which covered the property. Most of the non-alluvial land was open forest with the remainder being either thickets which were not burnt by Aboriginal people or open grasslands that, either through soil type or Aboriginal land practices, carried no trees. The land with the greatest propensity for this to occur would have been the basaltic Dermosol soils in paddocks such as Line, Springer and Calving and Hill.

It was in Line paddock that Webber had established his vineyard probably around the 1830s. It would have been much easier for him to establish a vineyard in grassland than an open forest where he would have had to completely remove large trees, stumps and roots to trench and form a coherent vineyard.

The map allows us to compare the current vegetation on the Tocal property to what may have first been there when Europeans took the land from the Aboriginal people.

Map 3.3 Tocal Likely Vegetation Pre 1750




The evidence that I have accumulated for this chapter has demonstrated how the pre European landscape was a product of the interaction between the processes associated with lifestyle of the Aboriginal peoples and their environment.

## 3.10 Conclusion

As Mitchell wrote in 1848, once the Aboriginal people were removed from the landscape it would change dramatically. This chapter has brought together a diverse amount of evidence to demonstrate the important influences that Aboriginal people had on the landscape. The Europeans walked into a manicured parkland and quickly exploited this delicately balanced natural resource. The new state was then influenced by successive changes in European technology, economics and values.

This chapter has shown that there has been a significant impact through Aboriginal land management on the Paterson Valley's ecosystem. The chapter has described the best available picture of the vegetation prior to the arrival of Europeans. It was an anthropogenic landscape, an assertion that is confirmed by extensive evidence collected and recorded. The application of panarchy and the adaptive cycle assists in understanding the evolution of the landscape as a product of the social ecological systems of the Aboriginal peoples. While the timescale is a great deal longer than the timescale that will be dealt with in the following chapters, there is enough evidence to show how the landscape evolved and changed through the thousands of years of Aboriginal land use. The removal of the Aboriginal people from the landscape was a significant influence on the future form of the landscape, but not as dramatic as the actions of Europeans, but nevertheless important and probably underestimated by many. The next chapter describes how Europeans imposed their institutions and infrastructure on the Paterson Valley.

# Part 2: Development and Crisis in the Valley

# Chapter 4: Development of European Infrastructure and Institutions

> *They surround them with their spears and then make them strip their clothes. They bring them into the settlement and then ask for a reward, which is given to them in tobacco or corn or a piece of blanket* (Turner 1973:95).

**Introduction**

A permanent convict settlement was established at the site of the city now known as Newcastle in 1804 (Gould 1981). The settlement was a prison for convicts who had been involved in the Castle Hill Revolt earlier that year and the Governor had to find somewhere to locate them, as there was no suitable prison within the Sydney colony. Some convicts tried to escape from the Newcastle settlement and the Aboriginal people cooperated with the European authorities in apprehending these runaways. Evidence from the Bigge Commission of Inquiry in 1820, cited above, confirms that, only 16 years after settlement Aboriginal people were already adapting to European institutions.

The geographical area covered by this section varies slightly from earlier chapters. The southern portion of the Valley in the flood plain area was strongly influenced by the city of Maitland during the 19th and 20th centuries. The villages of Largs and to a lesser degree Hinton are part of the Paterson catchment but for the purposes of this treatment, there will be little reference to these villages. The villagers have always seen themselves as part of the Lower Hunter and the Maitland region as distinct from having particular links or allegiance to the Paterson River and its valleys, which means their sense of place is not focussed on the Paterson Valley. Any statistics or analyses of European infrastructure or social systems will exclude these two villages.

## 4.1 Law and Order

Law and order was the first element of European institutional influence. In the early days of settlement Magistrates were appointed by the government from the ranks of

the grantees, for example James Webber and Charles Boydell were magistrates while William Dun was a coroner.

**Box 4.1 Sense of Place**

The concept of sense of place is probably the most powerful way of integrating human and natural systems. This is a relatively recent construct that has been used successfully in educational and other projects. It provides of a way of understanding the ways people react to change in the environment and their lives. There are various definitions of sense of place (Cameron 2003) but the following is recorded in a report on a sense of place study, which included Tocal:

> *A sense of place refers to a feeling of connection or belonging we might have to a place. We develop a sense of place mostly without even being aware of it. It grows out of our knowledge of the people, landscape, and events of the place combined with our feelings, attitudes and responses to these* (Yeend 2003:3).

Sense of place is important, be it for an Aboriginal family which has a link to a locality spanning thousands of years (endemic sense of place) or to a farm family who have owned a property for a few generations or even to a newly-arrived immigrant wishing to settle (built sense of place). It doesn't matter which role a person is in, all will be influenced by a sense of place, usually unwittingly; and their emotions and decisions will be driven by a sense of place. The logical corollary to this is that the feelings generated by sense of place will be a positive influence on the types of decisions made by the inhabitants with respect to the environment.

As the European infrastructure community and business structures became more sophisticated through the 20th Century, the issue of sense of place is more readily discernible. The key issue for the human inhabitants of the Valley was survival, either from a sustenance or financial point of view. Survival drove everything. The pressure of financial survival centred solely on resources from the Valley is no longer an issue for most people living in the Valley. Some farmers and most businesses still rely on Valley resources but many have income streams from outside the Valley – not linked to the Valley's natural or other resources. This means that people who are living in the Valley now have a sense of place centred on a more idealistic concept of the environment and not based on an environment that must sustain them on a daily basis.

Their services were required on a regular basis as the area was unruly and difficult to police, however, they were not permitted to dispense justice to their own convicts (Walsh 2007).

The police presence in Paterson reached a peak in the 1850s with a staff of six including a chief constable, a district constable and four ordinary constables (History of Policing at Paterson circa 1980). Around this time plans were underway for the construction of a new police station and courthouse that was commenced in 1857 and then extended in 1862. The infrastructure was probably ideal for the staff of six, and included barracks accommodation at the rear of the courthouse and police station. A new watch house and police residence was built in 1882-83. By 1865 staff numbers were down to three and by 1891 had been reduced to one. This was probably brought about by the contraction of the area covered by the Paterson Police station due to the establishment of policing in Gresford around 1860 or 1870 (Gresford 1829-1979, 1979).

Because Paterson becomes isolated in large floods, the need for a police presence was seen as greater than it may otherwise have been. Sometimes in La Nina years the village was isolated for up to a week or consecutive weeks at a time because of the lack of bridges and road infrastructure. The Paterson courthouse closed in 1967 but the presence of one policeman remains to this day. Similarly, for a period Gresford had a courthouse that is now closed, but still has one policeman.

### 4.2 European Immigration

The European institutions and infrastructure were dictated by the various phases of immigration into the Valley. The earliest Europeans to live in and exploit the Valley were gangs of cedar cutters (Turner 1973), commencing in 1804. Not long after this some freemen and ex-convicts were allowed small areas to farm on the lower Paterson (Hunter 1997). This phase of immigration would have had a significant effect in the local vicinity but not across the whole Valley.

The next phase of immigration was well-to-do, often young, settlers from Britain who took up most of the good land in the 1820s. James Webber, John Webber, Charles Boydell, William Boydell and George Townshend all came from North Wales.

They brought with them many names that relate to North Wales particularly those in the upper Paterson. These settlers had few free servants; instead they had a cadre of convicts many of whom had no long-term commitment to the locality but had to serve out their time. The commitment of the settlers to the locality was mixed, with some leaving within a decade or more and others remaining, a few with descendants still in the Valley in the late 20th century.

The next phase of immigrants to the Valley was of Scottish descent. This immigration was prompted by Reverend John Dunmore Lang whose family owned the Dunmore estate at Largs (Baker 1985). Lang was particularly interested in the development of the colony and agriculture and saw opportunities for displaced Scots, particularly highlanders, to start a new life in the colony. Many came to the Hunter and worked on the large properties particularly in the Largs, Hinton, and Wallalong areas.

The arrival of the Scots created divisions based around language, as many of them only spoke Gaelic. The Scots wished to continue their Presbyterian faith in Gaelic and were nurtured and encouraged by the well-known minister Reverend William McIntyre of the Free Presbyterian Church, Maitland (Archer and Sullivan 2004).

The divisions caused by the Scots' arrival did not dissipate, and in fact became more acute in the following decades. Later times saw immigration of Irish Catholics to the Lower Hunter and by then the Scots were reasonably well established, mainly as tenant farmers growing wheat on the Lower Hunter flood plain. McIntyre established a small free Presbyterian church in a locality called Ahalton near Mt Kanwary in 1847 (Archer and Sullivan 2004:34). McIntyre and his followers took exception to the arrival of Catholics and the preaching of Popery. In March 1860 McIntyre advertised to present a public lecture from Scots Kirk Free Presbyterian Church in Maitland entitled 'The Heathenism of Popery Proved and Illustrated' (Maitland and District Historical Society 1983). A crowd consisting mainly of Roman Catholics turned out and a riot ensued with injuries to McIntyre's brother and young nephew.

Such were the divisions within the community based around sectarianism in the mid 19th century. With the demise of the wheat industry in the 1860s and the opening up of lands to the north and north west following the introduction of the Robertson Land Acts (Box 4.4), many Scottish families left the Hunter. While there are some families of Scottish origin still living in the Paterson Valley, more left than stayed.

Migrants from Germany were the next group to settle in the Valley. Most were engaged as vine dressers and wine coopers on the various estates in the Hunter (Parkes 1986:19, 21). The Germans were the first group of immigrants from Europe who had specialised agricultural experience. Most came from rural areas of Germany as distinct from the English settlers, most of whom had non-rural backgrounds. Unlike the Scots, the Germans largely stayed on in the district and many families are still in the Valley today. Of all immigration phases the Germans have been the most enduring. A report in the Newcastle Chronicle regarding the outlook for tobacco in 1869 refers to the Germans as 'the most persevering and industrious of our settlers' (NC 18/11/1869).

The Germans often took up small blocks of land on a tenant arrangement and grew tobacco, as well as working on the vines. The Robertson Land Acts (see Box 4.4) were introduced a decade after the arrival of the Germans and this provided opportunities for them to take up land despite having little capital. In addition some of the larger estates were starting to change and settlers were able to purchase or lease land. Thus a combination of circumstances saw the Germans stay in the Valley. There are no other identifiable groups immigrating from overseas into the Valley since the German migration of the 1850s.

### 4.3 Governance

The next section of the chapter will address how governance developed in the Paterson Valley for local, state and federal spheres. It will not be a study in detail of every move and change in boundary or jurisdiction but an overview that will put past and existing governance systems in the context of environmental management.

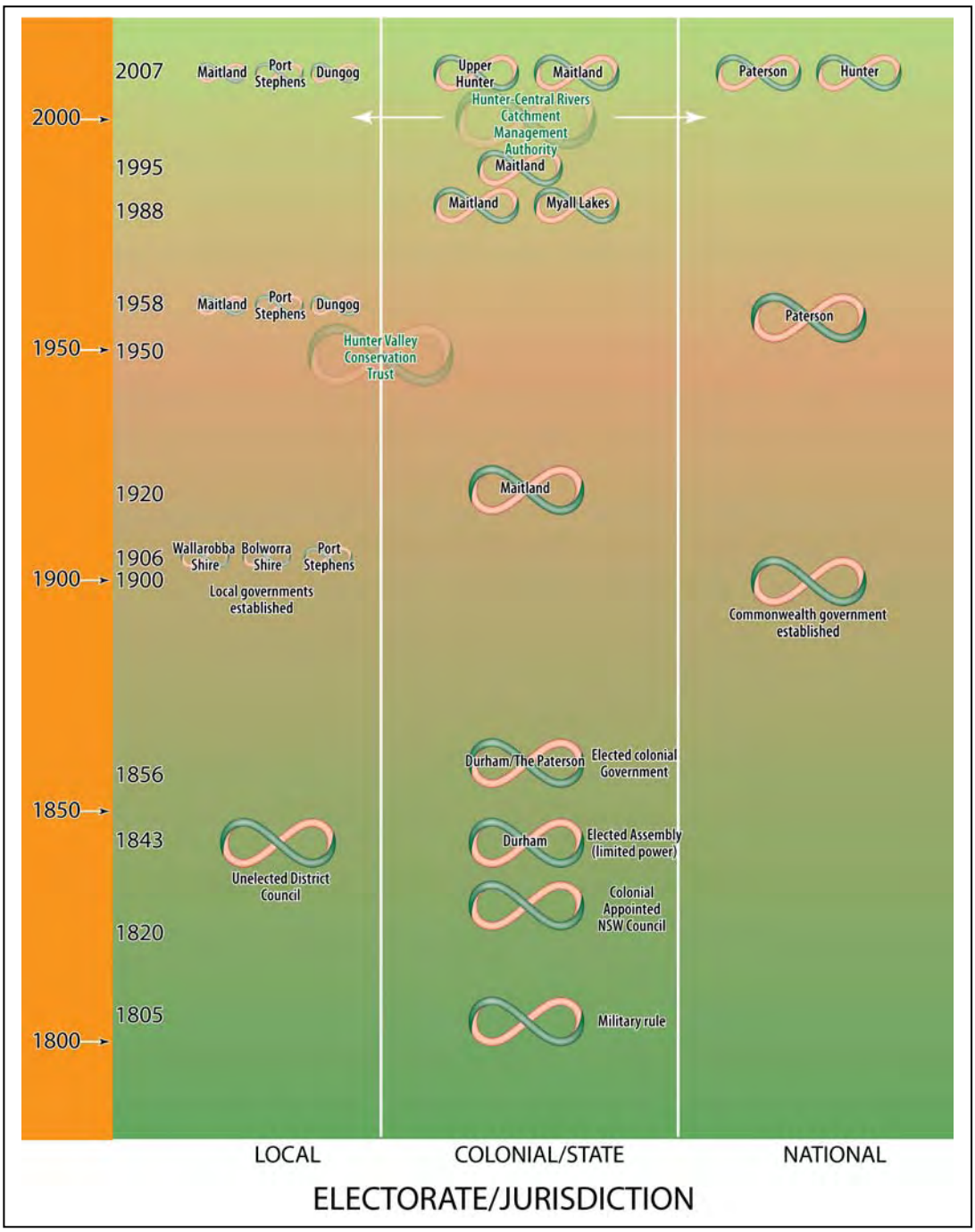
Figure 4.1 uses panarchy and the adaptive cycle to provide a representation of how governance has developed in the Valley.

In 1823 the NSW Legislative Council was established comprising of 5-7 leading citizens (appointed) who would advise the Governor. In January 1843 the NSW Government Gazette proclaimed the new Constitution Act, which provided for the election of members to service in the Legislative Council (Brown and Threlfo 2001). This was an act of the English Parliament and provided not only for a colonial legislative council based in Sydney but also for the establishment of district councils. The district councils became the basis for local government.

The Act provided for the Governor to incorporate districts, and to appoint the first council, with the subsequent council members to be elected by qualified residents (Larcombe 1973:205). On August 17 1843 the District Council of Paterson was established on what is largely the Paterson Valley. The boundaries for the 1843 District Council are probably the most consistent with environmental management of any governance boundary in the European history of Valley. At that time, on the basis of the 1841 census, Paterson District Council area had a population of 2746, 402 houses and an area 427 square miles of which 61.5% was alienated land (privately owned) with Paterson as the largest centre with a population of 90 (Larcombe 1973:209, 211). District Councils were empowered to generate revenue from tolls and rates levied on private properties. The implementation of district councils was problematic and controversial; almost every aspect of their operation was challenged by the press and citizens.

A key focus for the district councils were roads and bridges and many references in the Maitland Mercury for the Paterson District Council focussed on infrastructure. Council received funds from the government as annual grants for the repair of roads (MM 8/7/1865). The District Council had no particular interest in aspects of environmental management compared to local government of today. Amendments were made, but the District Council system stayed in place until replaced by local government in 1906.

Figure 4.1 Changing Governance in the Paterson Valley 1805-2007



District Councils underwent major reforms in 1906 as a result of the Shires Act 1905 and the Local Government Extension Act 1906 (Lambley 1989, Larcombe 1976). These reforms provided for shires, which were rural and incorporated organisations, and municipalities, which were also incorporated, with responsibilities for the urban and town areas. At that stage the Bolwarra Shire, covering 75 square miles, took in the lower part of the Paterson Valley including Paterson. The Port Stephens Shire took in the lower portion of the Valley east of the river and the Wallarobba Shire based in Dungog covered in the remainder of the Valley. These local government boundaries remain to this day; however, what was Bolwarra Shire is now part of Maitland City Council and what was Wallarobba Shire is now part of Dungog Shire.

The lower reaches of the Paterson River remain as a local government boundary, which in itself is unsatisfactory from an environmental management point of view. This is because there are different jurisdictions operating on each side of the river. There are different policies and management strategies in place for the drainage systems into the river, the management of weeds and other elements of the environment even though they are completely linked within the same river system.

The local government boundary between Maitland City Council and Dungog Shire Council includes the southern boundary of the original Tocal land grant. As the property has expanded there is now land in both Maitland City Council and Dungog Shire Council. This boundary has also become an electoral boundary for State and Federal governments.

Another form of local government was commenced in the later 19$^{th}$ century which is important with respect to environmental management. This was the establishment of Pasture Protection Boards, a unique arrangement that only occurs in the State of NSW. They arose from the Sheep Scab problem that had plagued the graziers in the colony.

**Box 4.2 Sheep Scab**

Sheep scab or *psoroptic* mange was a major animal health problem facing early pastoralists in colonial Australia. Scab was such a serious problem that there were various Acts passed through the NSW Legislative Council commencing with the 1832 Scab Act which aimed to restrict sheep movement and minimise cross infection (Fisher 1998). By the middle of the 19th century scab remained a significant problem and was probably the most political issue in the pastoral industries. Because the Legislative Council was largely controlled by squatters, there was a political will to do something about it. There was, however, no financial way of solving the problem by government paying for the control. As a result of the 1854 Scab Act, a levy was brought in to fund the control of scab. The expenditure of the levy was partly controlled by the pastoralists and partly by government.

Inspectors were recruited to work within local areas through Scab Boards. As well, there was a government-appointed Chief Inspector of Sheep who worked in association with the Boards. The Scab Boards later became the Rural Lands Protection Boards. As a result of these institutional arrangements along with the efficacy of tobacco and sulphur based treatments, scab was ultimately eliminated. The scab story is important when understanding how collective action by landholders (in this case pastoralists) through a combination of central and local control overcame a problem. It set in place an institution which remains to this day. Rural Lands Protection Boards have their origins from the Scab Boards and the concept of levies for a particular purpose has been extended across most rural industries.

Pasture Protection Boards oversee all matters relating to livestock diseases as well as feral animals (in particular rabbits) and the control of wild dogs. The Maitland Pasture Protection Board, now known as the Rural Lands Protection Board (RLPB), covers a very large area from the north of the Paterson Valley to the Sydney Basin. Pasture Protection Boards were the first form of environmental management by local government with their sole objective being to protect the interests of graziers.

The reforms of local government in 1906 challenged the role of Pasture Protection Boards and that tension exists to this day. Larcombe describes the tension:

> *The problem of noxious weed eradication has continued to strain relationships between the shires and pasture protection boards. From time to time suggestions have been made for weed control. The combined representations from government associations and other rural organisations, led, in 1962 to the constitution of the Noxious Plants Investigation Committee. After investigations of the problem the committee recommended a coordinating central authority, which would retain control within the local*

> *government framework. While such a recommendation may be applauded by the local government protagonist, it does not completely eradicate the stresses and strains resulting from the activities of two sets of authorities undertaking complementary functions in noxious pest control within a common area. Those advocates who seek to create a stronger and more viable system of local government, would certainly prefer a rationalisation of protective land services, through the adoption of a system of major-purpose regional councils, which among other functions, would undertake the general eradication of noxious pests both plant and animal* (Larcombe 1976: 242-3).

