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**Minister’s Foreword**

Catchment Management Authorities in NSW, together with their local communities, are well-recognised for the achievements they have made in protecting and improving natural landscapes across the State.

As Minister for Primary Industries, I am proud that these regional organisations have motivated, supported, encouraged and funded local communities to deliver more than 13,000 important projects, both big and small, to NSW.

Against the backdrop of the worst drought in living memory, as well as other serious natural events, the achievements of the Catchment Management Authorities in NSW since their inception in 2003 have been both impressive and ground-breaking.

The Catchment Management Authorities have used their skills and knowledge of local areas, issues and resources to produce projects in just about every corner of the State.

At the time of releasing the Catchment Action Plans in 2005, it was widely acknowledged that regular reviews were necessary to incorporate the growing knowledge of the Catchment’s natural, social and cultural resources.

This review of the Catchment Action Plans has provided an opportunity to cast a critical eye over the objectives, investment priorities and targets outlined as well as a chance to outline new approaches to setting priorities for investment in natural resources.

The Catchment Action Plans have been developed in consultation with local communities, Councils, and Government Agencies, using the latest scientific knowledge from the NSW Government.

This is a plan that outlines the shared vision for the sustainable management of the Catchment’s natural resources. I understand that the successful implementation of the Catchment Action Plan is dependent on the good relations between government agencies, industry and the wider community.

We all have a role to play in the sustainable and productive management of the Catchment’s resources and I hope that this Catchment Action Plan will ensure positive and practical outcomes for the years ahead.

---

The Hon Katrina Hodgkinson MP  
Minister for Primary Industries

---

1 Update to be provided by Minister if required
Message from the Namoi CMA Board

Since inception the Namoi Catchment Management Authority has committed itself to a vision for the catchment - vibrant communities and landscape for the future. Now, after seven years of investment in natural resource improvement, and community input, the Namoi CMA has taken a fresh and innovative look at how to provide that vision for the Catchment.

There have been significant changes during the life of our previous Catchment Action Plan;
- an increased confidence in the science underpinning the risks of climate change,
- a substantial increase in coal/coal seam gas developments in the Gunnedah basin,
- a severe drought, re-emphasising the need for a legislated Murray Darling Basin Plan,
- an acceptance of the need for activities to sequester carbon in the landscape.

There were substantial shifts in community knowledge, expectations and attitudes on; climate change, water management issues, urban and peri-urban sustainability and land use competition. Also program priorities of governments have changed.

Significantly, there is an improvement in our resource condition monitoring information for the Namoi; which shows declining resource trends; and this despite everyone’s best intentions and past investment programs.

Conceptually our traditional natural resource management has relied on the assumption that all natural systems respond to human intervention in a predictable, linear and manageable fashion. We have anticipated that our resources use will not substantially alter these systems or put at risk the provision of their vital ecosystem services. Essentially we had envisioned that these systems could cope with sustained use in perpetuity; that is - our resources use would be ‘sustainable’.

However there is evidence that natural systems do not act in this way - they are only able to absorb the same impact for so long without change, and then there comes a point of transformation, a tipping point or threshold, and they change - into a different state. Sometimes this change is abrupt, sometimes beneficial and sometimes it is devastating.

Our planning recognises this relationship and initially identified sixteen critical thresholds of concern for the Namoi Catchment. Critical thresholds are where crossing that threshold will trigger irreversible and undesirable change to the socio-ecological systems in the Catchment. Accepting that critical thresholds exist, we can set targets and design interventions to stay where we are in relation to these thresholds, or even move away.

Many discussions have revealed that this concept of ‘managing for resilience’ has resonated strongly with the Namoi community. Importantly, the concept accepts that people are an important part of a natural system which is always changing, where tipping points occur and where reverting to a previous state may sometimes be desirable but very rarely possible.

We expect that the inter-disciplinary and inter-agency collaboration required for successful integrated catchment management offered in this plan, thereby enabling a proper landscape approach to natural resource management, to be more in keeping with community expectations in the future.

This Namoi Catchment Action Plan will improve our understanding, our use, and the management of our key assets, and provide a sound platform to attain a vision of resilient communities and landscape for the future.

Namoi Catchment Management Board
August 2011

2 Updated paragraph from NCMA Board re 2013 update to be provided if required.
Executive Summary

The Namoi Catchment Action Plan (CAP) provides for the strategic direction of natural resource management in the Namoi Catchment to deliver on the vision of “resilient communities and landscapes for the future”. It has been developed using “resilience thinking” as a new way of undertaking catchment planning. Resilience is defined as the capacity of a system to absorb disturbance and still retain its basic function and structure.

Resilience thinking identifies “Social-Ecological Systems”. It assumes that we all live and operate in social systems that are acting on and underpinned by ecological systems. Social-Ecological Systems are complex adaptive systems that continually change and in ways that are not always easy to predict. They can change state in response to a shock or a slow pattern of change. The point at which a system will change into a different state is called a threshold.

Social-Ecological Systems are controlled by multiple variables, however it is usually only a handful of variables that are the critical drivers of change in a system. Within each of these variables there could be a threshold that, if crossed, means that the system will behave in a different way. Once a threshold has been crossed, it is usually very difficult to return to the previous state. By avoiding the crossing of thresholds, the system can be maintained in a “safe operating space”.

This CAP does not encompass every possible action or issue. Rather it focuses on the absolutely critical actions without which we risk collapsing some of our most important natural resource assets. Using this approach the CAP has identified critical thresholds that are immediate priorities for natural resource management intervention in the Namoi. The CAP provides targets and actions, which if successfully implemented, will ensure that the critical thresholds are not crossed.

It is clear that maintaining natural resources in good condition is important for the viability and development of the Catchment Community. Economic and social activities are dependent on the biophysical processes underpinned by natural assets. Economic and social systems within the catchment are driven by the availability of services provided by natural resources. Where natural resources are in good condition, options for social and economic use or choice are maximised and resilience maintained.

The CAP is an overarching ten year plan developed to guide the implementation of natural resource management activities collaboratively with partners. It is divided into four themes - biodiversity, land, water and people. Within each theme the critical thresholds are identified, along with the related targets and actions. The targets are long term and are aimed at avoiding the crossing of critical thresholds and are designed to provide a framework for negotiating shorter-term, time bound and achievable targets as part of Investment Programs implemented to deliver on Catchment priorities.

In summary, the following thresholds and targets have been identified:

Biodiversity Thresholds;
- Woody vegetation cover at 30% in cleared sub-catchments.
- Woody vegetation cover at 70% in intact sub-catchments.
- Regional Vegetation Communities maintain over 30% extent remaining.
- Population size of individual threatened species.
• Habitat area for individual threatened species or population.
• Area of endangered or vulnerable community.
• Presence of individual invasive species.
• Population extent of individual invasive species.

Biodiversity Targets:
1. By 2020 there is an increase in native vegetation extent and vegetation does not decrease to less than 70% in less cleared subcatchments and 30% in over cleared subcatchments and no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.
2. By 2020 maintain sustainable populations of a range of native fauna species by ensuring that no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.
3. By 2020 contribute to the recovery of priority viable threatened species, populations and communities.
4. By 2020 no new invasive species are established in the Catchment and the spread of key emerging invasive plants and animals is limited.

Land Threshold:
• Groundcover is at least 70%.

Land Target;
1. By 2020 there is an improvement in soil health as measured by an increase in groundcover at the paddock, sub-catchment and catchment scales.

Water Thresholds;
• Surface water flow quantity is at 66% of natural (pre-development) condition with a sensitivity to natural frequency and duration.
• Geomorphic condition is good (against benchmark condition).
• Recruitment of riparian vegetation is higher than attrition of individual trees, shrubs or groundcover species.
• Agricultural and urban supply aquifers do not cross into lower levels of beneficial use regarding quality.
• Alluvial aquifers are not drawn down below long term historical maximum drawdown levels.
• Groundwater is within 10m of surface where there are identified groundwater dependent ecosystems.
• Wetland is not drained, dammed or otherwise physically modified.