The duality of administrative control for these matters to do with environmental management is problematical and still creates some confusion with landholders, particularly those new to life in the country. The strength of the RLPB system is that it derives its primary income through per head levies on sheep and cattle. Every landholder pays a small amount to the RLPB as a rate to sustain the system. Governments are loathe to change the system as it could mean that this revenue would be lost and a reforming State government would have to accept the responsibility for these services from its own resources. While there have been various NSW inquiries and reviews of RLPBs, based on criticism from some sectors of the community, their independent rating system would seem to be their means to maintain the status quo.

The Boards developed a network of travelling stock reserves across the state and these reserves still exist. They are now some of the best-preserved sites of natural vegetation as they are largely undisturbed and unfertilised compared to neighbouring farmland. These reserves are no longer used for travelling stock and are often agistment areas for local landholders. The Maitland RLPB holds within the Paterson Valley eight reserves ranging in size from 5 to 136 hectares with a total area of 476 hectares (RLPB 2001:maps37-8).

As stated earlier, the first Legislative Council of 1823 (unelected) was replaced by an elected Legislative Council in 1843 through the English Act of Parliament.

Voting rights at that time were restricted to males who owned a certain amount of property and the new council was dominated by large landholders, collectively known at the time as squatters (Clark 1973:289-290).

The first election in the Paterson Valley was not without incident. On the evening of the election a riot broke out at the Paterson Hotel resulting in the death of Duncan McGillavray (Brown and Threlfo 2001:23). The disturbance arose due to animosity between the supporters of Richard Windeyer and Andrew Lang. The public unrest at the time says something about what was happening in the district. Lang's supporters were primarily drawn from the recently arrived Scots as well as some established settlers whereas Windeyer's were more from established settlers and few Scottish names appear in his list of supporters. The dissension seemed to be between the established Church of England residents and recently-arrived Presbyterians, but there are probably other issues that caused the conflict and unfortunate death of McGillavray.

Windeyer was elected for the County of Durham, which included all of the Paterson Valley. The NSW Parliament was then a series of councils from 1823 until 1855. The sixth council was replaced by a Legislative Council and Legislative Assembly in 1856 (NSW Parliamentary Record 1999:5). The Paterson Valley was represented through the electoral district of Durham/The Paterson until 1920. Long serving representatives included WM Arnold, HH Brown and W Bennett, who all provided stable and strong representation for the Valley.

For much of the subsequent period from 1920 to the present the Paterson Valley has been part of the electorate of Maitland, again having long-term members including Bennett continuing until 1927 followed by WAH Howarth until 1956. At that time Milton Morris was elected and served for 24 years as the Member for Maitland. A feature of the NSW Parliamentary representation for the Paterson Valley has been active and strong local members, who have usually been part of the government of the day.

The effectiveness of the state parliamentary representatives for the Paterson Valley saw it gain extensive infrastructure, particularly bridges, schools and the Lostock Dam. In addition the transfer of the CB Alexander Presbyterian Agricultural College to the NSW Government was undertaken when the then local member, the Hon Milton Morris, was a senior member of the NSW Cabinet (Hunt 1972). The impact of good parliamentary representation on ecosystem health can work in two ways. It can provide resources and government support for the conservation of the environment, alternatively it can provide resources which can result in further exploitation of the environment. Both have occurred in the Paterson Valley.

**Box 4.3 Hunter-Central Rivers Catchment Management Authority**
A pioneering initiative in governance for the environment occurred in the Hunter Valley after the 1949 flood. The devastation from the flood demonstrated that the current systems of flood mitigation were inadequate for the Hunter (Walsh & Archer 2007:7). The NSW Government passed the Hunter Valley Conservation Trust Act in 1950, which saw the establishment of the Trust as a Statutory Authority. Its aim was to coordinate all levels of government effort, particularly local and state, in flood mitigation. It received funds from the NSW Government for flood mitigation over many years and this remained its focus until the late 1980s. Its name was then changed to the Hunter Catchment Management Trust, however, its local government representatives and state government public servants did not change. The Trust was most successful in ensuring good communication between the state and local governments, particularly for flood mitigation but later for catchment management purposes.

The Trust became a model of national and international interest and was the forerunner of what is now the Australia-wide Catchment Management Authority (CMA) framework. The Hunter-Central Rivers Catchment Authority consists of ministerial-selected representatives from the catchment, who are then supported by advisory committees. No longer does local government have direct representation on this body, so the benefits of linking governance across the two levels of state and local are diminished, however, the National Government plays a pivotal role both from a funding and policy point of view .

The final level of government to be discussed is that constituted in 1901 with the formation of the Commonwealth of Australia. For much of the 20$^{th}$ century the Commonwealth Government had little interest or input into matters associated with ecosystem health in the Paterson Valley. These matters were left to state and local

governments. As the 20th century progressed the Commonwealth Government has become involved in issues formerly the domain of state and local government. This involvement probably arose from the fact that the Commonwealth has the most control over revenue-raising and taxation compared to other tiers of government. The Commonwealth is seen now a major influence in environmental management across the country, including the Paterson Valley.

The Valley has been part of various Commonwealth electorates and at one stage was all within the electorate of Paterson. At present the electoral boundary is the local government boundary at Tocal and progresses south with the River as the boundary. The northern electorate is Paterson and southern is Hunter. As stated earlier, divisions of this nature are largely unhelpful when it comes to ecosystem health. The redeeming factor is that the Commonwealth has established CMAs based on water catchments, which means that Commonwealth funding to the Valley should be on an equitable basis and not be affected by Local, State or Commonwealth Government boundaries.

### 4.4 Private Property

The other boundaries that are important to environmental management are those associated with private property. European economies are based largely on the notion of individual property rights, whereas Aboriginal economies were largely based on community and group property occupation ('country'). The imposition of the European economy on the Paterson Valley saw the land divided into discreet parcels for private property ownership. Governor Macquarie's attempt at settling well-behaved convicts on the lower Paterson River resulted in the former convicts being evicted by the next administration (Hunter 1997). The Bigge Commission resulted in clear guidelines for future distribution of government land to settlers. Henry Dangar then surveyed the Lower Hunter and this imposed a one-mile square grid across the lower Paterson Valley (Dangar 1828), see Map 2.3.

The survey by Dangar enabled the land to be subdivided into large estates, each with a one mile frontage to the Paterson River. This arrangement covered the mid and

lower portions of the Valley (Campbell 1926). Many of the boundaries from Dangar's 1828 map still remain today. The local government boundary which is now also a state and commonwealth electoral boundary is one of Dangar's east west grid lines forming the southern boundary of the original Tocal grant.

The straight lines did not take into account any of the natural features of the landscape which meant an unnatural fragmentation of the ecosystem into portions which would be managed quite differently from each other. The Tocal property is a long rectangle with its boundaries crossing wetlands, creeks and other natural features resulting in management difficulties from an ecological and economic perspective. The internal subdivision constructed following the 1965 farm plan take into account natural features, see Map 1.3 and Chapter 6.

While there were some sales and subdivisions of properties prior to 1860, it was the Robertson Land Acts that commenced in the early 1850s that first saw land being divided into smaller allotments for settlers to take up (Baker 1961). This only applied to land that had not already been divided and occupied as freehold by the first wave of settlers. The Robertson Land Acts enabled a person with limited capital to purchase a small block, usually 40 acres, and then lease other land around it at a nominal price. The settler had to clear and develop the land he purchased to meet his obligations as the landowner. The value system driving the Land Acts was based on the Yeoman Farmer Ideal.

Land tenure arrangements through the late 19$^{th}$ century were a combination of allocations of public land away from the river through the Robertson Land Acts as well as the gradual subdivision of the large estates as their owners sold or died (Burley 1962). In 1926 when Tocal was offered for sale, it was to be sold either as one parcel or a series of small blocks. It was subsequently sold as one, so it was never subdivided as planned in the sale poster. Other estates around Paterson including Bona Vista (in 1855) and Tillimby (in 1924) were subdivided at the time of sale into a series of small farms whose boundaries continue to this day. This method

of land sale and subdivision provided for the establishment of many small farms in the late 19th and early 20th century – usually dairy farms. Often the boundaries for the smaller farms were based on what had already become tenant farms, so at the time of the sale, the tenants bought the land that they may have been farming and living on for up to a generation.

### 4.5 The Yeoman Farmer Ideal

The concept of the yeoman farmer is a recurring theme throughout this study. The subdivision of the lands of the Paterson Valley into small farms can be partly attributed to the yeoman farmer ideal, an underpinning element associated with the settlement of Australia (Waterhouse 2004, Waterhouse 2005).

The origins of the term yeoman farmer are rooted in Old English but came to be associated with a person of middling social status who owned land and farmed it himself.

There was an undertone of moral superiority associated with the industrious Christian yeoman whose virtues were juxtaposed against those of the cities and the slums of industrial England and Europe. The links between a settled civilisation and Christianity also drove the yeoman ideal.

> 'It was a long held English tenet that a 'civilised' society was settled and agricultural, that an 'uncivilised' culture consisting of herders and hunters, was marked by its nomadic qualities. The English also argued that a society could not be classified as Christian until it had first become settled and civilised. A civilised society, as the ancient Greeks and Romans had demonstrated, did not need to be Christian, but civilisation was a pre-requisite for Christianity.' *(Waterhouse 2004:443).*

The yeoman ideal was one of the driving forces behind Macquarie's attempt to settle some farmers on the lower Paterson River between 1810 and 1820 and was also the force which assisted in driving the Robertson Land Acts which were to influence settlement in parts of the Paterson Valley in the late 19th and early 20th century. The yeoman ideal also had an influence on the soldier settlement and subdivision of large

estates after each of the wars however little of that occurred in the Paterson Valley. Instead the market saw large estates subdivided in the late 19th and 20th century and small farms established once dairying became a proposition.

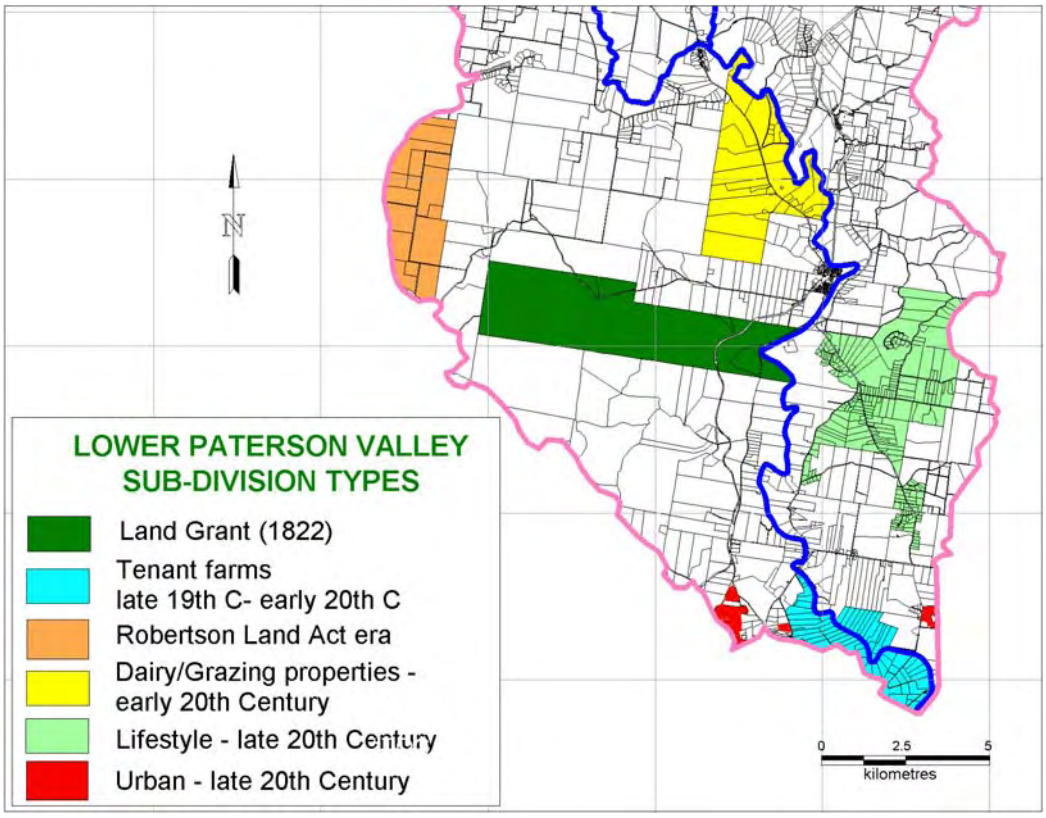
Therefore the fragmentation of the Valley into relatively small parcels of land can be attributed to some degree to the ideal of having the countryside populated with *….small-scale cultivators in the form of yeoman farmers as natural, God-ordained and reflecting the highest levels of virtue and happiness* (Waterhouse 2004:441).

The Robinson family of Martins Creek provide a good example of the yeoman farmer ideal occurring in the Paterson Valley. Charles Robinson, a saddler in Paterson registered his first conditional purchase of Crown land in 1866 (Cox 2007:81). Further blocks were added creating the family farm Mountain Vale which produced tobacco, corn, fruit, vegetables, milk and cream. The farm remained in the family for 100 years.

The yeoman farmer ideal represents a set of values that have driven land subdivision and land use in the Paterson Valley. It could be argued that the desire by many urban Australians to buy land and live in a rural community has, at its heart, the Christian value systems that drove successful governments to encourage and foster small owner operated farms since European settlement.

The impact of intensively using smaller parcels of land was significant because often the land was not capable of sustaining the production that was expected from it. The result was degradation and inappropriate land management practices, leading to many families in poverty. Accelerated erosion in the Monaro region of NSW was attributed to closer settlement and subdivision of the country into living areas (Merritt 2007:88).

Map 4.1 Lower Paterson Valley Subdivision Types




The subdivision and utilisation of land is a lasting element of adaptive cycles in within a social ecological system. Each of these examples illustrated in the map above can be related to a particular adaptive cycle. The Robertson Land Acts era subdivision was a response to an increasing population in the NSW colony who wished to pursue the yeoman farmer tradition. The late 20th century lifestyle subdivision was the result of increasing affluence within the community and the desire of some people to live in a rural environment. It also coincided with poor returns from traditional grazing activities and of farmers relinquishing rural pursuits. Local and State government institutional arrangements have a significant influence on the adaptive cycle when associated with land subdivision.

The subdivision of the large estates largely ceased by the mid 20th century and subdivision did not occur very much until the 1970s when the Valley became attractive to hobby farmers and new residents from urban areas. As a result land in the lower part of the Valley was subdivided into sometimes five or 25 acre blocks. This continued for a period until local government brought in a range of local environment plans, which placed restrictions on the sizes of blocks in subdivisions. Land subdivision remains a contentious issue.

### 4.6 Government Services and Transport

One of the attractive features to those who have come to live in the Paterson Valley is the wide range of government services within the Valley – this has not always been the case. The first government service to the Valley after law and order was the postal service; these services commenced in Paterson in 1832 (Cremer 1988). The post office moved around depending on who had the contract and at one stage it was held by Dr Nind who also served the village as its medical doctor. Years later when the government was seeking to establish its own building as a post office in the village some attention was given to purchasing the former residence of Dr Nind, the Royal Oak Inn. Paterson citizens were outraged at such a proposal and strongly protested (MM 19/1/1882); they wanted a proper post office and were successful in getting it (Cremer 1988). This type of response is typical of what seems to occur in the village and district of Paterson. The community has the ability to respond very quickly to a potential problem or governance that is not deemed popular. Meetings such as this have been held in Paterson whenever an issue has stirred public sentiment. In the case of the post office, public sentiment prevailed.

Post office services moved through the Valley during the mid 19th century. The Gresford district sesqui-centenary celebrations booklet (Gresford 1829-1979, 1979) recorded the following dates for the establishment of postal services: Gresford 1841, Eccleston 1859, Lostock 1861, Mt Rivers 1863 (transferred from Lostock), Allynbrook 1865. Clements (2003) records the Vacy postal services commencing in 1860. Hilldale once known as Big Creek has had its postal services operate from

Dungog rather than Paterson. The first post office servicing Hilldale opened at Wallarobba in 1878 and later a mail depot was located at Green Hills below Mt Douglas on the Dungog Road (Ingle 1987). When the railway line came through in 1911 a post office was opened in Hilldale following the urging of the Farmers and Settlers Association. The post offices became the local telephone exchanges and in some cases the exchange was a more important element of communication than the post office. Telephone services were particularly important in times of flood as they allowed residents to communicate details of conditions down the river.

The spread of telephone communication in the Paterson Valley is recorded in Table 4.1.

**Table 4.1 Development of Paterson Valley Telephone Services**

| ***Location*** | ***Year of arrival of telephone*** | ***Source*** |
|---|---|---|
| Paterson | 1874 | Cremer 1988 |
| Gresford | 1884 | Gresford, 1829-1979, 1979 |
| Allynbrook | 1914 | Allynbrook Public School Centenary Committee 1975 |
| Eccleston | 1915 | Eccleston Public School Centenary Committee 1967 |
| Mt Rivers | 1917 | Mt Rivers Public School 1975 |
| Lostock | 1922 | Lostock Public School 1978 |

It can be seen that the village of Paterson received its telephone service some 40 years before many of the upper Valley communities. The importance of this cannot be overstated, especially regarding flood warnings. However, these warnings would be on a personal basis between families who knew each other and took the opportunity to communicate. Not all properties had the phone connected and often floods and storms could bring down the phone lines, making communication impossible.

*Let the roads be put into order, and the rest will be easy* – These were the words of Brunsdon Fletcher writing on the history of the Coolah Valley in 1927 (Fletcher 1927). This was towards the very end of the animal-powered era when motor vehicles were quickly taking over from bullocks and horses. Fletcher's thoughts and other writings echo sentiments that are relevant to the Paterson Valley. While the

Paterson Valley is seen as a relatively settled and easily accessible region nowadays, it was not always the case. While the distances may have been relatively small, the impediments to moving through the Valley were great: in some cases short steep hills but mainly the many river crossings before one reached the head of the Paterson or Allyn Rivers.

The lower parts of the river are tidal which impedes travel. While roads are only one aspect of travel they became the primary artery for all travel during the 20th century in the Paterson Valley. Agitation for roads and bridges started early in the life of European settlement in the Valley and this has continued unabated.

Access to Maitland remained a controversy later into the 1860s with the punt at the Falls (Lorn) needing repair and the Pitnacree punt being inoperable, meaning people from Paterson had to travel to Maitland via Morpeth *through slush and mud up to a horse's middle from Largs to Morpeth* (MM 22/3/1864). There are many such anecdotes and stories regarding the state of the roads. Suffice to say roads have always been a major issue for the residents of the Paterson Valley. As the road standard rises so do the expectations of the community.

Roads north of Gresford through the Allyn and Paterson Valleys have also been controversial: the key issue being the multitude of river crossings necessary to reach the head of the rivers. The more problematical road is that which follows the Paterson River, where the River tends to wind and the Valley is steeper compared to the Allyn Valley which is more of a long basin with less need for river crossings particularly in the southern portion. The state of the roads still influences life in these Valleys today. For example the late Jim Dooley, a local agent, once told me that it was much easier to sell a property in the Allyn Valley because the road was relatively straight. He recalled that by the time you got a few kilometres out of Gresford on the Lostock Road potential buyers had become uninterested because of the twists and turns in the narrow road. The road from Gresford to Lostock is much better than it was prior to the construction of Lostock Dam. At this time there was an upgrade to

sections of the road and it was sealed to Lostock. There has been no further work of significance undertaken on the road since that time (circa 1970).

The Paterson Valley community also lobbied extensively for the construction of bridges. In 1856 William Munnings Arnold was elected to the Legislative Assembly for the County of Durham, a position he held until his death by drowning in 1875 (Boyle 1993). It was during this era that substantial bridges were built, which gave good access to the Paterson Valley. The bridges were Dunmore (Woodville) circa 1865, Pitnacree 1866, Belmore 1869 (Walsh & Archer 2007). These bridges brought great benefit to all those living in the Paterson Valley.