Water Targets;
1. By 2020 there is an improvement in the condition of those riverine ecosystems that have not crossed defined geomorphic thresholds as at the 2010 baseline.
2. By 2020 there is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses.
3. By 2020 there is an improvement in the condition of regionally important wetlands and the extent of those wetlands is maintained.
People Thresholds;

- There is no clearly defined threshold relating to people. Rather a focus on the generalities of building resilient social capital by increasing adaptive capacity and sustaining or improving wellbeing are considered important priorities.

People Targets;

1. Natural resource management decisions contribute to social wellbeing.
2. There is an increase in the adaptive capacity of the Catchment Community.

Each CAP theme and the relevant thresholds, targets and actions should not be viewed in isolation. The CAP is designed to act on the entire system, so the actions under one theme have significant benefits for all the other themes. Background information informing the CAP is available in the *Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment*.

Central to this CAP is ongoing adaptive management, with mechanisms and triggers identified to guide ongoing review and updating as our understanding of the Namoi Catchment improves and new information becomes available. Namoi will review the information underpinning the CAP on an annual basis, and updated versions will be delivered to the community and stakeholders for consultation and input every two years. This document represents the first update of the Namoi CAP 2010-2020.
1. Introduction

1.1. Catchment Action Plans

The Namoi Catchment Action Plan (CAP) provides for the strategic direction of natural resource management in the Catchment.

Individual Catchment Management Authorities (CMAs) across New South Wales have their own CAPs which have been specifically tailored to meet the unique needs of each catchment area. Each of these set targets and activities for a ten year period but are reviewed more frequently.

The Namoi CAP provides an overall framework, or picture, of a strategic way forward for groups and individuals who will be involved in managing the Catchment’s natural resources over the next ten years. Importantly, the CAP is a plan of action for all people and organisations in the Namoi Catchment, not just for the Namoi CMA.

1.2. Reviewing Catchment Action Plans

The Namoi CAP is written for a ten year period but must be able to evolve and change as the Catchment evolves and changes, and as new information becomes available. Namoi CMA’s previous CAP was written in 2005 and approved in January 2007. Thus in 2010, it was considered time to review it.

Since 2007 when the initial Namoi CAP was approved, there has been a substantial shift in community knowledge, expectations and attitudes towards environmental and natural resource management issues. There has also been a significant increase in the natural resource information available on the Catchment. This increased level of data will mean that a new CAP will be better informed.

In developing the latest version of the Namoi CAP, Namoi CMA worked closely with the Natural Resource Commission with regard to meeting their objectives and Standard for Quality Natural Resource Management (available at www.nrc.nsw.gov.au). Namoi CMA has also worked with the community, natural resource management experts, scientists, Government Agencies, Local Government and resilience thinkers, Paul Ryan and Brian Walker. As expected, when working with such a wide range of people, this CAP reflects the priorities of a wide range of individuals and organisations, including investors such as the New South Wales (NSW) and Australian Governments.

A collaborative approach to catchment management is essential and consequently the review of the CAP has looked at ways of increasing collaboration between Namoi CMA and other stakeholders within the Catchment. For more information on the objectives for the revision of the Namoi CAP please refer to Appendix A: Objectives Established for Revised Catchment Action Plans.

It is important to understand that this CAP, unlike its predecessor, is not intended to encompass every possible action or issue, but focuses instead on the absolutely critical actions without which, we risk collapsing some of our most important assets. A Resilience Thinking approach has been applied to determine 16 important thresholds in the Catchment and actions have been developed to stop progression towards these thresholds. Many
actions in the previous CAP have been discontinued in an attempt to focus limited resources on critical actions.

This CAP will be reviewed annually, with a major update occurring every 5 years. A substantive change such as a new target, threshold or three or more actions changing, will result in the CAP being resubmitted to the Catchment Community and the Ministerial approval process.

1.3. Requirements for updated CAPs

This CAP has been developed to address the following criteria and attributes developed by the Natural Resources Commission and these are outlined below:

- **CAP** was developed using a structured, collaborative and adaptable planning process.
  - Strategic planning process was logical, comprehensive and transparent.
  - Planning process meaningfully engaged the community, governments and other stakeholders.
  - An adaptive planning process is in place to evaluate effectiveness of the CAP and guide improvements as knowledge improves and/or circumstances change.

- **CAP** uses best available information to develop targets and actions for building resilient landscapes.
  - CAP describes the socio-ecological systems operating in the catchment using best available science and knowledge of community values.
  - CAP integrates biophysical and socio-economic information to analyse the systems operating in the catchment and develop strategies for improving landscape function and resilience.
  - CAP proposes targets and actions that are logically nested and supported by the available evidence.

- **CAP** is a plan for collaborative action and investment between government, community and industry partners.
  - Plan aligns with relevant natural resource management policies and community aspirations.
  - Plan can meaningfully guide other governments, industry and the community to align effort across the region.
  - Plan specifies agreed roles and responsibilities for partners in the catchment.

In light of these requirements, Namoi CMA has engaged with a new conceptual framework for thinking about natural resource management issues, namely “resilience thinking”.
1.4. The “Resilience Thinking” Approach

Resilience is defined as the capacity of a system to absorb disturbance and still retain its basic function and structure (Walker and Salt 2006).

The “Resilience Thinking” approach has arisen because current approaches to sustainable natural resource management are considered to be failing to deliver on expectations. One of the reasons for these failures could be due to current approaches relying on the modeling of average conditions thus ignoring the impacts of major disturbances. Sustainability, and approaches that try to optimise systems, don’t recognise secondary effects and feedbacks that impact on the overall system as a whole. Furthermore, sustainability approaches don’t recognise that the world as a whole is changing and that we need to be in a position to work with change rather than being vulnerable to it.

Resilience Thinking identifies “Social-Ecological Systems”. It assumes that we all live and operate in social systems that are both acting on and supported by ecological systems. It assumes that people are dependent on ecosystems wherever they are. Social-Ecological systems are complex and are in a constant state of flux. They do not always change in predictable or orderly ways. These systems can change in response to a sharp or sudden shock or a slow pattern of change. The point at which a Social-Ecological system becomes something new and different is called a threshold. Thus resilience is referring to a Social-Ecological system’s capacity to absorb shocks and disturbances without crossing a threshold and transforming into something new that we may not like.

Once a threshold has been crossed, it can be very difficult for a system to revert back to its previous state, or in other words to get back to how things used to be. When managing for resilience, we are managing to create or maintain distance between how things are now and a threshold which, if crossed, may mean things will change and perhaps not for the better.

For more information on the “Resilience Thinking” approach, refer to Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

1.5. Developing this CAP

The first stage of developing this CAP involved a series of consultations carried out in early 2010 attended by biodiversity, soils, water and social/economic experts plus Namoi CMA staff members. Discussion focused on identifying key assets for each of the Biodiversity, Land, Water and People themes and how they interact as part of a system along with identifying critical thresholds for those assets.

The resulting information provided the basis for the new CAP. These discussions further informed the development of the CAP by naming and defining assets. Assets are defined as those things that interact and are essential to support biodiversity, land, water and people in the Namoi Catchment. The results are particular to the Namoi Catchment and have been maintained in the CAP despite the availability of other models, frameworks or ideas of how to describe Catchment assets.

A significant analysis task was then undertaken to identify as much information about the thresholds and drivers of change for each asset that was identified in the expert workshops. This information is available in Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.
Conceptual models of how assets interrelate to provide biodiversity, land, water and people values have also been developed and are included in the CAP. Those assets identified as being most critical (i.e. contributing the most to each theme as identified in the conceptual models) have been prioritised in the Namoi CAP.

The Namoi CAP has identified potential critical thresholds in relation to those most critical “underpinning” assets that are immediate priorities for natural resource management intervention. The CAP provides targets and actions, which if successfully implemented, will ensure that these critical thresholds are not crossed. For example, a threshold that applies to biodiversity assets in the Catchment is that of 30% of the original extent of woody vegetation cover remaining. By prioritising those areas that are approaching 30% woody vegetation extent remaining for maintenance, regeneration or rehabilitation of woody vegetation cover, actions can be developed to ensure that this threshold is not crossed and that a related marked further decline in biodiversity does not occur.

Other plans and policies that relate to natural resources in the Namoi Catchment have been reviewed and actions have been developed to outline how this plan will contribute to them. For example, both Floodplain Planning and the Draft NSW Biodiversity Strategy priorities have been developed outside the Resilience Thinking process used to develop the remainder of Namoi CAP targets and activities. Notwithstanding this, they are considered of such importance that Namoi CMA has expanded this CAP to facilitate investment in line with these plans and strategies. For more detailed information on Namoi CMA’s approach to developing this CAP, refer to Appendix B: Namoi CMA’s Approach to CAP Development.

The targets contained in this CAP are long term targets aimed at avoiding the crossing of critical thresholds and are designed to provide a framework for negotiating shorter-term, time bound and achievable targets as part of Investment Plans designed to deliver on Namoi CAP priorities.

The conceptual model outlined in Figure 1 illustrates the alignment and relationships between State Targets, Catchment Targets and the associated actions. It also depicts the influence of the critical thresholds identified in the CAP and how these critical thresholds interact across and contribute to all four CAP themes as a socio-ecological system. The critical thresholds identified influence all four themes (biodiversity, land, water and people) in the Catchment and not just the individual theme they relate to.

More detail on how a critical threshold contributes to all other themes is provided in the Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

The 2013 update to the Namoi CAP has followed a similar process of ongoing evidence gathering and consultation in line with what was undertaken in developing the 2010-2020 Namoi CAP. The focus is particularly on the inclusion of the latest mapping, updates and further analysis that have been completed for the Namoi Catchment since 2010 in line with CAP actions. The completion of sub-regional resilience assessment for the Tablelands Slopes and Plains regions, being undertaken in collaboration with the Community Reference Panels for each region, is another important input. This and other latest evidence and analysis is included as per the adaptive management processes outlined in Chapter 7 of this document.
1.6. Our Vision for the Namoi Catchment

The Namoi CMA’s vision for the Namoi Catchment is:

“Resilient communities and landscapes for the future”

The priorities and approaches contained within this CAP are the ways in which Namoi CMA and all stakeholders can work together to deliver on this vision for the Namoi Catchment into the future.
1.7. Alignment with the Standard for Quality Natural Resource Management

A key requirement of the NSW Natural Resources Commission is that the CAP aligns with the Standard for Quality Natural Resource Management. The Standard for Quality Natural Resource Management has the following required outcomes:

- Collection and use of knowledge – use the best available knowledge to inform decisions in a structured and transparent manner.
- Determination of scale – management of natural resource issues at the optimal spatial, temporal and institutional scale to maximise effective contribution to broader goals, deliver integrated outcomes and prevent or minimise adverse consequences.
- Opportunities for collaboration – collaboration with other parties to maximise gains, share or minimise costs or deliver multiple benefits is explored and pursued wherever possible.
- Community engagement – implementation of strategies sufficient to meaningfully engage the participation of the community in the planning, implementation and review of natural resource management strategies and the achievement of identified goals and targets.
- Risk management – consideration and management of all identifiable risks and impacts to maximise efficiency and effectiveness, ensure success and avoid, minimise or control adverse impacts.
- Monitoring and evaluation – qualification and demonstration of progress towards goals and targets by means of regular monitoring, measuring, evaluation and reporting of organisation and project performance and the use of the results to guide improved practice.

For more detail on the ways in which this CAP meets each of the required outcomes, refer to Appendix C: Namoi CAP Alignment with the Standard for Quality Natural Resource Management.

1.8. External Operating Environment

Natural resource management at the National, State and Catchment scale is complex involving many different individuals and organisations, and a wide range of policies and legislation.

Land in the Namoi Catchment is managed primarily by individual land managers and corporate entities. Many industries operate in the Catchment that impact on and rely on natural resources, including agriculture, extractive industries, tourism and manufacturing. Our partners in natural resource management include the Catchment Community such as farmers, householders, community groups, Aboriginal organisations, and a wide range of industries along with Local, State and Federal Governments.

Natural Resource Management legislation relevant to the Namoi CAP includes the Natural Resources Commission Act, Catchment Management Act, Vegetation Management Act, Fisheries Management Act, Environmental Protection and Assessment Act and the Environment Protection and Biodiversity Conservation Act.

Natural Resource Management is also heavily influenced by the NSW state targets for natural resource management. The NSW Government also adopts natural resource
management policies, plans and strategies developed through its agencies to advance and co-ordinate action to deliver on these state-wide natural resource management targets.

The NSW CMAs have the challenge of developing regional scale strategic natural resource management plans that deliver the highest priority on-ground activities to achieve regional and state-wide targets. NSW Government Agencies have their own plans and strategies for managing natural resources and the environment and coordinate natural resource management investment under Catchment Action NSW and the Commonwealth Caring for Our Country initiative.

Importantly, the NSW CMA CAPs have no legislative power to influence, amend or over-ride other Government laws or policies. Subsequently the CAP relies on strong liaison and relationship building for delivery of its priorities. It is for this reason that this plan may fail due to thresholds and activities being over ridden by other government directives, agendas or planning decisions. The actions of individual land managers and corporate entities can also impact on delivery of Catchment Targets and there is very little that Namoi CMA can do about this, other than being reliant on goodwill, engagement and the use of incentives to change natural resource management practices.

Future natural resource management investment funding is not guaranteed, with significant variation in allocations possible from year to year for the life of this plan. Uncertainty in funding is matched by equivalent uncertainty relating to the political framework in natural resource management. The existence of any particular policy or legislative framework, such as that which established CMAs, can be overturned or undergo significant change within a short timeframe.

The reform process currently underway to integrate CMAs, the extension role of Department of Primary Industry, and the Livestock Health and Pest Authorities into new Local Land Services organisations is an example of this. Funding, governance and boundary details are still being resolved at time of writing. Nonetheless, the understanding, analysis and priorities contained in the Namoi CAP will continue to inform our understanding and management of landscapes even as regional bodies shift to deliver a wider integrated portfolio of responsibilities including natural resource management, bio security and emergency response roles.

More detail on how natural resource management is undertaken currently in NSW is included in Appendix D: Natural Resource Management in NSW.
1.9. How to read this document

The Catchment Targets are presented under each of the Biodiversity, Water, Land and People themes. Priority thresholds are also provided for each target. These thresholds have been drawn from the preliminary resilience assessment of the Namoi Catchment. Readers who wish to understand the full detail of the trends, drivers and thresholds for all assets, and other background information, should refer to Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

Each CAP theme and the thresholds, targets and actions should not be viewed in isolation. The CAP is designed to act on the entire system, so the actions under one theme have significant benefits for all the other themes. For example, actions under the biodiversity theme targeting vegetation communities, and actions under the land theme targeting groundcover, will also have impacts on water assets (such as water quality) in the catchment.