The river was important for transport of heavy goods until the arrival of the railway in Paterson in 1911. There was then a rapid demise of river transport, apart from cream boats, which used to travel the river collecting cream from the dairy farms on the riverbank.

The arrival and continued increasing sophistication of motor transport saw the demise of other forms of transport as well as a gradual upgrade of roads. The roads, however, remain a source of dissatisfaction by members of the community.
A problematic issue for current residents in Paterson is the heavy use of Tocal Road by gravel trucks from Martins Creek quarry. This quarry has become an important source of material for the construction industry, railways and mines and gravel trucks now perpetually traverse the road. The impact of these trucks on the ecosystem health of the lower Paterson Valley, in particular for those living on the road, is most significant. In 2004/5 the quarry had an output of 650,000 tonnes and only 10 percent of that was sent by rail. This means that there were about 20,000 truck movements on local roads to transport this material from the quarry. Many of those trucks pass through the village of Paterson (MM 16/1/2006). The quarry is in Dungog Shire Council but much of the road damage and impact is in Maitland and Port Stephens Council areas. Planning control has been taken from the councils by the State government and placed with the NSW Department of Planning. The impact of the quarry is significant both on the roads and to those who live near them. It is

perhaps the most significant environment amenity issue in the lower Valley at the time of writing this thesis.

The arrival of the railway in 1911 was a revolution for Paterson and provided much-needed employment, particularly for young men from the village. This also increased with the opening of the Martins Creek quarry. The quarry has been a source of employment for Paterson residents for most of the 20th century. Paterson was perceived by those further up the Valley (particularly north of Gresford) as a railway and working class village whereas Gresford was a pastoral village. This split between the two villages, while not always easily perceived, probably lasts in the minds of some long-time residents to this day.

The railway brought jobs to Paterson, including to those who worked on the station; those who operated initially the three sets of railway gates; the operators of the steam pump at Gostwyck Bridge, which pumped water to Martins Creek railway station and the quarry; and the quarry itself. As well some fettlers from the railway were based in Paterson. The railway transformed the face of Paterson, created a new village at Martins Creek and provided an extra transport outlet for the produce of the Valley in particular oranges and timber. The railway also became important for trucking of cattle driven down the Valley to Paterson for railing to Sydney or elsewhere. Graziers like CB Alexander who owned Tocal from 1926 until 1947 brought trainloads of cattle into Paterson for fattening on the Tocal pastures.

### 4.7 Churches, Religion and their Social Impact

Christianity and its associated institutions played a major role in society during the 19th century – much more than it does now. The rise and development of churches and their congregations were an important part of the social fabric of the Paterson Valley. This analysis of the development of churches in the Paterson Valley is centred on the dates of the construction of the actual churches as distinct from when congregations commenced in a particular area. The dates of construction of churches

give an idea of the respective wealth of that community and its commitment to worship.

The earliest services in the Paterson area were by Captain William Dun, the first man to be formally granted land in the Paterson Valley (Mitchell 1984:174). Dun was given extra land in recompense for his services, a measure that demonstrates the value placed on church services by the government administration. The earliest services were held in sheds and houses and few records exist; however this practice continued for decades as reported by the Mt Rivers Public School Centenary booklet.

> *Because there were no church buildings in Mount Rivers, the various Christian denominations held their services in private homes.*
>
> *Three different denominations were catered for – Anglican, Congregational, and Roman Catholic.*
>
> *To make travelling easier at night for his congregation and himself Anglican clergyman, Rev C Stretch only held night services on bright moonlight nights.* (Mt Rivers Public School 1975:last).

In early days the ministers were itinerant travelling around from Maitland or Paterson. The upper reaches were serviced in this way for some time prior to clergy being stationed at Gresford. The moonlight evenings would have enabled parishioners to attend church, the clergy staying overnight with a local parishioner.

In some cases simple timber chapels were constructed by the community for services. This particularly applied to the early Methodists, who had relatively simple chapels at Ravenscroft, Chapel Crossing Eccleston (Archer and Sullivan 2004); near Commercial Road Paterson (Archer and Sullivan 2004); Lostock (Lostock Public School 1978); Woodville (Gorton 1982). These chapels were used by the Methodists and on some occasions by Presbyterian congregations, not one of these buildings remains.

Paterson Valley is a stronghold of Protestantism, particularly Anglicans formerly known as Church of England. Being an early settled area when the Church of

England church was most dominant, the Valley became fully serviced by Church of England ministers, with the first arriving in 1839 to establish the Parish of Paterson, which took in all of the Paterson Valley and more (Clements 1993). In 1884 the Valley was strong enough to support two ministers and the Gresford Parish separated from Paterson (Gresford 1829-1979 1979). This arrangement remained in place until 1998 when the Gresford and Paterson Parishes were merged to become the Gresford/Paterson Parish (Collison & Hancock 2005). The first two churches in the parish were consecrated in 1845, St Mary- on-Allyn at Allynbrook (Fibbens 2005) and St Paul's Paterson (Clements 1993). The early establishment of these churches in the Valley was because of the interest by the then Bishop of Australia, Bishop Broughton due to his daughter's romance with William Boydell of Caergwrle, Allynbrook and also the zeal and enthusiasm of the first clergyman Reverend John Jennings Smith.

More Church of England churches were erected later: Vacy circa 1849, wooden church replaced by current building in 1887 (Clements 2003); Gresford wooden church constructed circa 1856 replaced by current building in 1898 (Collison and Hancock 1998); Woodville 1864 (Gorton 1982); Lostock 1892 (Lostock Public School 1978); Eccleston 1924 (Collison and Hancock 2005); Martins Creek 1928 (MM 25/6/1928).

The first churches built at Woodville, Vacy and Gresford can be attributed to the boom in wheat production through the Valley, followed by more substantial buildings some years later. The Lostock church can be attributed to the development of the tobacco, dairy and other industries at Lostock, as well as generous contributions from locals to its construction, including the donation of land. The Eccleston church no doubt arose from the optimism of the dairy industry and the Martins Creek church arose from the fact of having a new village based around the railway quarry. Long standing families made large commitments for the construction of the churches and their loyalty and sense of place lies with that particular building as distinct from being associated with the wider parish.

The Presbyterian Church was based primarily around Paterson and arose from the influx of Scots as outlined earlier in this chapter as well as from the productive endeavours of its first minister, the Reverend William Ross. This church was commenced in 1840 and completed in 1842 (The Aust 2/9/1842). The Presbyterians were a divided denomination with various members of the parish splintering into the continuing Presbyterian Church and the Free Presbyterian Church in 1846 (Archer and Sullivan 2004). While the Presbyterian Church continued in the district and St Ann's still operates to this day, the Presbyterians have never been as strong as the Church of England or Roman Catholic denominations. The movement of many Scots out of the district by the 1860s and the divisions within the church weakened its influence. During its heyday – particularly the 1840s through to around 1870 – services were held in the Ravenscroft Chapel, the Lostock Chapel and many family homes through the Valley. The church's profile in the district received a significant boost with the establishment of the CB Alexander Presbyterian Agricultural College at Tocal in 1965.

Eccleston was the centre for the Congregational church in the Paterson Valley and it operated in association with churches at Gresford, and with churches in the neighbouring Williams Valley in Salisbury and Underbank (Gresford 1829-1979 1979). The Congregational church was established in Eccleston in 1884 by the Congregational Church Extension committee. Its initiation and success was due to the strong commitment of some district families and early ministers. The current church was opened in 1895 (Eccleston Public School Centenary committee 1967). In 1904 a Congregational church was opened in Gresford (Gresford 1829-1979 1979).

The Roman Catholic Church first commenced in the Paterson Valley at Summer Hill in 1840. Irish Catholic landowners Clarke and Kealy donated land for the church (Ingle 1991). This was a small wooden church, which was replaced by a brick building in 1913 (Ingle 2001). The Roman Catholic Church in Gresford was constructed on land donated by James McCormick of Clevedon and was opened in 1867 (Gresford 1929-1979 1979). In 1884 a Catholic Church was opened in Paterson (Bruno 1984).

Hilldale to the east of the Paterson Valley has always had a focus on Dungog as much as Paterson, and this increased with the arrival of the railway line. Dungog, primarily a Protestant but not necessarily Church of England district, had a Union church constructed in 1899 and a new substantial brick church built in 1957 (Ingle 1987). This church has been used by both Presbyterian and Baptist denominations. Union churches developed through the Dungog district with the minority Protestant worshippers working in association. The Roman Catholic Church has never become involved with union churches in the area.

Churches have been a key element of the social fabric in the Paterson Valley as a venue for people to meet and share worship and a common purpose. They have also been, at times, vehicles for division within communities and perhaps the cause of long running differences between neighbours and families living in isolated locations.

The Valley was primarily Protestant but with Catholic families located throughout it, with a large numbers in the Summer Hill and Fishers Hill areas between Vacy and Gresford. An elderly resident recalled that there had been friction between Catholics and Protestants in the area throughout her time in the district. At one time there was a Hibernian Society in Gresford (Irish Catholic) and an Orangemen's Society (Irish Protestant). The village of East Gresford has tended to be Catholic which coincided with the location of the Catholic Church on land donated by Catholic landowner James McCormick. On the other hand Gresford tended to be Protestant with the Church of England Church being located on land donated by landowner George Townshend, a Protestant.

The best documented case of the Catholic and Protestant divide was recorded at the time of the Allynbrook Public School centenary:

> *The next teacher, John O'Shanassey, although an efficient teacher, gained the antagonism of Boydell and many local residents officially because he was taking time off without applying for leave before hand. However, there was much more in the dispute than this. Mr Inspector Jones observed:*

> *'That the Paterson District is marked by the existence of two rival political parties, Orangemen and Roman Catholics; and, I have been informed that Mr O'Shanassey has identified himself with the latter in an indiscreet and prominent manner, much to the annoyance of Mr. M. Gray and his party'.*
>
> *Gray had complained about the teacher's absences, especially when the teacher had taken time off school to attend the hearing of a libel suit between Gray and O'Shanassey's landlord* (Allynbrook Public School Centenary Committee 1969:13).

It is not difficult to understand the emotions and sentiments involved in this saga and the divisions it would have caused in the community. Religious division between Protestant and Catholic was a major issue in the community until very recently. These divisions faded from around the 1970s and are hardly an issue today. However they linger with the older generation brought up during the mid 20th century. Nowadays there are often ecumenical church services between the various denominations, where in times gone by this was not the case. At the time of a triple murder and suicide in Gresford in 2005, the community held ecumenical church services to assist healing and dealing with the grief. This could not have occurred in the mid 20th century.

In earlier times funerals would be held at which citizens of the other denomination would attend but would not enter the church. They would attend as a matter of respect but would remain outside the place of worship. This is no longer the case.

### 4.8 Schools

The development of a public school system across the Valley gives an idea of the population developments and changes over time. A listing of all government schools in NSW from 1848 has been prepared (OTEN 1998). This publication also gives the background to the development of public education in the state. One-teacher country schools became an institution in rural Australia and for many communities they were a major focus of activities and fellowship. Often families will say that once their children left primary school, they lost a link into the local community. The local primary school therefore is often a focus of collective endeavour and community support for a common goal. The role of the teacher in the one-teacher country school

is also particularly important and can make or break the success of the school and its role within the community. There have been notable examples in the Paterson Valley of highly regarded teachers who left their mark on the Valley such as Robert Marceau at Eccleston who was a renowned photographer. Marceau began teaching at Eccleston in 1918 and moved to Halton in 1925 and remained there until 1931 (Hartley 1993:18).

The local community often had to find accommodation for the teacher who took private board in various farmhouses. Some locations had school residences but most did not. The government would be loath to construct school residences if they thought the school was not viable in the long term.

School yards also had paddocks for horses that students rode. So the school was a small complex of buildings and facilities including the horse paddock.
The issue of transport of students to school was significant, many having to work on their farms before and after school and walk overland through the bush or along the road to school. As motor transport improved, the transport of students to school improved and buses were put in place. Improved transport, along with decreasing numbers of people on farms, caused the gradual demise of many Paterson Valley schools.

An analysis has been undertaken of all government schools in the Paterson Valley from 1850 to 2007 using the State wide listing (OTEN 1998). Some have changed names and have closed for periods so the data presented should be taken as a general trend rather than a definitive analysis. In addition some schools towards the northern part of the Valley were operated half-time with the teachers working the other half of their time at a nearby school in the next Valley. For example the teacher at Strathisla for a period was half-time at Carrowbrook. The Bingleburrah (Bingleburra) teacher was often half time at Sugar Loaf Creek or Wangat in the Williams Valley. The data shows that there were 5 schools operating at one time during the 1850s reaching a peak in the decade commencing 1910 with 20 schools operating and then retreating to

5 schools operating at present. These are Iona (Woodville), Paterson, Martins Creek, Vacy and Gresford.

| **Table 4.2 Paterson Valley Schools 1850 to 2007** | |
|---|---|
| **Decade commencing** | **No of Schools open for at least one year** |
| 1850 | 5 |
| 1860 | 8 |
| 1870 | 13 |
| 1880 | 16 |
| 1850 | 5 |
| 1860 | 8 |
| 1870 | 13 |
| 1880 | 16 |
| 1890 | 18 |
| 1900 | 19 |
| 1910 | 20 |
| 1920 | 17 |
| 1930 | 17 |
| 1940 | 14 |
| 1950 | 13 |
| 1960 | 13 |
| 1970 | 11 |
| 1980 | 7 |
| 1990 | 5 |
| 2000 | 5 |
| Data adapted from OTEN 1998 | |

The data demonstrates that the establishment of schools in the stronger agricultural areas and larger districts generally occurred first, and these schools stayed open for the longest time. Schools established in the smaller and more isolated areas opened and closed within a shorter period of time. Two schools were associated with non-agricultural activities; the Upper Allyn School servicing the sawmill village and Martins Creek School servicing the Martins Creek quarry village. The remainder are in agricultural areas; however, the villages of Gresford, Paterson and Vacy now have more non-agricultural occupations. The data shows the continual change occurring in the Valley as industries came and went and technology changed.

It is through the school and the church that people in isolated areas have social contact. Public schools cater for people from all denominations, bringing the community together for a common cause, whereas, churches can be a divisive

influence as they deal with only one denomination and group within the community. Therefore the wellbeing of a community can be enhanced through an actively functioning school community, viable church congregation and a trustworthy telephone/party line. These were the features of early to mid 20th century life within the small communities of the Paterson Valley.

### 4.9 Tocal College

The other educational influence in the Paterson Valley commenced with the establishment of the CB Alexander Presbyterian Agricultural College on the Tocal property in 1965 (Hunt 1972, White 1986a). The College was transferred to NSW Department of Agriculture in 1970 and has been run by that department, now NSW Department of Primary Industries, until the present. At the time of the transfer the NSW Parliament passed the CB Alexander Foundation Incorporation Act 1969 which established the CB Alexander Foundation to hold in trust the Tocal property. The Act conferred a degree of resilience into the College's administrative infrastructure which has since assisted in its operation.

The department had a long established office in Maitland and in 2000 this office was transferred to the campus of the College, later to be known as Tocal Agricultural Centre which incorporates Tocal College, CB Alexander Campus. The College, now Centre, has had a significant influence on the Paterson Valley from employment of staff to provision of a wide range of full-time and part-time educational courses and short courses for both youth and adults. In 1999 the then Hunter Catchment Management Trust relocated its administrative office to the College campus and has since become the Hunter Central Rivers Catchment Management Authority (see Box 4.3). The Paterson Valley therefore has been well serviced for many years by professional agricultural land management facilities. The Tocal Field Days and the College have had a significant impact on the Valley because of their location within the Valley and on the main transport route.

### 4.10 Public Access to the River

In the early 1820s all the land along the now most populated parts of the Paterson River was granted as freehold. Later public roads were carved through these freehold properties, including river crossings. The immediate alienation of all the river land to private ownership in the 1820s creates problems to this day. The first problem encountered by the European inhabitants of the Valley was that there were no public lands for the establishment of a wharf to export their products from the district. As a result, in 1832 land was obtained for the village of Paterson and a public wharf (Archer 1986:21). By quirk of fate a very small triangular section of land on the flood plain was set aside as a public landing place. This was east of the corner of Prince and Queens Street and is now part of John Tucker Park. Provision was made for the public wharf adjacent to the corner of King and Church Streets, which is now known as Kings Park. These were the only formal public access points to the river apart from the various crossings and punts, which were largely surrounded by private land.

Further up the Valley to Vacy and Gresford the position was no different. There have been some improvements in access to the rivers including public land at Gresford sports ground which accesses the Allyn River; land at what was known as Clark's Crossing at Vacy; and most recently land which was formerly part of Tocal but has been transferred to Dungog Shire to formalise a boat ramp at Clements Bridge, Tocal Road. Unfortunately there are few other public access points to the river, however, the river has been a focal point for many, particularly those in the village of Paterson whose properties back onto it. Many have constructed boat ramps or trolley systems to put their boats in and out of the river. Unfortunately as the river at Paterson silts in time their boat access will be rendered useless.

Tucker Park in Paterson has been an important part of recreation in the village and for the district. It has not only been an access point for over 180 years but also, with its expansion, an important picnic area for visitors to the area. The visual beauty that visitors often speak of regarding Paterson can in many cases be attributed to time

spent in Tucker Park, on the banks of the river. The establishment of this park was only possible through the generosity and foresight of Mr John Tucker (1852-1939), lifetime resident of Paterson. Tucker owned the farm nearby and heard that some land next to the public landing space was to be auctioned. He encouraged the then Bolwarra Council to purchase it but they declined. Tucker purchased the land himself and presented it to the Council (Clements 2001). In the mid 1970s Dungog Shire Council purchased land to the south of the park, doubling its size.

The land known as Paterson Park was obtained through the representations of the local MP, HH Brown in 1879 (Clements 2001). This has become an extremely important recreational resource for Paterson and land from it has been used for the construction of a new school, bushfire brigade and preschool. The park has in recent years also become a small golf course. The origin of the Gresford Park (showground) is unclear but it was transferred to the Crown in 1927 and is administered by trustees (Gresford 1829-1979 1979). The other significant area of land for public recreation is the Upper Allyn Forest Park which is part of the National Parks and Wildlife Services. This land was formerly State Forest; it became a National Park in the 1980s and provides access to the Allyn River for camping and picnickers.

Following the construction of Lostock Dam a caravan park and extensive picnic areas were constructed. Other facilities which were used for public or group access to the Valley include a scout camp on the Paterson River upstream from the Lostock Dam and the former Lostock School which is now a facility managed by a Sydney school for camps and retreats. In 2000 a riverside picnic area, stairs and lych-gate was constructed adjacent to St Mary's-on-Allyn, Allynbrook to enable easy access to the Allyn River (Fibbens 2005:41). The Eaglereach Eco Tourism Resort was established in the 1990s on the Mount George Range near Vacy. This is a land development based on community title and provides for the conservation of the environment on the community land. While it is only accessible by patrons of the resort, it does provide access for individuals to experience the natural environment within the Paterson Valley and the ecosystem is protected.

### 4.11 Collective Public Action

Ecosystem health is affected by the individual or collective action of members of the community. Collective action is brought about by some unity of purpose within a community. The unity is usually a result of an external threat or opportunity and its success can lapse if division occurs. Sense of place is driven by the attachment of people to a locality. Therefore sense of place and collective action can be linked establishing the anthropogenic elements of ecosystem health.