Within each of the Biodiversity, Water, Land and People themes, Catchment Targets and Actions to deliver on those targets are presented. Each action also identifies those involved in delivering on that action (“who”) and those instrumental in driving that initiative (“leader”). Whole of Government and community collaboration is an important principle underlying this CAP, and the priorities and actions proposed have been developed and refined in collaboration with all of the organisations named in this document. The “leader” role may involve facilitating and supporting the activities of a range of other organisations or action amongst the relevant organisations and influencing key decision makers – rather than necessarily undertaking or funding all of the work involved themselves.
2. The Namoi Catchment

2.1. General Description

The Namoi Catchment is located in Northern NSW and is bounded by the Great Dividing Range in the east, the Liverpool and Warrumbungle Ranges in the south and the Nandewar Range in the north. Major tributaries of the Namoi River include Cox’s Creek and the Mooki, Peel, Cockburn, Manilla and McDonald Rivers, all of which join the Namoi upstream of Boggabri. The Catchment has an area of approximately 42,000 km² and stretches from upstream of Woolbrook (east of Bendemeer) in the east to Walgett in the west, a distance of over 350 kilometres. The Catchment is home to approximately 100,000 people who live mainly along the Namoi River and its tributaries between Tamworth and Narrabri. The Kamilaroi people inhabited the entire Namoi Catchment prior to colonisation. Today, there are 12 local Aboriginal Land Councils representing some 6,500 people. The Namoi Catchment is a wealthy agricultural area with summer dominant rainfall which allows cropping and pasture growth all year round across most of the catchment.

Agricultural production was valued at more than $966m in 2009-2010. This includes livestock production with a total value of $479m comprising $416.9m for livestock slaughtered and $62.1m pa. for livestock products (wool, milk and eggs). It also includes $486.9m of crops of which cotton makes up $122.9 million. A significant proportion of the gross value of agricultural production comes from the Catchment’s irrigation industries.

Map 1: The Namoi Catchment
2.2. Development of the Namoi Catchment

Over the last fifty years, there has been a substantial change in the nature of regional economic development in Australia. The period from the 1950s to the mid-1970s was characterised by significant growth. Industries based on the region’s natural resources dominated and the Namoi region was no exception.

Agriculture has been at the forefront of development in the Namoi Catchment. Initially, the agricultural developments were based on grazing and subsequently on improving pastures for grazing. The development of tillage technologies appropriate to the self-mulching soils subsequently enabled cereal production to be expanded and to include both summer and winter crops. After the construction of Keepit Dam in the 1950s, the available tillage and irrigation technologies combined to enable areas of land suitable for irrigation to be developed and used for intensive cropping, especially cotton production.

Intensive cropping and irrigation supported the growth of a range of industries associated with more intensive land use, of farm input services and the transporting, processing and marketing of farm products. The Namoi Catchment experienced population and business growth, and expansion and diversification of its industries which included the major centres and most of the smaller towns until around 1980. Further to this and without an on-going stream of future growth opportunities the following underlying trends emerged:

- constraints on further growth from future growth of the natural resource base
- competitive pressures to increase productivity, especially in agriculture with its reliance on world markets
- competitive pressures imposed on public sector operations of transport, utilities and health
- improvements in infrastructure and new technologies in communications that enhanced mobility and opened up new ways of operating businesses.

The result has been an on-going process of structural change that has impacted in different ways across the Catchment’s industries and businesses.

Since the late 1990s, key trends emerging for the Catchment include:

- rapid growth in labour productivity in agriculture, mining and manufacturing
- steady growth in employment in the services industries
- a trend for economic activity to move to larger centres
- the rationalisation of many business branch networks, banking, communications and rural service activities
- the emergence of new national networks and franchises particularly in the retail industry
- the emergence of mineral and gas extraction industries.

These trends have continued, with the following trends also noted since 2001:

- a stable population overall although the shift to larger centres continues as does the increase in the indigenous population
- decrease on the number of people employed in agriculture (although overall employment has slightly increased)
- increase in the number of people with tertiary qualifications
- increase in the dependency ratio (which looks at the number of people of working age compared to those who are too old or young to work).

Agriculture continues to be a key industry for the catchment, and despite a reduction in the proportion of workers employed in agriculture over the last decade, it still continues to be a source of employment for 20% of workers in the Catchment.
The Namoi Catchment has enormous potential for further economic growth via the development of its coal, mineral and gas resources. One of the greatest challenges for Namoi CMA will be to balance the economic development pressures with an improved resilience of the Catchment’s natural resource base.

2.3. Assets

The key assets of the Namoi catchment are defined under the four broad themes of biodiversity, water, land and people.

**Biodiversity** is considered to be the “variety of all life forms; different plants, animals, the genes they contain and the ecosystems in which they live”.

Biodiversity in the Namoi Catchment is considered to be reliant on the following ten assets:

- Local landscape connectivity – the connectivity provided by small vegetation remnants and paddock trees.
- Total woody vegetation cover – the percentage of the Catchment or sub-Catchments that have woody vegetation cover.
- Regional landscape connectivity – how connectivity occurs across the Namoi Catchment and neighbouring catchments.
- Un-connected waterways (wetlands) - intactness of swamps, bogs, wetlands and less connected systems.
- Connected waterways (rivers and streams) – intact rivers and streams and connected wetlands (e.g. floodplain wetlands).
- Species populations – focused on species that are declining or stable, but at high risk.
- Groundwater dependent ecosystems - percentage of intact ecosystems that are dependent on groundwater.
- Large areas of conserved habitat – includes wilderness, National Park, reserves and other areas managed for conservation.
- Intact native vegetation communities – the condition and arrangement of vegetation and habitat, based on the variety of Regional Vegetation Communities occurring in the Catchment.
- Sensitive non-biotic habitat elements – caves, rock faces, granite outcrops.

**Land** is defined as “healthy soils and functional landscapes that are managed in a way that maintains optimal choices for future generations”.

Land assets are defined in line with Land Management Units under the overall asset of healthy soils. A Land Management Unit is a collection of similar soils that have much the same topography and hydrology and can therefore be managed as one unit at both the property and landscape scales. 22 Land Management Units have been identified for the Namoi Catchment. Information regarding the definitions of Land Management Units is included in *Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment*.
**Water** is defined as “surface and groundwater systems that consist of the riverine zone made up of stream bed and banks, wetlands and floodplains together with aquifers, both confined and unconfined. It also includes riparian vegetation, aquatic biota and water quality and covers access to water, both for people and environmental values”.

Water in the Namoi Catchment is considered to be reliant on the following 15 assets:

- Groundwater availability – the amount of groundwater available to people and the environment.
- Groundwater recharge – the ability of water to infiltrate and move through the landscape and therefore recharge aquifers.
- Groundwater quality – the freshness and useability of aquifers for use by people and the environment.
- Surface water quantity – the amount of surface water in the Catchment.
- Surface water availability (environment) – the amount of surface water available to the environment.
- Surface water availability (people) – the amount of surface water available to people.
- Floodplain flows – subcomponent of surface water availability that has strong influences on groundwater hydrology, wetland health etc. Includes river flows that break out onto floodplains and local overland flows.
- Instream flows – surface water flows that stay within bed and bank.
- Local flows – water independent of the floodplain and the river (perched wetlands etc).
- Hydrological connectivity – the degree to which surface and groundwater (and groundwater to groundwater) sources are connected.
- River geomorphology – stable and functioning geomorphology in the Catchment.
- Aquatic species – native fish (number of species and population size of each species), invertebrates, aquatic vegetation, and aquatic vertebrate fauna (not fish).
- Riparian buffers – vegetation alongside waterways including grasslands that filter and buffer water from land use impacts.
- Riparian vegetation – healthy persistent riparian vegetation.
- Optimal level of surface water quality and groundwater quality that can be expected under natural conditions (as compared to benchmark/reference sites).

**People** are defined as “the social and economic elements of the Catchment in relation to how they are underpinned by natural resources, an asset for increasing resilience and a driver of system changes”.

Twenty-eight assets were identified by expert workshops and these have been grouped into four capitals as per the ‘Five Capitals Model’ developed by the Forum for the Future Organisation ([http://www.forumforthefuture.org/projects/the-five-capitals](http://www.forumforthefuture.org/projects/the-five-capitals)). These four capitals and the related assets are outlined below:

- Human Capital – including intellectual capital, experience, leadership, skills, capacity to imagine a different future, knowledge and data, cultural diversity, sense of belonging, self knowledge and health.
• Social Capital – including proximity to other places, shared purpose, shared history, complexity of communities, mixture of ages, sexes, social cohesion, equity, social networks and industries.

• Manufactured Capital – major centres, towns, villages, infrastructure, soft infrastructure (services) and lifestyle amenity.

• Financial Capital – imported capital, economic diversity, distribution of wealth, available money, transferability of wealth.

2.4. Defining characteristics of the Namoi Catchment

The following characteristics define the Namoi Catchment:

• A geological progression from tablelands in the east, moving to slopes and plains in the west. The Catchment latitude and longitude mean it is subject to the interactions of global weather systems in a particular way. These factors give the Namoi Catchment its recognisable and valued climate (in particular the resulting temperature and rainfall).

Whilst these characteristics are key underpinning factors that have an impact on all assets within the Catchment, some changes are ordinarily so slow (e.g. soil formation) that their impacts cannot be measured over a lifetime. Therefore they can be set aside from the CAP to some degree. Climate variability means that changes to overall weather patterns are likely and this has been identified as a key driver that may change how the Catchment functions.

• The extent of native woody vegetation and the complexity of this vegetation.

The complexity of the vegetation and how it interacts with rainfall, temperature and altitude is particularly important in determining the biodiversity of the Catchment as a whole.

• The extent of deep soils with high water holding capacity which provide agricultural opportunities. Alluvial soils on floodplains extending into the far west of the Catchment, associated with adequate rainfall or access to irrigation water and a suitable climate, mean that high value agriculture extends right to the western extremity of the Catchment.

All soil types underpin the native vegetation, economic activity and surface and groundwater assets of the Catchment and none can be abandoned to degrading influences. However, highly productive soils have critical importance because of their significant contribution to the level of economic activity in the Catchment.

• Fresh and available surface water and groundwater are a direct result of the climate and geology of the Catchment. The high altitude at the eastern edge of the Catchment means that orographic uplift plays a part in rainfall. The eastern part of the Catchment is subject to coastal influences therefore water from rainfall enters the region’s surface and groundwater systems over and above the large scale continental high/low meteorological systems. Geology also influences surface and groundwater systems as it a key determinant in the permeability of soils and the amount of water that enters groundwater systems.

The level of groundwater available for irrigated agriculture is a key element that makes the Namoi Catchment different to many other Australian catchments. Combined with the quality of soils, groundwater availability provides a significant contribution to economic activity across the Catchment. Surface water availability for human needs and agriculture is likewise very important. The irrigation industries are supported by both surface and
groundwater resources with the latter providing a degree of buffering against the impacts of drought. The major rivers and streams that cross the Catchment underpin biodiversity, surface and groundwater availability and cultural identities. Rivers are key social nodes within the Catchment with most urban centres being placed on a major stream. Rivers factor highly in recreation, creative and social contexts.

- A social structure consisting of one major centre (Tamworth), the towns of Gunnedah, Narrabri, Quirindi, Werris Creek, Walgett, Barraba, Wee Waa and Manilla and a myriad of smaller villages and localities that all have their particular mixture of history, connectivity and culture. The Namoi has a strongly identified Aboriginal nation, the Kamilaroi Nation, which has maintained its language and identity into the 21st century.

Catchment communities underpin the economic base of the Catchment as it is people who make, spend and save money. Catchment communities also interact with, influence and respond to the policy contexts operating within the Catchment. The resultant land use changes that result can have both positive or negative effects on other Catchment assets.

- An economic structure that has to date been supported by agriculture and, in particular, irrigated agriculture. The economic opportunity provided by irrigated agriculture, and productive soils for use in either irrigated or dryland systems, has provided the opportunity for the agricultural sector to adapt, self manage and develop strong leadership and cutting edge technologies. Notwithstanding this, it is important to note that the majority of land within the Catchment is used for sheep and cattle grazing and not for highly productive cropping systems.

The Catchment economy underpins Catchment communities in that it provides the wherewithal for people to live in the Catchment. However, the relationship is circular, with the economy being equally dependent on people. The economy is also a driver of land use which can have both positive and negative effects on the water, soil and vegetation assets.

Figure 2 shows the importance of maintaining natural resources in good condition for the viability and development of the Catchment Community. The functioning of both economic and social facets within the Catchment is underpinned by this dependent relationship to operating biophysical processes. Relationships between the Catchment’s economic and social systems are highly complex and interdependent. In response, either acting independently or interdependently, economic and social systems operating within the Catchment are driven by the availability of services provided by natural resources. Where these biophysical assets are in good condition, services are increased and options for economic and social use or choice maximised. Conversely, natural resources in poor condition limit choice and the subsequent functioning of Catchment Communities, thus becoming a driver of decreasing resilience. The challenge for the Catchment’s future is to maintain the natural resource base such that decisions made now don’t limit the choices or options available to future generations.
2.5. **Shocks and drivers**

A ‘shock’ is defined as a sharp and sudden change in a factor that will impact on the Catchment in a significant way. An example of a ‘shock’ is a natural disaster such as flooding or bushfire that causes significant loss of life, property and major prolonged disruption to services.

A driver of change is defined as a long slow change that occurs in a way that the Catchment has some time to adjust to and can therefore be harder to identify as it can be causing change over a long period of time without being noticed. Examples of drivers of change include things such as climate change, aging populations and an increasing urban/rural divide.

In 2007, Namoi CMA undertook a Scenario Planning exercise for the Catchment to engage communities in integrated planning appropriate to the future projections of the Catchment. In consultation with the community the following drivers of change were listed as likely to influence the Catchment over the next 30 years.
Drivers of change:

- Mining development.
- Changes to population – either significant increases or decreases.
- Continuing declines to government resourcing (including local government).
- Continued tensions between environmental, economic and social concerns.
- Changing technologies.
- Improved understanding of the system.
- Increasing costs of agricultural production.
- Infrastructure changes (dam upgrades etc).
- Climate variability/change.

The same community consultation process developed an understanding of potential shocks to the system which included:

- Pest and disease outbreaks – in agriculture and humans.
- Political instability – including terrorism and global or national unrest.
- Technological failures.
- Emissions mitigation policies.
- Slowing global economies.
- Sudden population influxes – migration.
- Extreme weather related events – including floods, severe storms, bushfires, prolonged dry periods.
- Energy shortfalls.
- Environmental disasters/system collapses.
- Policy shocks – e.g. Murray Darling Basin Plan.
- Sudden changes to industry/production systems.

The full report from the 2007 Scenario Planning project is available at www.namoi.cma.nsw.gov.au.

Drivers of change or shocks that are most likely to impact on the Catchments progression towards thresholds can be identified. Some are of particular concern and have been raised by the community during the extensive community consultation sessions.

Mining and extractive industry development is the key change that the community of the Namoi perceive as having the potential to markedly change the social and ecological systems of the Catchment. These developments have the capacity to drive the Catchment over the identified thresholds relating to terrestrial biodiversity, surface and groundwater and soil health. Extractive industries also have the potential to create a dual economy, attract a migrant population and impact on social cohesion and wellbeing across the Catchment.
Positives from extractive industry development are most likely to be socioeconomic (i.e. increased per capita incomes, improved infrastructure etc.) whereas the thresholds crossed are likely to impact on natural resources. Agriculture, in particular irrigated agriculture, together with the government sector have been the primary drivers of economic activity across the Catchment to date. Clearly, any negative environment impacts which may accompany extractive industries have the potential to impact on the Catchment’s agricultural industries.