This section of the chapter draws together examples of where the community has acted on a collective basis. At times this has been through actions associated with farming or farm production, however, in other cases it has been for broader community matters. The first record of community action by Europeans in the Paterson Valley is probably the local farmers club with James Webber of Tocal as chairman at its second meeting on 3 September 1827 (The Aust 26/9/1827). In 1841 the district found itself in what is recorded in the press as a 'distressed state' due not only to a drought but also the importation of foreign flour into the colony. As a result a very large public meeting was held in Paterson to petition the Governor (The Aust 10/7/1841). The importance of this meeting was profound as the Governor and the then Council took notice of the petition and responded in detail (The Aust 29/71841).

The Loyal Paterson Union Lodge No 4225, MO was established in 1846 at a meeting held at the Bush Inn, Paterson (Clements 1997). The motto of the lodge was *We unite to assist each other* (Clements 1997). Lodges enabled working men to be part of an organisation that would provide social support and security. This was before the days of unions, health funds and other similar organisations. The lodge operated until it was merged with four other lodges in the Hunter district in 1996. There is a photograph of the Paterson lodge banner being carried by members in the Gresford centenary celebrations in 1929 (Clements 1997:9).

There many other reports of meetings for collective action but perhaps the most successful collective action by farmers in the Valley was the marketing of their milk.

Theophilus Cooper, then owner of Gostwyck and district warden, convened a meeting to form a cooperative company to erect a butter factory in August 1892 (MM 27/8/1892). While this initiative did not produce the desired outcome in the short term, farmers did end up with a sound cooperative marketing structure for their milk over the next few decades. The various wars in which Australia became involved through the 20th century created significant community action. For example on 14 May 1900, a concert was held in aid of the Patriotic Fund in Mr Eidler's shed at Allynbrook. The function raised around 23 pounds for the Boer War (local newspaper article undated). Another example of collective action around 1960 was a petition to the chairman of the committee for the provision of carting of milk in the Paterson, Vacy and Woodville areas. This was run by Sid Reynolds of Old Duninald in view of the actions of the Dairy Cooperative in dispensing with the services of local George Presland.

Agricultural shows have been convened at three different villages in the Valley during the 20th century. The first was held at Eccleston on February 12 1903 (DC 1988:23). This show was organised by the Reverend Figgis and held for three years 1903-1905. The show was staged on Mr P Sivyer's property at the back of the Congregational manse (Eccleston Public School Centenary of Education Committee 1967:8). The first Gresford show was held on 20-21 May 1927 (Gresford 1829-1979, 1979) and has been successfully held ever since, being a popular two-day event in the Valley's calendar. The first Paterson show was held in February 1949 and they were held annually until 1968. A mover behind this initiative was Sid Reynolds of Duninald who became the association's first secretary (Clements 2001).

There have been various farmer-based organisations operating in the Paterson Valley during the mid 20th century such as the Agricultural Bureau which arose from activities by the NSW Department of Agriculture to promote farmer education. Bureau branches are known to have existed at Vacy (Clements 2003:89) and Eccleston (Eccleston Public School Centenary of Education Committee 1967:8).

A Junior Farmers Club was established at Hilldale in 1953 (Ingle 1987:18). The club was very active and operated into the 1960s. Farmers in the Woodville area have had a long tradition of collaborating as participants in the Woodville Drainage Union.

During the 20th century in NSW farmer representative movements were split between large and small landholders; respective remnants of the squatters and the selectors. The larger landholders were members of the graziers association and there is a record of a Graziers Association branch being at Gresford (Sullivan 1997:88). The organisation representing the smaller farmers was known as the Farmers and Settlers Association and an operating branch is recorded at Hilldale in 1911(Ingle 1987:21). It was this group that urged the construction of a shop and post office. The Farmers and Settlers Association and the Graziers Association were separate state-wide bodies and the situation in the Paterson Valley reflected the arrangements for farmer representation across the state. Representation for dairy farmers was also problematic and it wasn't until the 1960s that the Dairy Farmers Association, as it was known until recently, brought together what were various disparate dairy farmer organisations. The Farmers and Settlers Association then became the United Farmers and Woolgrowers Association and then merged with the graziers to become the Livestock and Grain Producers Association. This occurred in the 1970s and 80s and more recently this has become NSW Farmers Association. Some years ago the NSW Dairy Farmers Association also came under the NSW Farmers Association. Now all farmers are represented by the one organisation, whereas 40 years ago there were at least three or more organisations representing farmers in the Paterson Valley.

During the late 1980s the Landcare movement became prominent in rural Australia. Accordingly the Paterson-Allyn Valley Landcare Group was formed, encompassing the whole of the Valley. In 1991 the Valley suffered from a serious drought and in response to the social and environmental affects of the drought, the Landcare group convened a series of four meetings to assist farm families to cope with the stress of the drought (Brouwer 1992). This series of meetings was a valuable aid in assisting

farmers at this time and had a significant influence on the community, the fourth meeting being attended by 85 people, of whom 50% were women (Brouwer 1992). Later in the 1990s a controversy arose associated with mining zeolite in the Duns Creek area of the lower Valley. Those in the Paterson-Allyn Valley Landcare group with an interest in the lower Valley objected to the mine. Their actions caused a division in the group and this and a number of other issues caused the group to split into the Gresford District Landcare group, which took an interest in the upper Valley, and the continuing Paterson-Allyn Landcare group represented the lower Valley. Some traditional divisions between Paterson and Gresford were also unhelpful in enabling the Landcare group to operate as one.

The local Landcare experience was a disappointment to many because it was a lost opportunity to take a whole of catchment basis approach to sustainable land management. The other issue was the differentiation of the objectives of Landcare regarding local on-ground actions as opposed to Landcare groups being a political lobby group to guard the environmental interests of a district. Landcare in the Paterson Valley never reached its potential because of these divisions and the problems that occurred in the early days of the groups. Many become disenchanted with Landcare as a result of this situation. The Gresford Landcare Group still plays a significant role in land management, particularly within the northern end of the Paterson Valley, by running an annual field day followed by an evening dinner with a guest speaker relevant to land management.

Another important land-based organisation is the volunteer Rural Fire Service brigade (RFS). The RFS became established in the mid to late 20$^{th}$ century and now there are brigades at Bolwarra/Largs, Iona/Duns Creek, Paterson, Martins Creek, Hilldale, Vacy, Gresford and Lostock. The RFS operates through a strong volunteer base in association with paid staff and now a centralised control structure from the NSW government in Sydney. The centralisation of the control structure has become a contentious issue in the service, influencing the morale of some volunteers.

### 4.12 Class Divisions

The preceding section of this chapter has shown how the Valley's community has come together on a collective basis, however, there has been the underlying divisive issue of class which requires some description. While the Paterson Valley society was never as class-based as that of Britain, class has definitely been an important factor, particularly when examining how the environment and land are managed. A class die was cast when the Valley was thrown open to European settlement by way of the allocation of large land grants to wealthy and influential settlers from England providing a rapid transformation of the social landscape from an Aboriginal community into an artefact of the English class system. The land grantees received low cost convict labour to assist them with their estate's development. The convict influence was to remain for many years in the Valley. The large land grants remained associated with some of the original families but in other cases new wealthy families purchased the estates and the class divisions continued. This is demonstrated in the case of Tocal Homestead when the foundation stone was laid.

> *On Monday the elite of Paterson were assembled to witness the ceremony of laying the foundation stone of Mr Felix Wilson's Mansion at his country seat 'Tocal'. There were present on the occasion, amongst others, our worthy Police Magistrate Major Johnson, Captain Levingston, C. Macquarie, Esq, J.P and his lady, the Postmaster, W. Dun Esq, and Messrs. J.G. Berry, Fopp, Moir, &e. The first stone was laid by Mesdames Wilson and Macquarie, under the superintendence of Mr. Moir the architect; after the ceremony the party partook of a sumptuous dinner prepared by the wealthy proprietor, after which the following toasts were drank (sic), with three times three – 'The Ladies' – Mr. F. Wilson (who rose and returned thanks in a neat and appropriate speech), 'Matrimony' and 'the health of Mr. Moir'. The evening was spent in temperate conviviality, and it was agreed by all present that never had a more pleasant meeting of so large a portion of the respectable Patersonians taken place. The arrival of Mr. Wilson as a Settler on the Paterson is hailed as an event of much interest by some of our large landed proprietors* (SH 11/3/1841).

Another example of class division is the obituary of the late Robert Studdert:

> *Mr Studdert was highly esteemed and respected by all classes of our community, and in his official capacity of Clerk of Petty Sessions a more obliging or a more efficient officer could not be desired – always ready to*

> *tender his mediation between contending disputants where trivial matters were concerned, before entering the arena of law. And, even in matters of a more important character his advice, which his extensive experience, and long active service in law matters, made most valuable – was eagerly sought after, by both high and low, rich and poor; and, in most instances, acted upon – thus preventing costly lawsuits, and the engendering of enmity and ill-will amongst our residents* (MM 29/5/1879).

The correspondent is sensitive to the differences within the community but mindful that the law had to be applied to all situations through the late Mr Studdert. Perhaps this is a snapshot of Paterson society in the late 19th century. It is one of the few opportunities we have to gain an insight into the class system of the day.

The Paterson Valley therefore had a class system imposed on it from the beginning of European settlement and it has probably taken over 150 years of social change for that to largely disappear. In an interview with an elderly resident in 1987, reference was made to some tennis courts in King Street, which were apparently used by the *socialites* of the district. The interviewee had been born to a respectable business family in Paterson in the early 1900s and had built up his own business interests and farm. He still saw that there was a division in the community between the socialites (as he perceived them) who played tennis and in the vastly different circles in which he moved. The Paterson Valley demonstrates a similar social stratification to the small Australian rural town, Bradstow described by Wild, (1974). While this analysis and description is now over 30 years old, it provide a framework to understand the various divisions and strata within a society. It is contended that the present Paterson Valley society has less social stratification than it had in the past but there are obviously groups of different status existing which would ultimately have some influence on ecosystem health and collective action across the Valley. Further research is required to create a better understanding of this feature of the Valley's community.

### 4.13 Water Services

The 1965 drought had a profound influence on the Valley and its rural community. The drought was probably longer and more severe than had occurred in most of the

population's lifetimes. In addition it came after the construction of the Snowy Mountains Scheme when dams were seen as a salvation to drought.

The political climate was therefore right for the idea of a dam to be constructed in the Paterson Valley to mitigate the impact of future droughts. Irrigation was increasing and the future for stabilising the incomes of farmers was seen to be possible through the provision of a reliable supply of water. As a result of this the NSW government decided to construct the Lostock Dam. The dam was in the seat of Hon Milton Morris, Minister for Transport who had originally been involved in the dairy industry and had strong affiliations with the people in the Paterson Valley. He was a senior member of Cabinet and the Government and held strong influence in the state affairs of the day. It would seem that the decision to construct Lostock Dam was made on the basis of general popular opinion and the perceived need for it. This was then followed by studies to provide economic justification for government investment (Pattison 1967:58, Atkins et al 1967:29).

At the opening of Lostock Dam, the Water Conservation and Irrigation Commission (WC&IC) produced a brochure, which gave detailed statistics of the dam and issues associated with its future use. The brochure explained its operation as follows:

> *Discharges from the storage are controlled to provide regulated flows for stock and domestic purposes and permit the irrigation of an area up to approximately 11,600 acres between the dam site and the Hunter River*.
>
> *It is expected that, as a result of the controlled flows from Lostock Dam, the ultimate value of increased farm production will eventually exceed $600,000 a year* (WC & IC 971:6).

The issue of State government jurisdictions arose immediately on the completion of the dam. The WC&IC only had a jurisdiction for the management of the river in the non-tidal zone, where they guaranteed and licensed water to irrigators. When the dam first commenced operation, the non-tidal zone was designated as being the Paterson Railway Bridge. This meant all the irrigators north of this point had to pay for their water even though they were still within an area of tidal influence. The

irrigators in this area immediately north of the railway bridge objected to paying for water as they felt it was there for them regardless of Lostock Dam. As a result of this the WC&IC cut off point was moved to Mowbray north of Gostwyck Bridge. This placated the irrigators in the area of tidal influence and resolved the issue for the time being.

The NSW Public Works Department (PWD) was responsible for managing all aspects of the river in the tidal zone. The PWD interests were more in estuary management and flood mitigation and they had no jurisdiction over water use. Irrigators in the tidal zone therefore continued to irrigate their crops and pastures with the Lostock Dam having no impact on their operations despite the fact that it had been justified in the basis of enhancing the reliability of the irrigation water supplies in times of drought. The tidal reaches of the Paterson River are fresh water and intrusions of salt only occur in times of drought. This had occurred during the 1965 drought resulting in saline water encroaching much further up the Paterson River than would otherwise be the case.

Once the Lostock Dam was established and operational, water users in the upper Paterson collaborated and formed a group, which worked in association with the WC&IC for the operation of the dam and to facilitate the release of water. This group had a close working relationship with the personnel releasing water from the dam.

The calendar year 1980 was one of the driest years on record for the Paterson Valley. The first 11 months constituted the driest consecutive period in the Valley's recorded rainfall history. As a result the demands on the Paterson River tidal pool for irrigation were significant. During that year discharges from the Lostock Dam were adequate to cover the needs of the irrigators but little water ended up flowing into the tidal reaches. There is anecdotal evidence to suggest that at one time the river stopped flowing in the vicinity of Gostwyck due to the low releases from the dam. As a result of the limited or lack of inflow into the tidal reaches the salinity levels rapidly increased and by October a crisis existed for irrigators in the lower Paterson.

This situation was given significant publicity by the local and subsequently the Sydney media. Various meetings were held and a Lower Paterson Water Users Association formed. This group lobbied the NSW government to release water from the Lostock Dam to mitigate the saline intrusions in the estuary. The formation of the Lower Paterson Water Users Association placed the irrigators in the lower Paterson into direct conflict with those in the upper Paterson. This situation created significant animosity, some of which remains to this day. The political representations and media campaign by the Lower Paterson Water Users was successful:

> *The Water Resources Commission agreed to conduct an experiment in which discharge from Lostock Dam would be increased for a short period to determine if salinity reduction could be achieved and if so how effective this salinity reduction could be. Increased releases were commenced on November 6th, 1980, with the aim of providing flows at Gostwyck of 100ML/day for 4 days and 65ML/day for a further 14 days* (Muir 1980:1).

The Commission closely monitored the river's behaviour following these releases. The monitoring indicated that the releases of water from Lostock decreased salinity to make irrigation feasible within the Paterson/Woodville reaches of the river.

In the late 1980s the Hunter Water Board undertook a review for its future sources of water. The board had planned to construct a major dam on the Williams River at Tillegra by 1995 having the water available by 2002. Representations by local people in that Valley and their political representatives resulted in the board being directed to undertake a review of alternative water supply options with a view of delaying the Tillegra project (Holroyde 1990:9). The review examined a wide range of options for the future supply of water to the Hunter Water Board, including an option to use Lostock Dam as a water source for the Board. This proposal was attractive to the Water Resources Commission, as it would enable the sale of the largely unused water impounded by the dam. The proposal looked at various options for extracting the water: either taking it across from Lostock Dam to Glennies Creek Dam to the west; pumping it across through to the Williams Valley from the Lostock Dam; allowing it flow down the Paterson River to the vicinity of Gostwyck and then pumping it over

and letting it flow down Tumbledown Creek to the Seaham Weir. The study favoured allowing the water to flow down the Paterson River and then pumping it to Gostwyck and then pumping it across to meet up with the existing Water Board supply system (Holroyde 1990).

The residents and farmers in the Paterson Valley met these proposals with strong opposition. A series of public meetings was held which mobilised community opinion. Various public meetings and representations were held and finally the Hunter Water Board abandoned their proposal for the Lostock supply option.

### 4.14 Conclusion

The imposition of European infrastructure and institutions on the Paterson Valley has been the result of a combination of external and internal influences. The external influences have been brought about by markets for products and government policy. However, there are many instances where the citizens of the Valley have worked to determine their own destiny. The reasons for the vigorous lobbying and collective action are hard to identify but are believed to be associated with the strong sense of place which people feel about living in the Valley, as well as the longevity and stability of the community. Many of the families who are influential in organisations within the Valley have links going back over 150 years. In addition new arrivals to the Valley have sought to be part of the community which has seen a mixing of new arrivals with traditional families in determining the future of Paterson Valley organisations.

The key attractor driving this change has been the collective influence of technological change and its application to the Valley; in particular the change from horse-drawn transport to motor vehicle.

While the returns that are now to be made from farming do not usually provide enough for families to live on, the availability of transport and nearby employment has allowed families to remain living in the Valley and earn income from elsewhere.

The next two chapters will examine how European land use has exploited and transformed the Valley's landscape. This process could not have occurred unless the necessary institutions and infrastructure described in this chapter were in place.

# Chapter 5: The Exploitation of the Alluvial Landscape

> ***….. and being originally densely wooded, required great labour in clearing; a disadvantage, however, amply compensated by the amazing fertility of the soil, which is all alluvial, and still subject to being covered by water during the high floods. The ready communication by water carriage to Newcastle likewise, and the regular weekly packet communication again from thence to Sydney, contribute to render land here extremely valuable.***
>
> *The country back from the river consists of rising hills of inferior soil, with fertile flooded vine brushes, watered by lagoons communicating with the river. These lagoons swarm with the most delicious fish; and during the dry summers, when the water is low, the natives wade in and actually drag out cart-loads thereof, including immense eels* (Cunningham 1827:78-79).

**Introduction**

Cunningham's description places into perspective how valuable the alluvial landscape was to the early settlers. Cunningham sums up the quality of the soil, the regular transport to Sydney and the biodiversity of the alluvial landscape, see Figure 5.1.

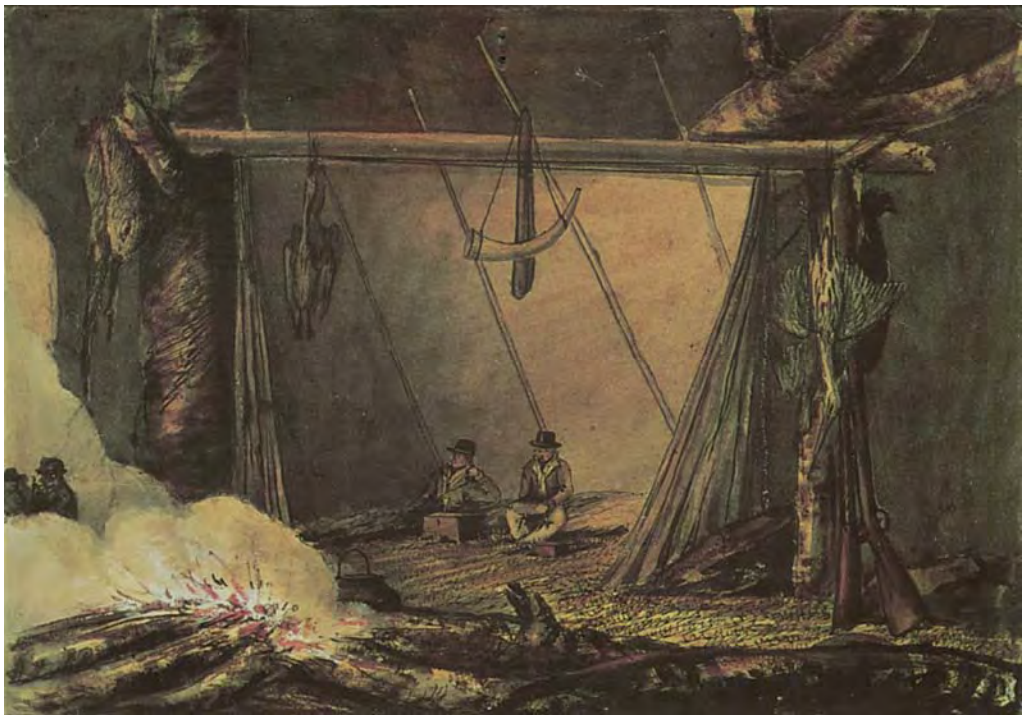
While the core of the alluvial landscape is found in the rainforests or brushes adjacent to the River, three other elements important to the overall ecosystem health of the Valley are covered in this chapter. These are the wetlands, the riparian zone or riverbank, and the River itself.

The area in question within the Valley amounts to approximately 51 square kilometres which, as a proportion of the Valley, is very small, but the influence of this landscape on the Valley's environmental history and ecosystem health is significant. In addition the qualities of this landscape have conferred a degree of resilience on the Valley's agricultural systems because of the fertile and generally reliable nature of the rich alluvial soil. Farmers can usually rely on their alluvial land to stand by them in a drought. However, the converse is true, particularly for the lower reaches of the Valley, where in La Nina years a full season's production is lost from floods.

Map 3.3 is a representation of the extent of the alluvial landscape vegetation prior to the arrival of Europeans.

The chapter will describe the actions of Europeans in the 19th and 20th century which brought about changes in the alluvial landscapes, rainforest and wetland zones. It will then cover the forms of land use which exploited the alluvial soils and wetlands. The adaptive cycle will be used to analyse these changes. Finally the fate of the riparian zone and River will be discussed.

Figure 5.1 On the Banks of Paterson's River, John Lewin 1801



ML

This is a painting of one of William Paterson's campsites during his leadership of the exploration of the Hunter estuary in 1801. A close examination of the painting shows that the explorers were sustaining themselves from the land, particularly from the local avifauna that would have been plentiful due to the landscape through which they were moving. Their time was spent on the river or close by apart from some excursions to local peaks to gain an overall impression of the Valley. Paterson's and his colleagues' journals are used as evidence in constructing the pre-European landscape of the Valley.

## 5.1 Settlement of the Paterson Valley

It was the beautiful Australian rainforest timber, red cedar, which lured Europeans up the tidal estuary of the Hunter and into the Paterson Valley. The cedar and other useful timbers grew in the rich alluvial soil on the River levee and could easily be cut down and floated down the River. It was well within the technology of the day, given the available manpower of convict labour. Despite the primitive technology the resource was soon depleted, as evidenced in the Bigge Inquiry of 1820. Brevet Major Morisset on 17 January 1820 commented that:

> *100. Has not cedar become scarce and the difficulty of obtaining it increased?*
> *It has in consequence of the quantity cleared about this part of the settlement. The distance now to a place where it is procured is 70 miles (70 river miles, much less by land)* (Turner 1973:70).

The impact of the timber cutting on the ecology of the forest was much greater than the mere removal of some large trees. The cedar cutters built huts for themselves which were timber, thatched with rushes (Turner 1973:59). The latter would have been obtained from the nearby wetland. The other impacts would have been the collateral damage inflicted through the falling of the large trees on the surrounding forest and the impact caused by the manhandling of the large logs to the bank of the River. The first degradation of the Paterson riverbanks would have occurred at this time from the impact of pushing the logs down the relatively unstable bank into the tidal river.

Hunter (1997) describes in detail the European settlement of what was then termed Paterson's Plains.

> *At the beginning of Macquarie's governorship, which extended from 1812 to 1821, a few trusty men were actually allowed to begin farming at Paterson's Plains as a reward for cutting a special quantity of cedar. Subsequently a few other well behaved persons were allowed to farm on their own special account in this locality* (Hunter 1997:1).

> *In 1812, John Tucker jnr, together with the other men, was allowed a farm of about thirty acres, on Paterson's Plains. He was about seventeen years old. He was allowed livestock from the government herd at Newcastle for his farm.*
>
> *He subsequently requested that boundaries to his farm be marked to avoid 'disputes with neighbours', affirming that he had 'neighbours'. In 1814, he additionally sought permission to leave Newcastle for seven days in order to take his surplus wheat crop to Sydney for sale and to purchase necessities for his farm. He sold wheat and other crops to the Store at Newcastle* (Hunter 1997:5).

It can be seen from Hunter's description that the military settlement in Newcastle was starting to develop a fledgling market economy. The incentives were there for the men to cut cedar and as a result they were given the opportunity to establish a farm. Once farming they could sell their products in Newcastle or even Sydney. The products of the European activities on the ecosystem were now being converted into cash for the settlers to live on. They did not, however, own their land; the tenure of the land was to become a problem in the future. Macquarie's directive was for them to have access to land as a privilege. At the time of Macquarie's departure in 1822, the settlers were still on their land but without any written authority (Hunter 1997:2).

John Allen, at the time of the Bigge Commission, was a constable at Wallis Plains as well as a farmer. He gave detailed evidence to Bigge, which described many aspects of life and his farm on Wallis Plains (Turner 1973:150-3). The situation at Wallis Plains would have been very similar to that at Paterson's Plains. The Wallis Plains settlement was on the banks of the Hunter River near its junction with Wallis Creek between what is now East Maitland and Maitland.

Macquarie's encouragement of the small settler unfortunately was not in accord with the prevailing policy of the English government. Macquarie believed in the Yeoman ideal: that having the land populated with small area farmers led to a responsible and civil society. The problem with small area farmers was that they had no capital, which the government felt was required to develop the land and also make the colony self sufficient. The Bigge Commission recommended that the land be developed by people with capital, and as a result the Valley was divided into large estates and

allocated to wealthy English settlers. The systems and technology used did not change in the short-term, however, the small farmer was a thing of the past. Only later in the century did the small settler return to the Paterson Valley.

The well-to-do and capitalised British settlers were allocated land according to their demonstrated capital. For example, James Webber was formally granted 1500 acres by Governor Brisbane on 18 September 1822 which he later had increased to 3300 acres. He arrived at Tocal in March 1822 with four convicts and set about clearing the land and growing crops. His convict workforce was later increased, and he was recorded as having 34 convicts in 1828 (Walsh 1999:29).

## 5.2 The Rainforest: Clearing and Early Agriculture

There were no half measures in developing the rainforest landscape for agriculture, as described by the recollections of a long-time Hunter resident writing under the pseudonym of Memory.

> *'The contrast between the brush as felled but recently, and the adjacent wall of living timber, may be more readily imagined than described. The one a picture of extreme loveliness, and the other of desolation.*
>
> *But when the whole was felled, and it remained sufficiently long to dry, and the firestick was applied, what an impressive lesson might be learned of the awful power of caloric when fuel in abundant store, and of such an inflammable character as was there. All but the larger limbs would be speedily consumed, but a great amount of labour had yet to be expended in getting rid of the remaining incumbrances before a crop of any kind could be put in. When in all the timber was cleared off, it took a sharp hoe to make a hole in root matted soil for the reception of the maize seeds. But the way it throve under the circumstances and the enormous crops obtained, often over 80 bushels per acre, acted as powerful stimulants; and the work went hopefully and cheerfully on, so many other discouragements were not wanting. How easy the life for the farmer of the present days compared with those who have preceded him at a time under the circumstances of which I write. They may have been begrimed by the smut of the burnt timber when cross cutting or rolling it into the masses for burning, and often working late at night attending to the fires; in compelled finally to chip in their seed, of maize, of barley, or of wheat. To plough for a year or two was impossible; the network of fine roots had to rot first; and for many years after the task of ploughing was the most irksome one, from the combined obstacles of roots and stumps'* (MM 1/9/1877).

The ability of the settlers to exploit the land was dependent upon the technology available. Allen makes it clear that there were no ploughs used at this stage of agricultural development in the area. Everything was hand-hoed which again limited the ability of Europeans to exploit the natural ecosystem. Given the small area of land cleared and available for cultivation, it is suggested that these settlers would have continuously cropped the land and in doing so significantly reduced the fertility. There was no record of animals and their manures being used in the rotation. In addition the rainforest land, once bared of vegetation, would quickly change with cultivation. An early change would be a fairly rapid oxidation and removal of organic matter from the top of the soil profile. Prior to clearing and cropping, the organic matter level of these soils would have been extremely high.

Allen's evidence indicates that these farms clung to the bank of the River and the nearby land. The highest and best land is on the levee adjacent to the tidal river. The settlers would have built their dwellings and established farms in this location. Their land would have extended along the River rather than away from it because of the quality of the soil. They would, however, have had a huge task ahead of them to clear the land of its dense jungle-type rainforest. The settlers are recorded as growing corn, potatoes and wheat. This could mean that they would be growing two crops a year in the land as the wheat and corn grow in different seasons. This evidence all points to a rapid draw on the natural fertility of the soil.

The forest did not yield easily to the settler, but with the use of intensive manual labour and fires in the spring, the land was eventually taken from being a rainforest to a bare but productive paddock growing highly sought-after crops. The fires would have burnt much of the humus, particularly where the logs were piled. The soil, because of its intrinsic qualities, was able to survive this treatment and still provide an effective medium in which to grow crops for nearly 200 years.

The culture of corn suited the land immediately following clearing the brush because the corn grew high and could be planted around stumps and logs and was easily

harvested by hand. It was also convenient as it was a springtime crop, which went in immediately after the fallen forest would have been safely burnt in winter.

One of the problems for the settler was to completely clear the paddock of fallen logs, timber and stumps (stumping). A farmer from Stirlingshire writing under the pseudonym *Hunter River Settler*, records the process. This writer says that corn is grown for a number of years before wheat. He goes on later in the article to explain that on his new land he could raise two crops per year, one of wheat and one of corn. This practice was possible but did have the effect of depleting the soil of available nutrients.

> *Ever since I came here, the men are employed stumping and burning – there are 10 or 12 acres of this farm to clear; but I expect by this time next year, it will be all under crop……*
>
> *……we are throng just now planting Indian corn; the wheat is in the ear and looks very rank: there has to be corn planted for a number of years before you can sow wheat, as it would grow sloamy (sic), the land is so rich* (HRS 1838:52-3).

George Wyndham, in his diary records the following in late April 1830:

> *27th finished carrying early maize.*
> *28th began ploughing for wheat. The maize land. Two ploughs.*
> *29th three ploughs. Carrying of corn stalks.*

Wyndham obviously planted an early crop of maize, harvested it and was also removing the stubble (corn stalks) from the land and was ploughing it again to sow a crop of winter wheat. This practice of growing two cereal crops each year was ultimately unsustainable but no doubt gave settlers like Wyndham a good cash flow early in the development stage of his farm.

Wyndham's diary of 1837 confirms the use of fire and the practice of stumping at Dalwood on the Hunter River west of Maitland:

> *April 1837*
> *24th Dangarfield burning down dead timber in oxen's Field (sic).*
> *27th Ploughing and stumping at Sandy Island*

James Gilchrist's 1839 diary for George Mosman's estate Burrowell near Seaham has excellent detail as to how the labourers (convicts) were employed on the property. For much of the year he would have five or six employed stumping and/or burning on Burrowell. This suggests that the clearing of the arable land was still well underway in the late 1830s on this property. Burrowell is on the eastern side of the Williams River and has similar land to the lower Paterson Valley.

Wentworth describes cultural systems for maize and wheat production on the Hawkesbury:

> *It is however, a very common practice, among the settlers on the fertile banks of the Hawkesbury and Nepean, to plant what is called stubble corn; that is, to plant it among the wheat, barley, and oat stubbles, as soon as the harvest is over, without ploughing or breaking up the ground. Maize is frequently planted in this way until the middle of January, and, if the season should prove sufficiently moist, yields a very abundant crop. The usual manner of planting it is the holes about six feet apart: five grains are generally put in each of these holes. The average produce of this grain on rich flooded lands is from eighty to a hundred bushels per acre. Wheat in the same situation yields from thirty to forty bushels; and barley and oats about fifty bushels an acre* (Wentworth 1824:423).

Double cropping was popular because of the financial benefits to the farmer. The system of planting maize in holes about six feet apart indicates that the land was still being cleared of rainforest logs and stumps. Wentworth's writings always refer to the vastly different yields of crops on alluvial land compared to the uplands.

Wentworth confirms the use of forest land for the culture of crops. His experience would have been in the Sydney region, not the Hunter, however, the same practices would have been carried out in both locations. Wentworth raises the issue of manuring crops from time to time:

> *On forest lands, however, the crops are not so productive, unless the ground be well manured; but the wheat, barley and oats grown on this land are much heavier and superior in quality. The difference of weight in wheat grown in the forest and flooded lands, is upon an average not less than 8lbs, per*

> *bushel, the former sort weighing 64lbs, and the latter only 56lbs.* (Wentworth 1824:423-4).

The issue of fertility depletion was well understood in the colony by the 1820s if we believe that Wentworth's writings of 1824 were common knowledge. He compares the value of land for would-be colonists in his book:

> *Flooded land, however, anywhere within fifty miles of Sydney, (that is in any part of the counties of Cumberland and Camden) will fetch double the price of "forest land" at the same distance from that town: - because within that range such land (which is much sought after on account of its inexhaustible fertility by the mere agriculturists who have but scanty means of collecting manure) will well support the cost of attending the transport of its produce to market; even in situations wholly inaccessible to navigation* (Wentworth 1824:447).

The agricultural industry of the colony was clearly divided between the pastoralists and agriculturists, the agriculturists having few livestock. It would seem that it was known to be important to manure a crop but it was practically difficult without livestock.

The impact of the settlers' development on the rainforest's ecosystem health was dramatic. In just a few years, the whole complex and sophisticated ecosystem had been changed irreversibly and replaced with the European farming system, which was to lack stability. The new system did survive but only due to the natural resilience within the landscape, brought about particularly through a fertile alluvial soil. The forest probably remained for a period along the riverbank but was soon cleared so as not to shade the crops which hugged the narrow band of alluvial soil along the levee. The ecosystem health in this landscape was changed very quickly and there are few remnants of this majestic forest left.

### 5.3 Wetlands: Drainage and Siltation

The next element of the alluvial landscape to be dealt with is the wetlands. Some were permanently inundated but many were seasonal. The temptation for the settler to drain them was great and records indicate that significant effort was expended in

draining wetlands. It seems there was a debate as to whether settlers should use their energies draining the wetlands or growing crops in the high forest country out of flood reach.

Robert Dawson, chief agent for the AA Co had spent five years in the colony and put forward his views on the matter. Dawson also indicates the paucity of agricultural expertise amongst the settlers:

> *If one-fourth of the capital which has been thrown away on forest grounds nearer to the mountains, had been expended in embanking and draining some of these lands, the colony would not have suffered as it has done. There are few settlers, however, who had been accustomed to agriculture before they immigrated to New South Wales; and as they have consequently no idea of the effects of draining and embanking in low countries, they will not easily be convinced until time and circumstances force the conviction upon them. The examples, however, of Mr Broughton and Mr Webber on the Patterson's River, and of Mr Graham on the Hunter's River, and even the very rough attempts both of Mr Sparkes and Mr Harris on the latter, upon lands which the tide has left, ought to convince every person who sees or enquires into the results of their trials, how important it is to set about reclaiming of lands which are covered to a great depth with vegetable deposits, and which lie in situations where neither blights nor droughts are likely to affect their produce.*
>
> *My opinion upon this subject was openly and frequently expressed long before I saw or heard of any use being made of such land in Australia; but where ignorance and bigotry usurp the place of reason and experience; it is of little use to offer suggestions. I doubt not, however, that I shall, if I live, hear that my opinions have been confirmed, and that the sufferings of the last three years will have more weight than my arguments in the establishing of better ideas upon the subject of agriculture in New South Wales* (Dawson 1830:401-2).

Lang, recorded in Gilchrist 1951, describes the lagoon on his brother's farm Dunmore:

> *My brother's farm on the Yimmang is completely intersected by a picturesque lagoon of a mile and a quarter in length. It was eighteen feet deep at one end, but was considerably shallower at the other* (Gilchrist 1951:149).

Both cattle grazing and drainage activities at Dunmore would have impacted on the lagoon.

Assigned convict, Joseph Mason records his 1830s experience in the lower Williams and Paterson River areas:

> *My brother with two of his fellow servants and myself went for a walk the Sunday I was there and we crossed one of these swamps lying between the Williams Rivers and the Pattersons (sic)River it measures about one thousand acres and was nearly cut a mile in length to the Williams River for the purpose of draining it. But it did not seem to answer the end designed, as no part of it was then under cultivation, but was full of great footmarks of cattle which were made in wet weather, and as it was then dry and hard it was very bad walking* (Mason 1996:163).

Mason observes that the wetlands were drained to produce crops and notes the impact on the wetland he is traversing. Later he suggests that the inundations into the wetlands from surrounding hills made cropping the wetland a risky business. The feelings of a convict working under these conditions are expressed in the poem *Labouring with the Hoe* by Francis MacNamara, see Appendix 4.

A flood in 1847 raised some interesting observations regarding wetlands and their drainage:

> *One gentleman we have heard of, who has largely drained, at a considerable expense, a large swamp of some 200 acres in extent, a very large proportion of which he put in with corn; the flood has, however, swept over the spot, and thus, at a moderate compunction, upwards of 3,000 bushels have been lost* (MM Sat 23/1/1847).

Again the futility of draining the wetlands is evident. The same article also refers to the deposition of silt following the flood.

> *Many 100 acres of corn, the only hope of the farmer to reimburse him for the pinched and scunty (sic) harvest of wheat, have thus been ruined; the strong deposit of the stream, together with the deprivation of air, entirely killing vegetation* (MM Sat 23/1/1847).

This observation would suggest that even by 1847 the River was depositing significant amounts of silt across the flood-plain and wetlands following each flood. The cumulative impact of this silt was to change the wetlands forever, whether they were drained or not. In other words, over the past 180 years the actual depth of soil of the wetlands has been increased significantly, which would change their role within the Hunter's estuary and ecosystem.

James Gilchrist's Burrowell diary gives the best indication of the use of the wetland environment. The extensive diary records various efforts towards undertaking drainage and also the construction of a timbered well for the farm's water as distinct from accessing the River, which in this location was at times brackish. The following extracts from Gilchrist's diary gives some indication of the intensity of the work in his wetlands and the investment that the farm was making in changing the ecosystem for the purposes of agricultural pursuits:

> *1839*
> *Jany 22nd Potatoes in swamp of No4, and a small piece of Scott's Garden, all lifted a middling crop, supposed to be about 2 ½ tons*
> (Gilchrist 1839).

This suggests that Gilchrist had grown his potatoes in what was a reclaimed swamp area. Whether the name of the paddock was Swamp or if it was really a swamp, one is not clear. It does, however, suggest that wetland-like country was being used to grow potatoes. In this case they were successful, as 1839 is confirmed as having a dry summer (Albrecht and Albrecht 1992:3).

> *Feby 4th Richard Babington and mate, who cast Mr Turner's drain, came to look at our Drain, and offered to case a large drain as it is commenced at 12/- per Rod or 8d per yard. and the small drain through the Swamp 4ft. deep, at 6/- per Rod, or 6d per yd.*
>
> *March 16th do Richd. Babington (Mr Turner's drainer) here last night, about casting drains, wanted 6d per cubic yd. to case a drain 3ft. steep (deep).*
>
> *March 21st Let Godwin and Hoisem 200 Rods of a drain in swamp, 3ft. deep, 6ft. 4" wide at top and 2½ ft. at bottom at 3/- per rod* (Gilchrist 1839).

By 1839, the market economy was starting to develop in the Lower Hunter and contractors were available to undertake work. The convict system was in a decline and labour had to be paid for.

> *May 2nd Good part of the swamp covered with water, observed that none of it came from the Large Creek, but that the water flowed from Sinclairs Creek to the Large Creek* (Gilchrist 1839)

Gilchrist observed the behaviour of his watercourses on the property in order to understand more about the way the water moved. He no doubt has a vested interest because he would like to further drain the swamps and make use of them for agriculture.

> *May 10th Took the levell (sic) of Drain through Swamp, and found it to be 2 inches higher at the first Bridge, than the bottom of the Tunnell (sic), and 3 inches lower at the first turn in the Swamp, than the bottom of the Tunnell* (Gilchrist 1839).