The Namoi CMA has undertaken a range of initiatives since its inception to identify, understand and recognise what the Catchment Community values in the Namoi Catchment. This has included a range of approaches to identify stakeholder needs and values including specific research such as ongoing broad Community Benchmarking Evaluations and a targeted Living Culture Study undertaken with the Aboriginal Community. There have also been specific mapping exercises to inform priorities and program development.

Particular attention will be paid by Namoi CMA to how extractive industry development should occur in the Catchment. The following series of ‘thumbprint’ maps illustrate in brief the significance of potential mining to other values of the Catchment. The first seven maps (Section 2.5.1) illustrate the values of agriculture, infrastructure, forestry, native vegetation, nature conservation, recreation and water across the Namoi Catchment. These are followed by three maps (Section 2.5.2) illustrating the mining leases, exploration licences and mining titles across the Namoi Catchment.

This series of maps have been built using the significant base-level geographical datasets developed by or available to the Namoi CMA. They are based on vegetation extent, pre-European vegetation modelling, soil landscape mapping, biodiversity strategy mapping, riparian vegetation condition mapping and analysis, Atlas of NSW Wildlife, mining and exploration lease data and modelled run-off and rainfall mapping amongst other digital data sets. A full description of how these maps were produced is available on request from Namoi CMA.
2.5.1. Identified values in the Namoi Catchment

Map 2.1: Agriculture and land capability value in the Namoi Catchment
Green represents high value agricultural areas due to proximity to water and quality of soils

Map 2.2: Infrastructure value in the Namoi Catchment
Map 2.3: Forestry and plantation value in the Namoi Catchment
Green represents potential forestry footprint.

Map 2.4: Vegetation extent in the Namoi Catchment
Dark green represents woody vegetation and light green represents non-woody
Map 2.5: Nature conservation and biodiversity values in the Namoi Catchment
Blue represents high value to nature conservation and biodiversity

Map 2.6: Recreation values in the Namoi Catchment
Map 2.7: Surface and groundwater values in the Namoi Catchment
Blue represents high value due to recharge, quantity and quality.

2.5.2. Mining and exploration in the Namoi Catchment

Map 2.8: Current mining leases in the Namoi Catchment – active developments (as at 2009)
Map 2.9: Exploration licences in the Namoi Catchment (as at 2009).

Map 2.10: Current mining titles in the Namoi Catchment – (January 2011)
A major shock identified as being particularly current to the Namoi Catchment Community is any significant reduction in the Namoi Valley’s water use cap resulting from the Murray Darling Basin Plan (Note: irrigated agriculture is producing 48% of the Catchment’s gross value of agricultural product). Community and stakeholder representatives assume that if this plan doesn’t come to pass due to political influence, eventually a policy platform will develop that will significantly reduce the amount of water available to irrigated agriculture within the region. Similarly, a Carbon tax, Emissions Trading Scheme or any other policy mechanism that places a price on carbon has the potential to significantly change the nature of economic activity in the Catchment.

Climate variability (or climate change) was the key driver of change identified by many scientists, agency staff and some members of the community. Generally, however, the community remained non-committal on the matter of climate. Climate variability/change has significant potential to drive the Catchment towards thresholds relating to terrestrial biodiversity, surface and groundwater and soil health. The priorities in this CAP are sensitive to likely impacts of climate change and, in some cases, represent an attempt to buffer systems before the worst of the predicted climate change impacts occur. Further effort is being focussed now on more detailed planning for climate change adaptation and mitigation on ground to inform the next updates of regional plans, and associated on ground initiatives. For more detailed information on the expected impacts of climate change on the biodiversity, water, land and Community of the Namoi Catchment, please refer to the Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

2.6. Buffers

Buffers that provide some insurance to assets in the event of either a driver of change or ‘shock’ eventuating can be established in biodiversity, water, people and land systems. Examples of buffers that might help to prevent the Catchment inadvertently crossing thresholds in the case of long term system change or a shock are provided below:

- Maintaining greater levels of native vegetation extent such that threshold levels are not breached even in the case of large scale shocks such as large scale bushfires or climate variability.
- Ensuring improved connectivity and resilience of individual native vegetation areas (local area connectivity) so that species have greater ability to move and adjust to sudden impacts or slow system changes.
- Ensuring that enough water remains in rivers and aquifers so that they have inherent health and quantity at the time of a shock or are able to maintain integrity under a scenario of prolonged change.
- Ensuring that there are more people who are able to carry out leadership roles than there are leadership positions at any one time so that succession of responsibility can occur in the case of shock (i.e. succession planning).
- Ensuring that there are individuals who have more skills, knowledge and options for lifestyles than are required currently. This will provide options for rapid adjustment should an industry, urban centre or community become unviable as a result of a shock or slow change.
2.7. Trend information – State of our Catchment

Trend information has been compiled for the Catchment and can be viewed in more detail in *Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.*

A brief synopsis of major trends in the Namoi Catchment is as follows:

**Terrestrial Biodiversity:** The scientific literature confirms that a threshold exists in species numbers when the percentage of woody vegetation extent falls below 30%. At the Catchment scale woody vegetation extent is already below 30%, currently sitting at around 25%. However as some areas of the Catchment were historically grassland rather than woodland or forest, the threshold has probably not yet been crossed. When the percentage of woody vegetation is compared to the area that might naturally have been wooded, the percentage is at 53%. For this reason it is still valid to attempt to maintain biodiversity assets across the Catchment. All biodiversity assets identified are on a downwards trend in the Catchment, with the exception of large areas of conserved habitat, which are increasing in area due to recent reserve acquisition programs across the Catchment.

**Water:** Ecological collapse is probable if a river’s flow drops below two-thirds of natural flow and if the frequency and velocity of flow are significantly altered. ‘Natural’ in this context refers to the amount, frequency and velocity of flow compared to pre-development conditions. However, frequency and velocity are not able to be expressed as thresholds or percentages. Currently the normal flow of the Namoi River and tributaries overall is considered to be at approximately two thirds of natural flow. As is the case with terrestrial biodiversity, water assets are mostly trending down. Exceptions to this general downward trend are surface water quality which is very poor but stable, and water available to the environment which was considered by the expert panels to be improving due to policy settings.

**Land:** Thresholds are detailed and vary according to each soil type but include the percentage of soil carbon, bulk density thresholds, exchangeable sodium percentage (ESP), percentage of ground cover, electrical conductivity (EC – measure of salinity) and soil particle size. Soil assets were considered in a slightly different way to the other themes, with one overall asset being defined as ‘healthy soils’ with detailed information being provided at the Land Management Unit scale. Some soils are considered to be stable in relation to their health, others are improving. It is considered that the poorer, more fragile soils in the west of the Catchment (e.g. sodic soils) are continuing to decline.

**People:** Thresholds remain difficult to establish for social systems and it is unknown at this point which social and economic thresholds we may be approaching that will see a significant change in the way the Catchment functions.

Trends for people assets are highly variable (just as the assets defined are varied), operate at different scales and can be quite different depending on what part of the Catchment is under consideration. For example, it was considered by an expert panel that social cohesion and shared history were trending down across the Catchment, but that skills and knowledge were trending up. However, there are exceptions, with some parts of the Catchment retaining a strong social cohesion and shared history, with other parts declining in relation to skills and knowledge.
2.8. Resilient Landscapes

Key understandings emerging from the Resilience Assessment process were as follows:

- Biodiversity is highly dependant on extent of native vegetation communities and woody vegetation extent.