Gilchrist's tunnel was probably made from timber and would have gone through the river levee (bank) and may have also involved a crude flood gate to keep out the tidal water, but to enable him to use it to drain his farm. This is the first record of such an apparatus being set up in the Hunter estuary. Similar strategies could have been employed by the lower Paterson settlers because their lands were also subject to inundation and there existed a potential for drainage.

Flood gates are a feature of the lower parts of the tidal reaches of the Paterson Valley. These have been constructed as part of the flood mitigation program, where the riverbanks have been raised to create a levy so that the water remains within the River for minor and moderate floods to avoid farmland being inundated. The flood gate consists of a cover over the outlet into the river which seals up when the river rises keeping the water within the river: when the river becomes very high the water spills out over onto the farmland and wetlands remaining there until the river falls significantly. The flood gates system has had a major impact on the wetlands because

smaller floods under natural conditions would have replenished them but this water is now kept in the river.

Waterhouse prepared a thorough study of the wetlands of the Hunter region. This study categorised the wetlands of the Paterson as *Lower Hunter: small swamps* (Waterhouse 1981:27). The study could not record the extent of the pre European wetlands system as many have been drained and now appear as flat low-lying alluvial land, with the remnants appearing as small swamps. Further attention was given to the wetlands by Timms, which indicated that almost all the water bodies were adversely affected by man, mainly via drainage, nutrient accessions and cattle usage (Timms 1987, 1989).

**Table 5.1 Paterson River Floodplain Lakes**

| *Paterson Series* | Area* (h) | Depth * (m) | Perimeter length* (m) | Permanence* | Modifications |
|---|---|---|---|---|---|
| 32. 'Tocal' Sth | 1.9 | 4.0? | 810 | Intermittently flooded | None |
| 33. 'Tocal' Nth | 0.7 | 1.5 | - | Intermittently flooded | Partly drained |
| 34. 'Tocal' Homestead | 7.6 | 2.5? | 2010 | Permanently flooded | None |
| 35. 'Orange Grove' | 0.7 | - | - | Semi-permanently flooded | Partly drained |
| 36. 'Duninald' Sth | <0.5 | - | - | Semi-permanently flooded | Partly drained |
| 37. 'Duninald' Nth | 1.1 | - | - | Seasonally flooded | drained |
| 38. 'Bona Vista' | 6.4 | 2.5? | 2970 | Semi-permanently flooded | Partly drained |
| 39. Unnamed South of Paterson | 3.7 | - | - | Semi-permanently flooded | Partly drained |
| 40. Unnamed in Paterson | <0.5 | - | - | Semi-permanently flooded | Partly drained |
| 41. 'Brisbane Grove' | 1.3 | - | - | Semi-permanently flooded | None |
| 42. 'Valentia' | <0.5 | - | - | Seasonally flooded | None |

*measured at full water level +scheme according to Cowarden
COWARDEN, LM CARTER, V GOLET, FC 1979. Classification of Wetlands and Deepwater Habitats of the United States. Washington: US Fish and Wildlife Service, Office of Biological Services.

(Adapted from Timms 1987:313)

Timms' record is useful as it shows that six of the lower Paterson lagoons had been partly drained.

It was only possible for Timms to report on the remaining wetlands, as by the time of his study, significant sites had disappeared all together. For example, Lake Paterson and the extensive wetland in Sheep paddock north of Tocal Homestead have been drained. Timms records Tocal Homestead lagoon as not being modified, however, it would seem that it was modified in the Colonial era to allow for road access and its

height was raised to make it permanent. Evidence exists around its perimeter of large trees that would have been on its banks and now remain as inundated stumps and roots.

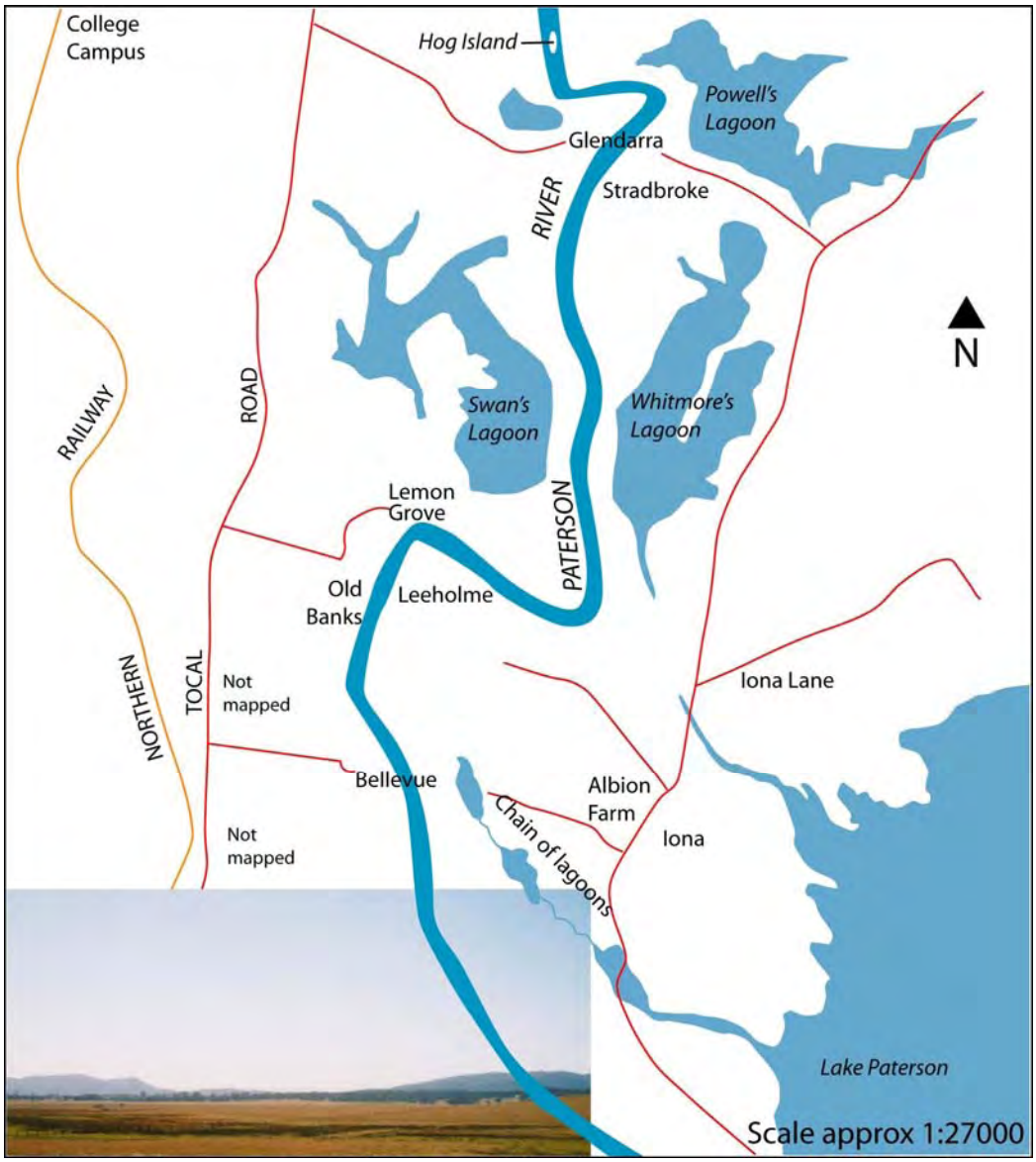
The Woodville drainage system now removes all water from the Lake Paterson locality. The lake was also interconnected to the Wallalong wetlands by way of the watercourse which is now traversed by Taylor's Bridge at Woodville, see Map 5.1.

Lake Paterson was largely the property of John Galt Smith who died and left it to his nephew, James Agnew Smith:

> *James Agnew Smith is credited with draining Lake Paterson. As a result he got 100 bushels of maize off his land compared to others only getting 40 bushels* (Conversation with Harry Boyle, 17 March 2004).

The Tocal property had many more wetlands at the time of the first European settlement than it has today. At the time of the arrival of James Webber there were significant wetlands almost surrounding Tocal Homestead and extending west as back swamps to Webbers Creek. To the north a large wetland complex existed in Sheep paddock and extended through into the Bona Vista estate. Over the River on what is now the Tocal dairy there were a number of wetlands and lagoons. The lagoons and wetlands of Tocal made it an attractive area of land for a colonial European farm. James Webber had the choice of almost all of the Hunter Valley and he selected Tocal. The principal reason for its attractiveness would have been a ready supply of fresh water for the house and farmyard as well as areas of fertile alluvial land for growing crops and animal feed. The farm Webber set up was able to exploit the lagoons through their availability as natural barriers for his sheep, and for virtually permanent stock water for all classes of stock.

Map 5.1 Extent of Wetlands in Stradbroke/Lemon Grove/Iona area prior to European Land Use




Wetlands were a dominant feature of the lower Paterson Valley when Europeans arrived. Over the past 180 years these wetlands have been progressively drained and their current area is less than 20% of what they were in 1820. Lake Paterson (see Figure 2.2 for painting of it around 1820 and the above photo for the locality as it is today) has disappeared, the other three major lagoons on this map are very much smaller than they were when surveyors Dangar and later White mapped them. These maps are based on surveys of Dangar 1823 (Dangar 1822-24) and White 1831 (White 1831) and have been transposed onto an aerial photograph by surveyor Luke Doran. The map has then been drafted by Dean Morris to provide a representation of the lagoons as they would have been in 1820.

The benefits of the lagoons were fully exploited by pastoralist and stud breeder, Charles Reynolds and successive generations of the Reynolds family who ran Tocal property as a most successful stud enterprise. Reynolds constructed an extensive network of post and rail fences on the property going into the lagoon. As a result a large number of small paddocks were created which enabled Reynolds to separate his breeding stock. Evidence of some of the fences remains today and these have been reconstructed as part of conservation works on the site. The main lagoon has never been known to go dry but it has become very low in drought years. During these times the fences were extended by Reynolds to keep the livestock apart as they waded into the muddy lagoon. The nearby land was subdivided into a series of small paddocks and the flats were used to produce feed for the stud stock. As a result of this, much of the knoll on which Tocal Homestead and the farming complex sits would have been quite bare for much of the time because the livestock were mainly hand fed. The impact of this on the lagoon would be significant, particularly during heavy downpours of rain and the close proximity of the paddocks to the lagoon. The impact of the early land use on the lagoon is described more fully by Cook (1998) and Cook et al (2003).

To the south-west of Tocal Homestead lie the Quarry Creek wetlands and this creek's confluence with Webbers Creek. Until the mid 1990s this area had been exposed to extensive grazing for around 170 years. A project was undertaken to rehabilitate a portion of this wetland through the exclusion of livestock and the planting of a range of indigenous flora. Heinrich (circa 1996) reported on the site prior to the works being undertaken which provided scientific and technical guidance for the rehabilitation project. Since then extensive plantings have been done and livestock have been largely excluded (see Appendix 4). The project has been a most successful project and provides an outstanding example of how quickly the lower Paterson Valley wetlands can be reversed from a degraded ecosystem into a system with increased biodiversity and biological activity. The former wetland complex to the north of Tocal Homestead in what is known as Sheep paddock is now virtually non-existent. Works were undertaken prior to the 1960s to drain this area. At the time of

the establishment of the College in the 1960s further works were done which drained the area. Again works were undertaken around 1990 to completely drain the site. The remnant wetlands were virtually non-existent and were heavily grazed and degraded by livestock. A management decision was made to fully conserve the Quarry Creek wetlands for the purposes of maintenance of biodiversity and to use the Sheep paddock wetlands entirely for grazing. The decision was made easier as a significant part of the latter wetlands had been planted to cottonwood poplars in the late 1960s and early 1970s.

A small wetland was once evident on the north western corner of Tocal dairy property adjacent to Tocal road, but it was filled in progressively, concluding around the 1970s. Anecdotal evidence from the Misses Curtis, former custodians of the Tocal Homestead indicates that the wetland was habitat for ducks. The Misses Curtis recalled a family of ducklings traversing the road from this wetland to the Tocal Lagoon but once the Tocal dairy commenced its development program in the 1960s, they didn't see the ducks again.

### 5.4 Enterprises on Alluvial Land

The enterprises undertaken on the alluvial landscape and its associated elements will now be discussed. Some of the enterprises may have also been found elsewhere in the Valley particularly in the rainforest brush soils away from the River.

#### 5.4.1 Wheat Growing

Wheat growing brought prosperity to the lower Paterson Valley following its settlement by Europeans. Despite floods and droughts wheat was the primary source of income for many landowners until the 1860s when the industry collapsed.

> *The collapse of coastal wheat farming left a gap on the market, it did not surrender to a glut, and it was not of itself indicative of improving a situation in the inland. It was the outcome instead of a series of disastrous seasons caused principally by the outbreak of a fungoid disease in the wheat crop that is popularly known as stem rust (Puccinia graminis tritici)* (Robinson 1976:32).

Robinson's study examines the development of the NSW wheat industry from 1851 to 1911. He demonstrates the importance of transport routes to the industry and confirms the strategic advantage of the lower Paterson Valley until the advent of the railways to the inland. Fortunately the inland railways had proceeded far enough for a wheat industry to develop on the tablelands where rust was not so much of a problem. Rust had been identified in the Lower Hunter's wheat industry on and off for many years but the 1860s saw it devastate the local industry. The outbreak of rust was to have significant social implications in the Valley for the tenant farmers. Rust was a surprise attractor and its impact was enhanced due to a series of La Nina years, the high rainfall and moist conditions facilitating its spread. The wheat industry succumbed to rust but the embedded resilience within the Valley's natural resources (in particular the rich alluvial land relatively close to markets) saw the Valley's farmers being able to move into growing other crops.

The industry in the Lower Hunter had been important in terms of the colony's wheat supplies and food security. The 1840s drought and changes in tariffs brought about social unrest and dissatisfaction with government policy on imports (Archer and Anderson 2003:9). Some large meetings were held in the Lower Hunter, resulting in petitions to the Governor for change.

Wheat-growing saw the expenditure of significant resources on farm infrastructure. Perhaps the most significant farm storage infrastructure was constructed by Felix Wilson on Tocal when he built three underground silos to store wheat (Archer and Anderson 2003:23). These silos proved a failure but remain as important relics of a former key industry in the lower Paterson.

Entrepreneurs were quick to establish processing infrastructure in the Lower Hunter including the Paterson Valley. Pearson (1995) describes the transfer of watermill technology from Britain to Australia. Some water-powered mills were constructed in the Paterson Valley, for example EG Cory of Gostwyck, Paterson (Aust 26/8/1831); Charles Boydell of Camyr Allyn, Gresford (Sullivan 1999:151) and on Trevallyn, see

figure 3.7. These entrepreneurs underestimated the episodic nature of the Paterson climate and the force of the flooding River, so all of the mills were destroyed by the floods well before the end of the 19th century.

Figure 5.2 Residence of Andrew Lang Esq, Paterson's River, Robert Russell 1837

NLA

**The confidence of the early settlers in the future of the Valley is demonstrated by this painting of Dunmore, Largs. Andrew Lang, like many others built himself a fine Georgian residence and outbuildings. His wind-driven flour mill was well located to service his needs and those of others within the Valley.**

Flour mills driven by wind or water were to give way to steam. Steam, being much more reliable, became the norm for processing the Paterson Valley crop. There are many records of steam flour mills including: Mr Smith's, East Maitland Steam Flour Mill (MM 4/1/1845), James Keppie's new steam mill at Paterson (MM 14/3/1849); Mather and Peter Keppie steam flour mills at Paterson (MM 26/2/1853); William Corner's steam flour mill to let in full working order, Paterson (MM 12/3/1859).

William Corner, enterprising Paterson farmer and businessman, was probably the greatest beneficiary of the booming Paterson wheat industry. He constructed a large

brick barn on the Cintra estate to the north of the village and was able to trade in wheat and flour to great advantage

The steam flour mills would have had a significant requirement for wood, which would have been collected in their vicinity. Such industry and enterprise put pressure on the immediate ecosystem for resources. The steam flour mills were an important part of the industrial and social fabric of the Valley during this period. It is likely that the steam engine from one of these mills later powered a sawmill on the southern portion of the Cintra estate.

The wheat industry created significant off-farm local employment from milling and the manufacturing of equipment. A new threshing machine, advertised to let or sell is recorded as being one of Keppie's from Paterson (MM 11/11/1848). So Paterson was the site for machinery manufacturing to service its wheat industry.

The wheat industry also required buildings on farms to process the crop. The property Sherwood on the Allyn River was advertised for sale in 1859 and the sale notice includes a description of a large barn, 50 foot by 40 foot with a threshing floor of 2inch sawn planks, all in thorough repair (MM 2/7/1859). This is a significant structure to be found on a property so far up the River at this time.

Wheat was not to disappear from the Paterson Valley immediately, despite the 1860 collapse. Evidence exists through much of the latter 19$^{th}$ century of some wheat being grown but it gradually faded away. The following reminiscence of a childhood at Lostock describes the life of a small farmer in the upper Paterson Valley. This report is extensive and covers much more than wheat. It gives an excellent view of the life on a small farm in the region around the turn of the century:

> *The average settler lived on an almost subsistence basis with barter of goods more in evidence than cash sales. The recollections of Mrs. Fanny Mines, nee Gellwiler would be typical.*

> *Born at Lostock in 1890, daughter of Christian and Margaret Gellwiller (sic), she was one of ten children – five boys and five girls. She first attended school in 1897. Her father had immigrated (sic) from Germany and her mother was of German descent. The house they lived in was of slab construction, with some rooms being divided by a curtain. The kitchen floor was dirt with a camp oven at the back in which bread was baked. Water was carted from the river in a cask on a slide, towed by horses. Her childhood memories were of a happy family with very few household or farming aids, but with a basic diet almost totally produced on the farm.*
>
> *Her father, helped by the older members of the family, kept a large vegetable garden, in which most of the common crops flourished. With the help of two draft horses, larger areas were sown to wheat and maize. The maize was mainly used to feed the animals, but the wheat was important to the family's supply of flour. When the wheat crop was ripe it was harvested with a sickle and stooked in the paddock to dry. It was then threshed by hand, bagged and loaded on a bullock dray. Mr. Gellwiler then set off to the mill at Paterson, where the wheat was ground, the miller keeping a portion in payment. A certain amount was also bartered for other essential supplies. The rest, which hopefully, was sufficient for the ensuing twelve months, was loaded on the dray for the trip home. The round trip took many days. Another crop grown was tobacco and the most immediate memory of Mrs Mines was the stench given off by the smoker of the local weed! There were also a number of fruit trees.*
>
> *The livestock apart from the horses consisted of a few cattle which provided the family with milk, butter, cheese and a small amount of meat. The main livestock and practically the only cash earner was pigs. Mrs Mines recalls her father received about 5/- a side of bacon which was killed and cured on the farm. The cash was most necessary to pay the rent on the farm, but also for any other small purchases needed. Another recollection was of hawkers coming to the farm, selling things such as cloth @ 3d a yard, household and farm hardware – just about anything that was needed. Invariably the wagon had a number of poultry coops underneath. Apparently poultry was just as good as cash in those days and a lot easier to come by!* (Lostock Public School 1978:17).

The subsistence nature of the small farmer's existence is an important and reccurring theme throughout this thesis. The small farmer, be they tenants or freeholders, had very little cash. So whatever they could lay their hands on, they would turn into cash – particularly the natural resources of the land. This reinforces the view that the small area landholder and farmer had a greater cumulative impact on the environment than did the large landholder. The evidence continues to suggest that the rise of

small area holdings saw a decline in the ecosystem health of the area. In addition it created a series of social problems of poverty and lack of opportunity for those small area farmers.

### 5.4.2 Lucerne Growing

Wheat gradually gave way to lucerne (alfalfa), which became a signature crop of the Hunter Valley in the late 19th and 20th centuries. In fact the variety of lucerne grown throughout Australia until the late 1970s was called Hunter River. Lucerne came into the colony at a relatively early stage but did not seem to become prominent in the Valley until well into the development of its agricultural systems. Madew (1933) suggests it was only introduced and grown around 1836 or 1837 and then was still not prominent until after 1850.

Lucerne comes from the Middle East, most probably in the vicinity of present-day Iraq on the Tigress and Euphrates Rivers and prefers a hot dry climate with deep soils and underground water sources. It grows well on the deep alluvial soils of the Paterson Valley providing it does not become flooded or subjected to excessive waterlogging.

The lucerne industry came at a fortuitous time for the lower Paterson Valley landowners and tenant farmers. The wheat industry collapsed in the 1860s and without lucerne, the farmers would have been in much more trouble. Fortunately they were able to turn to lucerne to grow and export by sea to Sydney. This became the mainstay of farmers from Woodville through Wallalong and Phoenix Park to Hinton. Large haysheds were constructed on the banks of the Paterson River and hay was pressed inside these sheds, possibly stored, or forwarded straight to Sydney. Some hay was forwarded in a green state so that it would have to be used within a day or so – otherwise it would putrefy. The lucerne industry created many other enterprises in the Lower Hunter including a significant manufacturing business for Duncan Sim and Sons at Morpeth (Walsh and Archer 2007:79). Sim constructed all types of farm machinery including mowers, rakes and the renowned Sim and Sons

hay press. This hay press seems to be unique in Australia and was used for decades pressing hay on the banks of the Paterson River.

The hay bales were pressed down and held in place with wire. The wire went over timber slats which secured the pressed hay. These slats were cut by local timber cutters from the eucalypt forests nearby, in particular spotted gum as it was quite suitable for this material. Alf Jordan operated a sawmill in the Paterson area in the early 20th century producing slats for lucerne hay bales.

William King in his memoirs prepared in 1922 recalls his father commencing to grow lucerne at Wallalong in the early 1850s (King 1922:6-7). It seemed to be a trial and error system which was subsequently perfected. King senior sought out mechanised equipment and was one of the first to have a horse-drawn mower operate in the district. King's farm on the Wallalong estate and on the edges of the Paterson River made an ideal location for the trading of the lucerne hay. These markets evolved to include the Sydney Haymarket for Sydney dairy cows and horses and also for horses working in the local mining industry. The following advertisement, albeit much later than when King commenced lucerne growing, is an example of the requirement for lucerne hay in Newcastle:

> *Fodder for shunt horses, Newcastle – The gazette of August 22 invites for the supply during 1877, of fodder including green lucerne, for the shunt horses at Newcastle* (MM 24/8/1876).

Lucerne was not only grown for hay but also grown as a seed crop. There are isolated references to this, including one crop at Vacy. This article refers to floods which had recently affected the district:

> *The crops of lucerne saved for seed has been almost destroyed and it will be a great loss to many farmers, as last year some had had as much as two and three ton, and has found to be a very remunerative crop* (MM Sat 22/3/1890).

The impact of lucerne growing on the ecosystem health of the Paterson Valley tends to be one of the more positive of any crop. Lucerne is a perennial legume requiring

Figure 5.3 Lucerne Hay Production

This illustration shows the unique operation of the Valley's lucerne hay industry – the rich alluvial flats linked to the tidal river for ready transport to Sydney. The top frame shows a farmer cutting his lucerne with a two horse mower; this equipment became common on the Valley's farms in the late 19th century. The illustration also shows the stark outlines of large dead eucalypts around the farm and farm house suggesting that these scattered trees from the woodland had been ringbarked. Fringing the top of the frame are some willow branches indicating the proliferation of willows on the alluvial landscape. The middle section of the illustration shows the farmer pressing his lucerne hay with a Sim and Son hand operated hay press. He is then trimming the bale with a hay knife preparing it for market. The bottom frame shows the steam-powered riverboat laden with stacked bales of hay heading to Morpeth or Sydney. Fringed around this is a flowering branch from a remnant rainforest tree.

Source: Garran 1888:102

little or no fertiliser and will grow for a number of years before it has to be re-sown. Usually farmers rotate it with maize or other crops, the other crops usually benefiting from the nitrogen build up from the lucerne. On the downside, the phosphorous and potassium levels of the alluvial soils decreased as a result of the annual removal of significant amounts of plant material, particularly lucerne.

In 1977 another surprise attractor hit the Valley's land use on the alluvial landscape. Lucerne crops were devastated by two exotic lucerne aphids, the spotted alfalfa aphid (*Therioaphis trifolii*) and the blue green aphid (*Acyrthosiphon kondoi*) (Walters and Holtkamp 1984:1). All of the lucerne grown was of one variety, Hunter River, so there was no inbuilt genetic resistance. Because of this lack of genetic diversity, all of the Valley's production of forage from lucerne stands was reduced to virtually nil in 1977 season. A livestock feed crisis occurred which was averted in the short term through the use of conserved fodder and by substitution from other feed sources. Seed of less susceptible varieties was imported from America, and funds were made available for research and plant breeding which has, over time, solved the problem particularly through breeding aphid resistance into lucerne varieties. The overall cost to the State in losses of agricultural production in the years 1977 to 1980 was estimated to be $76.4 million based on 1975/76 values (Walters and Dominiak 1988:i). Lucerne remains as an important crop and it now draws its varieties from a global genetic base.

### 5.4.3 Grape Growing and Wine Production

Another enterprise that was based on the cleared alluvial soils was the grape and wine industry. Some of the earliest grape-growing undertaken in the colony outside the Sydney Basin occurred in the Paterson Valley. This quickly became a significant industry at Tocal, Camyr Allyn, Orindinna, Cawarra and the Lewinsbrook estates. For many years the Paterson Valley was an important source of wine for the colony. The most prominent and most enduring vineyard was that of Dr Henry Lindeman on Cawarra at Gresford. Advertisements for land during the mid 19$^{th}$ century often referred to the potential of a property for a vineyard. The sale of Adair's grant at

Vacy records it as being well-adapted for vineyards (MM 15/3/1850). James Webber established a vineyard on Tocal and this was continued by long-term leasee, Charles Reynolds. He is recorded as intending to put in an additional ten acres to his present vineyard in 1869 (NC 20/2/1869). Unfortunately Reynolds died two years later in a horse accident and it is not known if his project had commenced. His widow and son continued to develop the livestock enterprise on the property and it would seem the vineyard enterprise lapsed.

The culture of grapes in the 19th century involved trenching them in rows. The vineyard trenching undertaken by Webber in the 1820s is still evident in Line paddock on Tocal. He had chosen a Dermosol to grow his grapes which was probably a treeless grassland and easy to trench and establish a vineyard. The majority of vineyards were, however, on alluvial soil.

The first prolific writer on the potential for the culture of grapes and winemaking in the colony was James Busby. The NSW Magazine reviewed Busby's publications and, as part of the review, recorded that Mr Webber at Paterson was one who had taken the lead in the growth and culture of vines (NSW Magazine 1833:96). It is clear that the culture of grapes was one of the foundation enterprises in the Paterson Valley and remained so for many years. For example the following newspaper report demonstrates community interest in wine production.

> *PATERSON*
> *THE VINTAGE – the season's vintage will now be over in a few days. Throughout the most favourable weather has prevailed, and the yield has been a most abundant one. The Cleveland Vineyard, the property of James McCormack (sic), Esq, which is eleven acres in extent, will produce over nine thousand gallons of wine; three acres of eleven are young vines only in their first year of bearing. It is estimated that the older portion of the vineyard has yielded about a thousand gallons to the acre. Mr William Boydell's vineyard, twelve acres in extent, will yield about eight thousand gallons. I have not as yet been able to ascertain the average yield of the other vineyards, but learn that the returns are expected to be as satisfactory as the above-mentioned.* (MM 6/3/1869).

A few years later the news was not so good when a wet February caused freshes in the River and the Paterson correspondent feared that the grape crop would be destroyed (MM 26/11/1874). Rain that falls in January, February and March causes disease problems for the vines in the Paterson Valley. Ultimately vineyard enterprises moved from Paterson to the drier climate of Pokolbin or ceased production.

It seems that a contributing factor to the demise of grape production was associated with the quality of the soils on which they were grown. Grape production on the Paterson Valley was largely undertaken on the fertile alluvial soils. The high fertility resulted in prolific vine growth in wet years which was a contributing factor to disease problems. During the humid and misty summer and autumn days the lack of aeration between the vines caused greater disease pressure on the crops.

### 5.4.4 Tobacco Growing

One of the earliest and most enduring crops during the 19th century in the Paterson Valley was tobacco. If lucerne became a signature crop for the lower Paterson, for the upper Paterson it surely must have been tobacco. Tobacco had many features which suited the climate of the Paterson Valley and the developing land tenure system. But there were also other aspects of the climate, such as hot and dry periods in the summer and wet autumns, which did not suit tobacco.

Madew gives a valuable summary on the features of tobacco which made it a suitable crop for the area.

> *Requiring a period of summer warmth with good moisture and rich soil, tobacco was a suitable crop for the alluvial flats. Furthermore it requires careful and painstaking attention, as well as skilful handling, to ensure rapid growth, a restriction of pest, and matured and unbroken leaf, which would be most likely when grown by those closely interested in their work. Consequently we would expect its cultivation in small lots, on the rich flats of the Hunter, with an improvement in the quality and quantity of production with the era of small farms and practised cultivators* (Madew 1993:57-58).

Tobacco growing got off to a strong start with enterprising larger landholders such as James Webber of Tocal and Charles Boydell of Camyr Allyn actively growing the crop and processing it. The locally grown tobacco had to compete against the imported product from America which had been grown for many years using cheap labour and a favourable climate. In addition the economies of scale of the American industry produced a consistent quality, a problem which plagued the local producers. By 1831, Webber's tobacco was seen as equal or superior to that from America (SH 5/2/1831). Tobacco was not just for smoking; the nicotine extract was also used as a treatment for scab in sheep.

> *Thursday, 19th – The Lambton arrived at 10am having been out 24 hours from Newcastle. She brought coals and tobacco – the latter from Mr. Webber – also a quantity of tobacco stalks for the scab, instead of tobacco itself.* (Parry circa 1830:66).

This record is from Sir Edward Parry who was Commissioner for the AA Co at Carrington, Port Stephens. Scab was probably the worst disease of sheep at that time, see Box 4.2. The tobacco industry was quickly established in the Lower Hunter around Maitland. The river flats were cleared on the Bolwarra estate and tobacco was grown, with cigars being manufactured there in 1830 (Wood 1972:234). The tobacco needed an alluvial soil but it was able to grow in the poorer quality upper Paterson alluvial soils as well as on the rich fertile Bolwarra flats. Records exist of land being cleared on the Toryburn property, Allyn River around 1830 for tobacco. The area was known as the *tobacco ground* (Wood 1972:283).

The following sale advertisement indicates how important tobacco was in the 1830s:

> *For sale by private contract – The Estate of 'Emral' on the western bank of Paterson's River consisting of 2560 acres, with a water frontage of three miles, containing several flats of alluvial Land of the richest description, particularly adapted to the growth of Tobacco, from which cultivation several gentlemen in the vicinity have realised large sums of money.*
>
> *The Alluvial land contains a large proportion of the finest Cedar timber. This Estate, being the highest location on the Paterson, commands an extensive Run, calculated to support a Herd of 2000 Head of Cattle; it is situated within 2-3 miles of the rising Town of Paterson, which a Steamboat proceeds once a*

> *week from Sydney. Although no improvements have been made upon the Estate, yet, from its fortunate situation, it is admirably adapted for the location of a recent Immigrant, who may establish himself once, without an expense and ruralist delay in attending the Government Land Sales* (SH 28/10/1834:3).

The tobacco industry provided employment and the opportunity for small enterprise by newly arrived settlers and migrants. For example Daniel Cowley, a cooper, advertises that he is making tobacco kegs in Paterson and is willing to travel 25 miles from Paterson to provide his services (MM 31/1/1846).

Tobacco twisters were in demand as the following advertisement shows:

*20 Tobacco twisters wanted, at the factory, Clevedon, James McCormack* (MM 17/9/1861).

The next advertisement shows the link between vineyard work and how tobacco growing fitted in for the small landholder:

> *TO GERMAN VINE-DRESSERS*
> *WANTED, TWO CAPABLE VINE-DRESSERS, either to hire at Cawarra, or to rent two rich tobacco farms, doing a certain amount of vineyard work in place of rent. Apply to the undersigned, within the next fourteen days.*
>
> H.J. LINDEMAN
> Cawarra, Gresford, April 22, 1863 2803
> (HRGA 24/4/1863)

Another example of tobacco growing being suitable for the under-capitalised small settler or farm worker is found in the evidence presented at the coroner's inquest into the Tocal murder of 1874. Frank Reynolds, then manager of Tocal is recorded as explaining how a gentleman came to be working on the Tocal estate:

> *'I reside at Tocal. I know James, Nicholas and Thomas Culbert. For about 18 months they were ringbarking for me in my capacity as manager. I paid the old man off about 28th September last. At the time of the settlement the elder prisoner asked me for a bit of tobacco ground or ringbarking or something else to do. He said it would be a great help to a poor man. I told him I would think about it and tell him in a few days.*

> *A few days afterwards he came in, and I agreed to give him half a mile of splitting and fencing. I have him a bit of tobacco ground free of rent and he thanked me. As near as I can remember, about a week before he left I saw him again and I asked him if he was twisting his tobacco, and he said yes. I then asked him when he was going to commence the fence, he said he would finish his tobacco first and after a few days he would go on with the fence – that he would take it easy for a few days and then the only interruption would be when he was getting the tobacco ground ready* (MM 28/11/1874).

This is a similar arrangement to the vine dressers for Lindeman at Gresford. The location for Culbert's tobacco growing enterprise was on Webbers Creek towards the back of Tocal probably in what was known as Pitcocks paddock. The quality of the soil in this vicinity is much lower than on the Paterson River or the Bolwarra Flats, but it was apparently still suitable for tobacco growing.

Reports in the Maitland Mercury and elsewhere indicate that tobacco production fluctuated dramatically. Whether this was due to poor seasons, low prices or low acreages being planted it is difficult to determine. Perhaps it was a combination of all of these factors. For example in 1851 the acreage is recorded in NSW as being 1731 but within three years it was only 8 acres but then increased again to 116 acres. The maximum acreage of the period in NSW was 1889 with 4833 acres (Campbell 1901:101).

Tobacco production had a significant impact on the ecosystem health of the Valley. It was a crop which involved annual cultivation of alluvial ground which, if flooded, would see topsoil removed by a flood, particularly in the upper reaches of the Valley. I suspect that a significant amount of topsoil was lost through tobacco culture in the 19$^{th}$ century from the upper Paterson Valley river and creek flats. Tobacco culture was an impetus for intensive use of what can be quite fragile and exposed land in the upper catchment of the Valley. The crop did, however, produce a cash income both for the large landholder and the small holder, share farmer or tenant and was responsible for creating a livelihood for many families over successive generations in the Paterson Valley. Tobacco was also at times a highly unreliable crop due to seasonal influences, as well as price and quality fluctuations because of competition

with imported quality products from America, something few other products from the Paterson had to contend with.

The cultivation of tobacco involved the clearing and intensive use of fragile land and necessitated the construction of large drying barns and presses. These would have used local timber resources for their construction. It is not clear when tobacco cultivation ceased in the Paterson Valley but it was some time in the early 20th century. Perhaps the main legacy from the tobacco industry was the establishment of many families as independent farmers who first became established by growing tobacco. The reasons for the demise of the industry are complex, related to markets, possibly disease through La Nina years and also the impact of the First World War on the availability of labour. Tobacco also required a local processing facility so if local processing was not readily available or was deemed not efficient, then farmers may have ceased growing the crop.

### 5.4.5 Orange Production

The other signature industry for the 19th and early 20th century in the mid and upper Paterson Valley was orange production. Horticultural pursuits were encouraged and promoted by George Townshend, early grantee, speculator and entrepreneur of Trevallyn on the Paterson River. He promoted orcharding through the sale of many fruit trees including oranges (Sullivan 1997). The orange variety grown in the early days of fruit-growing in the Valley was the St Michaels sweet orange, brought from St Michaels Island of the Azores (SG 5/6/1830). An advertisement from Townshend for his plants refers to his oranges as being the Trevallyn St Michael (MM 2/6/1870). A later article probably from the Maitland Mercury circa 1910 also refers to the oranges coming from St Michaels Island (sic).

Mentions of oranges for sale commenced in the mid 1850s. George Townshend had trees for sale (MM 14/7/1857) and in the same edition he had his Trevallyn preserves available through outlets in East Maitland, West Maitland and Newcastle. JD Brown of Colstoun (sic), Gresford had 2000 dozen oranges for sale in the Maitland Mercury

on 25 May 1858 and records of orange production go from there until the turn of the century. Evidence in the Maitland Mercury refers to the large landowners whose scale of production warranted attention by the newspaper. However, anecdotal evidence from throughout the Valley indicates that oranges were grown by virtually every small farmer as a means of diversifying their income. The Paterson River orange was a major industry for many years, employed a large number of people, and used a specific set of environmental circumstances which had consequences for ecosystem health.

Oranges were an ideal product for the Valley because they were adapted to the climate of the area, suited the pockets of soils through the Valley and also travelled well to market. They had excellent keeping qualities and were readily accepted by the market place. As the railway line extended up the Hunter Valley and beyond the oranges were distributed to towns along the way. In addition they were taken to wharves for forwarding to Newcastle and Sydney. The grading and packing of oranges in Paterson required the ready availability of fruit boxes cut from local timbers which created further employment in the Paterson area as well as increasing pressure on natural vegetation.

The Paterson River orange prefers a well drained soil even though it will grow in quite clayey soils. After the 1893 floods, a disease occurred in the oranges in the Valley necessitating a visit from Mr AH Benson, the fruit expert from the Department of Agriculture of NSW (MM 21/10/1893). Benson identified waterlogging on the heavy clay soils as a problem. It would seem that some of the orangeries had had timber drains laid previously that were no longer functional (Hunter 2004, MM 23/11/1893). Benson also commented on the fact that some trees were covered with lichen. He recommended spraying the trees with Bordeaux mixture. Perhaps this is the first formal recommendation for the use of an agricultural chemical in the Paterson Valley from the NSW Department of Agriculture. The following reminiscence from Len Graham of Paterson describes the development of Frank Auchett's business.

> *In 1916 Paterson was an extensive citrus growing district. Paterson River oranges were known throughout the state for their special quality and flavour and were always readily sought after by business people and private…..*
>
> *Although the oranges were not grown in Paterson itself the Paterson River extended for 40 miles to Carrabolla with growers at Gresford, Lostock, Mount Rivers, Bingleburrah (sic), Allynbrook, Halton, Eccleston and others in the early times. Each grower brought his fruit by horse-drawn wagons and one grower and his neighbours would hire a bullock team to bring the oranges from Carrabolla and this would take three days for the trip to Paterson. There were no bridges and all the river crossings were very stony and rough. The quantity for the season would vary from 15,000 to 40,000 cases* (Conversation with Len Graham (Len Graham, handwritten notes, undated)).

The production of oranges probably commenced on the river flats but as the land was broken into smaller parcels with the holdings running back into the hills, farmers found they could clear the brush soil in the steep valleys and gullies away from the River and grow oranges which caused the loss of many rainforest patches. Oranges may be assumed to be a relatively benign crop in terms of ecosystem health but in fact it was quite a destructive industry because it required such specialised soils and environment. The orangery on Bingleburra is reputed to have been one of the steepest, where drays could be easily loaded by backing them into the side of the hill and loading the oranges on at ground level. The Bingleburra brush is probably one of the larger brushes cleared for orange production. Other orange production can be found in pockets up valleys and gullies well away from the River – an early aerial photograph of Hungry Hill at Paterson shows an orange orchard up an isolated valley in the area owned by the Arnold family. The original vegetation does not readily regenerate particularly if fire and grazing occur, although some abandoned orange orchards have been recolonised by pioneer rainforest species along with lantana.