- Riparian values including water for people and the environment are highly dependant on keeping sufficient natural flow in rivers and protecting the geomorphology of streams, rivers and floodplains.

- Groundwater can only be relied on if management does not compromise integrity, quality or recharge (including protecting the role of floodplains in recharge).

- Soil health can be markedly improved by a focus on groundcover as this impacts on many soil health elements such as structure, organic matter and permeability.

- Decisions need to be made on the basis of maintaining wellbeing for people, taking into account how they are supported by and rely on their natural resources. This includes making balanced decisions that take into account where economic and social decisions may lead to biophysical thresholds being crossed.

- Adaptive capacity is the most important attribute that will help people in times of change or crisis caused by shocks.

Obviously, when thresholds are combined with trend and baseline data for the Catchment, it can be seen that, in some places, thresholds have already been exceeded and communities may need to adapt to living with their landscape in a transformed state. An example is where subcatchments have been cleared down to less than 30% woody vegetation cover. It is considered that these areas are now highly agriculturalised and there is no surety that investment in increasing woody vegetation cover would lead to a return to the previous ecological state. Investment in increasing woody vegetation cover would likely have a terrestrial biodiversity outcome, however the outcome would represent the subcatchment in a transformed state – i.e. fauna and flora will return but not necessarily in the same configuration as before.

An alternative view when considering these same subcatchments could be that they are extremely valuable highly agriculturalised landscapes, and any attempt to transform them back to 30% woody vegetation cover is a threat to the social and economic values represented by their current use.

Resilience Thinking does not in itself answer the worrying questions about which values should be protected where. It does provide some guidance in the form of thresholds. Communities can be encouraged to understand their assets and how they are reliant on them and to understand the trends or trajectory they are on. Communities should be informed of where the critical thresholds are thought to exist which, when crossed, may lead to the collapse of assets they care about and depend on. Thus communities can then make informed decisions for themselves about which trajectory they want to be on.
3. Terrestrial Biodiversity

Definition: “The variety of all life forms: different plants, animals, the genes they contain and the ecosystems in which they live”.

Biodiversity plays a critical function within the Catchment, providing the productivity that agriculture depends on, clean air, clean water, tourism opportunities and an important sense of place and wellbeing to people. Some asset types are able to be assessed to determine status, thresholds and trends, whereas others are more difficult to assess as information is not readily available.

On the basis of the resilience assessment undertaken, it would appear that total woody vegetation cover, and intact native vegetation communities, are the most critical assets for biodiversity, followed by large areas of conserved habitat, connected waterways and regional landscape connectivity as shown by the conceptual model presented in Figure 3.

Evidence strongly suggests preventing a trajectory in woody vegetation loss crossing the 70% cleared threshold as critical to maintaining biodiversity assets in the Catchment. Species loss occurs as the vegetation cover is reduced but the rate of loss increases exponentially after woody vegetation cover reduces below the 70% and 30% woody vegetation extent thresholds. Thus a threshold that maintains a minimum of 30% of woody vegetation cover is important for more cleared areas so as to avoid further loss of biodiversity. A threshold that maintains those areas that retain 70% or more of their woody vegetation cover is also considered important as these areas are likely to maintain most of their biodiversity. The analysis completed for the Namoi takes account of those subcatchments that naturally have less tree cover such as grassland areas and these are taken into account when establishing priorities for woody vegetation restoration or maintenance.

A third critical threshold has been defined regarding the maintenance of a diversity of ecosystem types at or above 30% of their original extent. This threshold is an attempt to capture the diversity of ecosystems (and therefore habitats) rather than just the amount of woody vegetation. No information was available in the scientific literature that helped to establish the number or percentage of ecosystems that need to remain intact for overall maintenance of biodiversity. Thus the best evidence suggest that to maintain biodiversity, the maximum diversity of habitats needs to be maintained, so no further Regional Vegetation Communities should drop below the 30% original extent remaining threshold. A preliminary figure of 61% of ecosystem types at 30% original extent was carried forward into this CAP in 2010. This is because, based on the 2010 mapping baseline, 61% of all Regional Vegetation Communities found in the Namoi had not yet crossed below the 30% extent remaining threshold. This threshold has been maintained, although expressed differently for clarity based in this updated CAP. Updated vegetation mapping and revision of Regional Vegetation Community classifications shows there are 70 “true” and 3 “derived” Regional Vegetation Communities in the Namoi Catchment. Regional Vegetation Communities include both woody and non-woody vegetation types (e.g. grasslands and wetlands).

Native vegetation extent, condition and configuration are all important in relation to maintaining biodiversity. Based on the resilience assessment undertaken, and the available research, extent has by far the greatest influence, with condition and configuration reliant on having native vegetation present in the landscape in the first place. Thus the critical threshold of extent is carried forward as a target in the CAP. Condition is also seen as important in relation to biodiversity and is thus identified as part of the actions involving maintenance of all Regional Vegetation Communities under several targets. Area statistics
and the conservation status of the Regional Vegetation Communities mapped in the Namoi Catchment are available in the *Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment*.

Thresholds for threatened species, populations and communities will need to be identified for each individual entity and will most probably relate to the population size or extent of a species, population or community and the habitat area for a species or population.

Invasive species are an important driver of change to biodiversity assets, and thresholds have been identified that relate to the presence of individual invasive species and population extent of invasive species. Thus the priorities in the CAP are based on preventing incursions of new species into the Namoi Catchment and eradicating newly emerging invasive species before they become established. These are the key priorities in relation to invasive species. Targeting established or widespread invasive species is only considered a priority where they are the critical threat to an important biodiversity asset (such as a threatened species or endangered ecological community) and control is feasible.

Figure 3 shows how biodiversity assets interact to provide biodiversity in the Namoi Catchment. An ‘arrow to’ represents a contribution to another asset. Total Woody Vegetation Cover and Intact Native Vegetation Communities contribute to most assets and are therefore considered the most critical underpinning assets to biodiversity.

For more information including the full detail of the analysis of system function, trends, drivers and thresholds for biodiversity, and other background information, refer to *Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment*.

Four Catchment Targets for biodiversity have been developed based on the 8 thresholds identified. These targets are designed to prevent the critical thresholds from being crossed in the Namoi Catchment. Actions 1-24 describe broad activities that a range of partners can undertake to achieve the targets set and thus maintain biodiversity in the Namoi Catchment.
Figure 3: How Assets interact to provide terrestrial biodiversity in the Namoi Catchment.
3.1. Terrestrial Biodiversity Critical thresholds

1. Woody vegetation cover at 30% in cleared sub-catchments.
2. Woody vegetation cover at 70% in intact sub-catchments.
3. Regional Vegetation Communities maintain over 30% extent remaining.
5. Habitat area for individual threatened species or population.
6. Area of endangered or vulnerable community.
7. Presence of individual invasive species.

3.2. Catchment Target Terrestrial Biodiversity 1

By 2020 there is an increase in native vegetation extent and vegetation does not decrease to less than 70% in less cleared subcatchments and 30% in over cleared subcatchments and no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.