The demise of the Paterson Valley orange industry gradually occurred during the first half of the 20$^{th}$ century and by the 1970s only a few orchards remained, in particular John Priestley's organic citrus orchard. The decline was brought about by competition from inland irrigation areas which had planted seedless varieties and could produce higher yields at a lower cost of a product more acceptable to the

market. A generational change also occurred whereby the younger generation of farmers did not want to continue orange production because of its modest returns. To continue would have meant a complete removal of existing trees and replanting of new varieties in an uncertain market situation.

## 5.5 The Riparian Zone

The next part of the alluvial rainforest landscape to be discussed is the riverbank or riparian zone. There is no particular industry directly linked to this zone apart from grazing but the zone has been degraded as a consequence of most forms of land use. The riverbank and associated parts of the River including the in-bed area receive little mention in the 19th century records, correspondence and reports. There are some references which give an indication of issues associated with ecosystem health. The poem *Ode to Yimmang Water* (Appendix 4) demonstrates that the River was revered by some for its natural beauty but this was apparently not enough to see it not irreversibly degraded. Commandant Morisset report to his superiors in Sydney on the treatment of the riverbank and tidal riparian zone by the convict settlers in the tidal reaches of the Valley. The following is a postscript to a letter written in August 1822 regarding a shipload of coal to Sydney:

> *P.S. I have to request that a copy of the government and general orders which forbids timber being felled or thrown into rivers – it is absolutely necessary it should be sent to this settlement by the first opportunity, as it has been reported to me that some of the new settlers have already commenced throwing the timber they fall on their farms into the river, so much so as already to endanger the navigation of the river* (Postscript to correspondence from JT Morisset, Commandant, Newcastle 20 August 1822, SR Reel 6067P:213-4).

It would seem that the settlers on the banks of the Paterson and Hunter Rivers found it easiest to dispose of the timber when felled by discarding it into the River. The rainforest that they were trying to clear would have been moist and difficult to burn. One could imagine them pushing or levering much of the timber they cleared off their land into the River. The impact on ecosystem health was not only through the removal of the vegetation but also on the aquatic ecosystem. Few formal records

exist of this type of activity but it does given an indication of the way the land and environment was treated in those early years.

While the native rainforest was rapidly being cleared, efforts were underway to revegetate the banks with introduced species, in particular the weeping willow. Legend has it that Lieutenant Fredrick Bedwell was responsible for introducing the willow to the Paterson River. Bedwell's legend lives to this day and was central to recent discussions in Paterson in 2005 as to whether to preserve or remove willows from the Paterson Village lagoon.

Bedwell is reputed to have accompanied Napoleon to his exile on the Atlantic island of St Helena. Following Napoleon's death, Bedwell brought a willow cutting from St Helena to Australia and Paterson (MM 15/9/1931). This legend has been repeated over the ages and the reference is from the writings of John Tucker (1853-1939), Paterson farmer, resident and historian. Tucker's writings and others have perpetuated the willow story. The influences of the Napoleonic Wars and those who fought his armies are strongly represented in the Paterson Valley. Bedwell's mother-in-law had been granted the Cintra property as a result of service of her late husband's service to the British Army. Lieutenant Ward had served at Cintra in Portugal and his widow named the estate after this locality. The property to the south, Bona Vista, owes its name to its grantee Captain James Phillips, who served in Spain (Mitchell 1984). It is important to note that the willow has strong foundations in the Anglo-Saxon culture of the Paterson Valley. Efforts by NSW PWD to remove the willows from the River in the 1980s were met with much protest.

The removal of the complex native vegetation from the riverbank has resulted in significant instability of the Quaternary alluvium. Quaternary alluvium is only held together with roots of vegetation and when this is lost, it becomes unstable.

Newspaper reports following floods in the Lower Hunter Valley indicate extensive bank slips. A similar impact would have occurred on the Paterson River. The following report is associated with the 1893 flood:

> *The late flood has greatly damaged the banks of our river. Immense landslips have occurred in many places, leaving great gaps in the agricultural and orchard lands, and our river, with its graceful willow-fringed banks, winding like a silver thread at the foot of our hills, ever beautiful to look upon is now thick and muddy, and the trees and willows on its banks are crushed, and beaten down by the vengeful waters, until all the beauty has departed* (MM 25/3/1893).

Records of the state of the River and riparian zone for the lower Paterson are more numerous than those of the upper Paterson for the 19th century. Thorough research of many sources has found no significant information as to the state of the upper reaches of the River at this time. There is, however, a reference from the Karuah River taken by Hodgkinson during his travels.

> *I crossed the Karuah, over a shingly bed, overgrown with swamp-oak, and then entered on a level tract of country, tolerably grassy, but of very inferior soil* (Hodgkinson 1845:95).

The interesting aspect of this reference is that the bed of the River is 'overgrown with swamp oak'. One of the issues involved in River management is deciding to control the natural allocasuarina species that grow within the bed of the River. Hodgkinson's observation is relevant to the Paterson River Valley because of the similarity of environment and situation. The species are well adapted to the environment and aggressively colonise the river pebbles and sand tracts when the opportunity arises. The impact of these islands of trees on the subsequent course of the River causes concern for today's land managers.

Perhaps the most telling aspect of ecosystem health is the changing depth of the River. Fortunately there are good reports from the 19th century record. The first significant record describes the extent of navigation by steamers in 1862:

> *ARRIVAL OF THE STEAMER BOLWARRA*
> *On Tuesday last, the steamer Bolwarra, belonging to the Australasian Steam Navigation Company, arrived at Paterson, and proceeded to the Gostwyck Mills, where she took in a quantity of hay and other produce, and finally completed her loading at Mr. Corner's where she took a quantity of grain. This boat is in every way suitable for the navigation of the river, only drawing two feet six inches of water when fully loaded* (NC 9/5/1862).

Gostwyck estate is several kilometres north of Paterson and it would now be impossible to reach it by any boat due to siltation of the River.

The 1867 flood had a significant impact on the River and as a result sandbars developed in the vicinity of Hog Island:

*THE FLATS IN THE PATERSON RIVER – The steamer Bolwarra on her trip from Morpeth to here last Tuesday morning, stuck on the flats near Ogg (sic) Island, and was detained there for five hours before she could be got off* (MM 21/5/1868).

The sandbars referred to could well have occurred due to the gradual shifting of the River to the west which eventually saw the demise of Hog Island in the mid 20th century. The reference to flats would seem to be the formation of sandbars within the main channel of the River making navigation with a fully-laden riverboat impossible.

Reference again occurs in 1880 to problems in the Paterson River:

> *THE RIVER – The steamboats which trade up and down the Paterson River find that the river is shoaling up in different places, between Paterson and Pitnacree Bridge. Both the Anna Maria and the Bolwarra have now a serious difficulty in getting up the river at low tides. Something should at once be done to deepen these shoaling up parts of our natural highways, in getting our produce to the markets, more particularly when we cannot avail ourselves of the railways* (MM 4/4/1880).

A report three years later referred to a similar problem in the Hunter River in the vicinity of the confluence with the Paterson and Morpeth (MM 18/9/1883).

The problems continued and the following is reported in 1905:

> *It is not an unusual occurrence for the steamer to be stuck on the mud bank down the river, causing great inconvenience to both passengers and shippers. It is not long since the dredge did a little clearing but as it is only allowed to stay a week or two to dredge about 12 miles it is not nearly sufficient time to have it done right. It is practically so much money wasted, as ___ months afterwards the river is just as bad as ever* (MM 6/11/1905).

The River was soon to give way to the railways as the main transport route. Just six years after this incident the River was no longer the main route for heavy transport from the Paterson Valley. Expenditure on dredging would have probably continued until the rail arrived and was then abandoned because the political necessity no longer existed. Perhaps the railway came just in time as the River was silting to a stage that made it impractical for continued service to the village of Paterson. Droghers (a form of riverboat which could load goods without using a wharf) continued to work in areas of the lower Paterson and cream boats collected cream from dairy farms in the tidal reaches of the River into the 20th century.

Table 5.2 Paterson River Depth 1832 and 2001 (metres)

| **Location** | **1832** | **2001** |
|---|---|---|
| Bank (below Tucker Park) | 2.1 | 0.4 |
| Mid-stream | 2.7 | 1.0 |
| Mid-stream | 3.4 | 0.6 |
| Bank | 3.4 | 0.6 |
| Bank (river bend) | 3.7 | 0.5 |
| Mid-stream (river bend) | 6.7 | 3.3 |
| Mid-stream | 7.0 | 4.0 |
| Mid-stream | 4.6 | 0.7 |
| Mid-stream | 3.7 | 1.3 |
| Mid-stream | 3.4 | 1.0 |
| Bank | 3.0 | 0.9 |
| Mid-stream | 6.4 | 3.0 |
| Bank* (wharf site) | 3.4 | 1.5 |
| Mid-stream (wharf site) | 6.4 | 3.0 |
| Bank (wharf site) | 2.7 | 1.3 |
| **Average depth** | **3.91** | **1.36** |

* Site selected for Paterson Wharf

The location for each of the readings is as per White's 1832 map (SR Map 47a)

The previous reports and observations give some idea as to the changing depth of the River; however, we also have a firm record from Surveyor GB White's survey of the Paterson Village site in 1832. White was set the task to survey for a village on land which had been obtained from Susannah Matilda Ward, the original grantee.

On 17 January 2001 White's sounding locations were revisited and measured. White's readings were converted to metric. There is no indication as to the tide on which White took his measurements. The tide in 2001 was estimated to be mid level. There may be some inconsistencies in the comparative tide levels and the locations of each reading, and the 2001 sites were rough estimates compared to White's, which were surveyed. Still an overview of the data demonstrates that the River in 2001 is only one third the depth it was in 1832.

These measurements and observations give clear evidence of the massive changes that have occurred in the River in the past 180 years. It is impossible to gauge the full impact of these changes on the aquatic ecosystem health. The massive siltation has smothered the River's previous ecosystem leaving it a shallow bed of sand with no quality habitat. In addition the riparian zone, unprotected from livestock, has resulted in the River being relegated to the status of a drain rather than a living ecosystem.

### 5.6 Flood Mitigation

The disastrous 1949 flood saw the establishment of the Hunter Valley Conservation Trust in 1950. This was an Act of Parliament which provided for collaboration between local and State government to oversee future land management and conservation works in the Hunter. The works were to be focussed on flood mitigation but there was also strong interest and activity in soil erosion amelioration in the Upper Hunter. From the 1950s until the 1980s major works were undertaken in the Lower Hunter estuary for flood mitigation. These works impacted significantly on the Hunter River at Maitland but also on the lower Paterson River from the confluence of Webbers Creek.

The flood mitigation scheme undertook major works along the riverbank of the Paterson River particularly in the vicinity of Woodville and Wallalong. Major structures were installed to control the in-and-out flows of water from the adjacent wetlands and farmlands. In 1994 the NSW Public Works Department published a folder and a series of fact sheets on the achievements of the flood mitigation scheme:

> *Since flood mitigation work began in the Lower Hunter Valley, Public Works has built 160 kilometres of levees and spillways, 175 floodgates, 111 kilometres of flood canals, 14 kilometres of bank protection works and 40 kilometres of control and diversion banks in the Lower Hunter, Paterson and Williams Valleys* (NSW PWD 1994 Folder:2).

Flood mitigation works have been generally applauded by those in the urban areas although the system is untested by a flood of equivalent size to the record of 1955 (Walsh and Archer 2007). The works were not universally popular with affected landholders. The net effect of the works was to protect urban areas by directing flood waters across farming land. In addition the construction of the levees was of great inconvenience to some landholders, as was the drain construction. Some of these works were quite massive engineering projects taking a long period to complete. The lower Paterson River riparian vegetation remnant in this zone was a casualty of the works. Where intensive bank stabilisation work had to be undertaken there was no place for the few remaining rainforest trees, so the lower Paterson is largely devoid of any riparian rainforest. The works also resulted in significant stabilisation of the Paterson riverbank, particularly in the Woodville/Wallalong area. The riparian zone was transformed from a natural silt and vegetated interface to that of quarried rock, which has provided a very different habitat from what was there originally. These works were usually undertaken to remediate major bank instability and by the time the work started the riparian habitat had been destroyed.

The implications of flood mitigation works on ecosystem health are worth considering. On one hand the works provide security to those living in urban areas

and reduce the incidence of flooding. On the other hand the works were disruptive to local farmers and have been blamed for increased flooding of farmland.

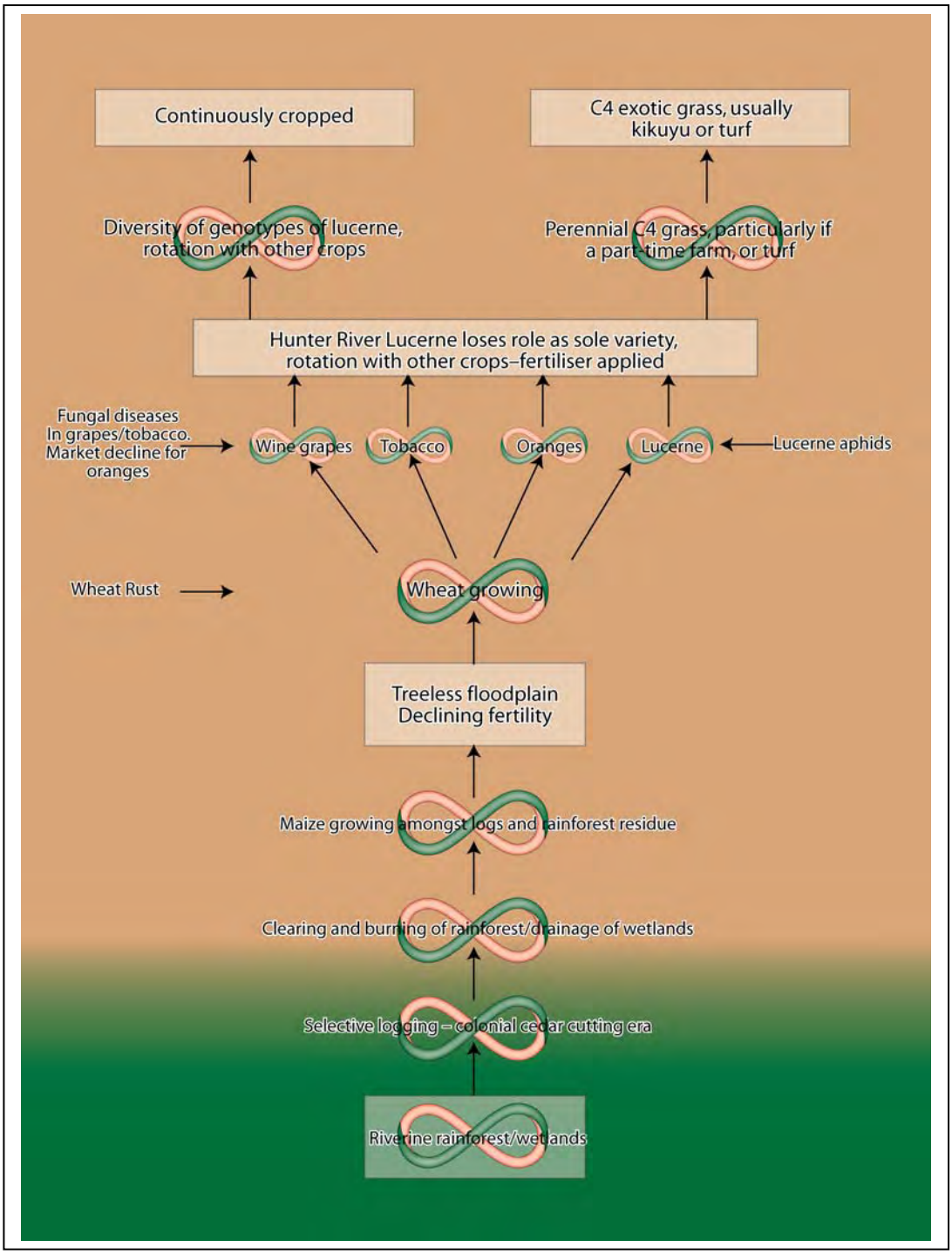
In at least one case at Wallalong the flood mitigation works have resulted in floodwaters remaining much longer on the farmland than they did prior to the works being installed. The impact of this on the farm's production is significant. The ecological impacts of the flood mitigation works should also be considered. The extensive drainage channels used to augment removal of water from the wetlands following a flood caused further depletion of the wetland systems than had been the case in the past. The Tocal wetlands escaped these works but the Lake Paterson wetland was a victim of this and other flood mitigation and drainage works.

**5.7 Conclusion**

Panarchy is a way of analysing change through application of the adaptive cycle over time. Panarchy can mean interpreting chaos and unpredictable change as well as identifying the reasons for stability and resilience. Phases of both elements can be seen in the changes that have occurred in the alluvial landscape.

The arrival of the Europeans saw the destruction of a complex ecosystem, which was holding the Quaternary alluvial material together allowing the Paterson River channel to remain stable despite the torrential floods. The removal of the rainforest on the alluvial flats and the draining of wetlands created significant short term wealth from agriculture, however, many changes were to occur over the next 180 years. All of the attractors discussed in Chapter 1 are influences on the changes that have occurred on this landscape since the arrival of Europeans. The gravitational pull of the riverbed has resulted in erosive forces both on the land itself and on the riparian zone, which has had a long-term consequence of siltation of the upper tidal parts of the River.

Figure 5.4 Changes in the Alluvial Landscape



The strongest attractor, which has resulted in the destruction of this landscape, has been the market for the products that the landscape has been able to produce. The market for cedar was followed by the market for fine wool, beef and many other crops and products. A key element has been a continual change in what the market required and the landscape was exploited to meet the needs of the changing market.

Surprise attractors are a feature of changes in the alluvial landscape. Many were diseases which saw the steady or in some cases rapid demise of an industry. Sometimes an industry overcame a problem with innovation and science. The lucerne industry was decimated by a surprise attractor, the lucerne aphid but it soon recovered and in doing so, enhanced its resilience.

The episodic nature of the climatic events also had a significant influence on the changes in this landscape. It was not, however, the droughts that had the single biggest impact on the landscape. It was the La Nina, or wet years, impacting on wheat growing, wine grapes and tobacco by favouring fungal diseases. Lucerne performance is affected by wet conditions, stands will be quickly killed by warm flood waters, and so drier years are much more acceptable to the Valley's lucerne growers. The other element arising from La Nina eras were floods, and repeated floods saw the departure of farm families from the Paterson River to other parts of NSW, and the degradation of a landscape no longer protected by its riparian vegetation from the force of floods.

The high natural fertility of the alluvial soil has conferred resilience on the agricultural system imposed by European agriculture. This fertility of the soil and its depth has enabled it to be exploited continually for the past 185 years but to remain productive to this day. The soil is good for farming but not as a riverbank protector when devoid of vegetation, so while it confers resilience on agricultural production, it is not able to withstand strong floods.

The River has become a victim of European agriculture, especially in the area below the confluence of the Paterson and Allyn Rivers to the village of Paterson.
This area was subdivided into quite small farms and much of the riverbank vegetation has been lost. The Quaternary alluvium here is also quite light and the River is also at its strongest prior to it reaching the Lower Hunter floodplain. It is contended that this is the most vulnerable and unstable part of the Valley because of the loss of the stabilising riparian rainforest combined with the greatest erosive capacity of the River.

The next chapter will examine the fate of the non-alluvial landscape following the arrival of Europeans and their animals.