Actions and who will be involved

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increase the area of private and public land to be managed for maintenance and improvement of native woody vegetation extent in subcatchments approaching either the 70% or 30% thresholds (Map 3).</td>
<td>Private landholders, Public land managers, Local Government, Office of Environment &amp; Heritage (OEH), Livestock Health and Pest Authorities (LHPA), Crown Lands, Community groups, Namoi CMA, OEH (public land)</td>
</tr>
<tr>
<td>2</td>
<td>Encourage planning Authorities to take account of this target and thresholds when approving any land use change.</td>
<td>Namoi CMA, Local Government, Department of Planning &amp; Infrastructure (DoP&amp;I)</td>
</tr>
<tr>
<td>3</td>
<td>Ensure that proximity to critical thresholds is considered in the negotiation of Property Vegetation Plans to avoid any reduction in woody vegetation extent in priority subcatchments.</td>
<td>Namoi CMA, Private landholders, Public land managers.</td>
</tr>
<tr>
<td>4</td>
<td>Increase the area of private and public land to be managed in accordance with the NSW State Biodiversity Strategy requirements (Map 5).</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Crown Lands, Community groups, Namoi CMA.</td>
</tr>
</tbody>
</table>
### 3.3. Catchment Target Terrestrial Biodiversity 2

**By 2020 maintain sustainable populations of a range of native fauna species by ensuring that no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.**

**Actions and who will be involved**

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete State and Transition models to explore invasive native scrub dynamics and interaction with woody vegetation thresholds.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>Increase the area of private and public land to be managed for maintenance of priority Regional Vegetation Community extent including improving condition (Map 4).</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Crown Lands, Community groups, Namoi CMA.</td>
<td>Namoi CMA (private land) OEH (public land)</td>
</tr>
<tr>
<td>Ensure that proximity to critical thresholds is considered in the negotiation of Property Vegetation Plans to avoid any reduction in Priority Regional Vegetation Community extent.</td>
<td>Namoi CMA, Private landholders.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>Complete State and Transition models for priority ecosystems that establish thresholds of regeneration capacity.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>Invest in education, extension and community engagement to facilitate improved understanding of the importance of woody vegetation to biodiversity.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>Increase the area of private and public land to be managed in accordance with the NSW State Biodiversity Strategy requirements where applicable to maintaining sustainable populations of a range of native fauna species (Map 5).</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Crown Lands, Community groups, Namoi CMA.</td>
<td>Namoi CMA (private land) OEH (public land)</td>
</tr>
<tr>
<td>Increase the area of private and public land to be managed for maintenance of priority Regional Vegetation Community extent including improving condition to maintain sustainable populations of a range of native fauna species (Map 4).</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Crown Lands, Community groups, Namoi CMA.</td>
<td>Namoi CMA (private land) OEH (public land)</td>
</tr>
<tr>
<td>Action</td>
<td>Who</td>
<td>Leader</td>
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<tr>
<td>--------</td>
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</tr>
<tr>
<td>12</td>
<td>Encourage planning Authorities to take account of this target and thresholds when approving any land use change.</td>
<td>Namoi CMA, Local Government, DoP&amp;I</td>
</tr>
<tr>
<td>13</td>
<td>Ensure that proximity to critical thresholds is considered in the negotiation of Property Vegetation Plans to avoid any reduction in Priority Regional Vegetation Community extent to maintain sustainable populations of a range of native fauna species (Map 4).</td>
<td>Namoi CMA, Private landholders.</td>
</tr>
<tr>
<td>14</td>
<td>Invest in education, extension and community engagement to facilitate improved understanding of the importance of regional vegetation communities to sustainable fauna populations.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
</tr>
</tbody>
</table>

### 3.4. Catchment Target Terrestrial Biodiversity 3

**By 2020 contribute to the recovery of priority viable threatened species, populations and communities.**

**Actions and who will be involved**

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Survey threatened species and draw linkages between Regional Vegetation Communities or other appropriate predictors of occurrence and species distribution.</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Namoi CMA, Community groups.</td>
</tr>
<tr>
<td>16</td>
<td>Apply resilience thinking concepts to individual species by exploring individual species thresholds regarding population sizes and habitat size.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups.</td>
</tr>
<tr>
<td>17</td>
<td>Decrease threatening processes where intervention will directly improve recovery in line with revised Priority Action Statements and Threat Abatement Plans.</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Community groups, Namoi CMA.</td>
</tr>
<tr>
<td>18</td>
<td>Increase the area of private and public land to be managed in accordance with the NSW State Biodiversity Strategy requirements (Map 5).</td>
<td>Private landholders, Public land managers, Local Government, OEH, LHPA, Crown Lands, Community groups, Namoi CMA.</td>
</tr>
<tr>
<td>19</td>
<td>Invest in education, extension and community engagement to facilitate improved understanding of viable threatened species, populations and ecological communities.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
</tr>
</tbody>
</table>
### 3.5. Catchment Target Terrestrial Biodiversity 4

By 2020 no new invasive species are established in the Catchment and the spread of key emerging invasive plants and animals is limited.

**Actions and who will be involved**

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Identify and assess level of threat of new invasive plants and animals entering or becoming established in the Catchment.</td>
<td>Local Government, OEH, LHPA, Community groups, Namoi CMA, Department of Primary Industry (DPI).</td>
</tr>
<tr>
<td>21</td>
<td>Establish or link with networks of land and water managers, invasive species experts and stakeholders to establish priority listings and early warning procedures for new invasive plants and animals entering the Catchment.</td>
<td>Local Government, OEH, LHPA, DPI, Crown Lands, Community groups, Namoi, CMA, Private landholders, other CMAs.</td>
</tr>
<tr>
<td>22</td>
<td>Increase the area of private and public land and water where strategic control measures are implemented to limit the spread of key emerging invasive plants and animals.</td>
<td>Private landholders, Public land managers, Local Government; DPI, Crown Lands, Namoi CMA, OEH.</td>
</tr>
<tr>
<td>23</td>
<td>Reduce widespread invasive species below critical levels at sites where threatened species or endangered ecological communities are impacted in areas where this is technically, logistically and economically feasible to do so (in line with Threat Abatement Plans &amp; NSW Biodiversity priorities for widespread weeds where applicable).</td>
<td>Private landholders, Public land managers, Local Government, DPI, Crown Lands, Namoi CMA, OEH.</td>
</tr>
<tr>
<td>24</td>
<td>Invest in education, extension and community engagement to facilitate improved understanding of potential new invasive species.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups</td>
</tr>
</tbody>
</table>
Map 3: Priority subregions for woody vegetation extent maintenance or improvement.
This map shows priority subcatchments based on proximity to thresholds based on 2012 mapping for the purpose of catchment and subcatchment scale planning. Dark green represents a priority for maintenance and restoration as the subcatchment is close to the 30% extent remaining threshold and light green represents a priority for maintenance as the subcatchment is at or above the 70% extent remaining threshold. This map is suitable for catchment and sub-catchment scale planning.
Regional Vegetation Communities (RVCs) consist of a combination of typical tree, shrub and groundcover species and includes grassland communities. Priorities are those RVCs coloured red and orange so as to avoid further RVCs dropping below the 30% extent remaining threshold identified in the CAP. This map is suitable for catchment and sub-catchment scale planning.
This draft map identifies areas that are generally in moderate to good condition; well connected with the surrounding landscape; part of a highly cleared, degraded and/or fragmented type of vegetation; and floristically distinct from other well-conserved types of vegetation. The map identifies the best remaining examples of native vegetation belonging to ecosystems that have experienced high rates of past clearing, degradation and/or fragmentation. The priority areas were identified by modelling at a state scale and the maps are designed to be viewed at a 1:250,000 scale. Site assessment is therefore required to confirm Priority Area status when allocating investment to sites ‘on-the-ground’. In addition to the Priority Areas identified on this map, OEH has other programs (such as threat abatement programs), which identify priority sites, and that also require investment. The four vegetation formations with the greatest amount of priority area in the Namoi Catchment are Semi-arid Woodland, Dry sclerophyll Forest, Grassy Woodland and Forested Wetlands.
### 3.6. Benefit Statement

<table>
<thead>
<tr>
<th>Plan/P等原因</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| **NSW State-wide natural resource management Targets** | 1 – By 2015 there is an increase in native vegetation extent and an improvement in native vegetation condition.  
3 – By 2015 there is an increase in recovery of threatened species, populations and ecological communities.  
4 – By 2015 there is a reduction in the impact of invasive species. | This CAP target and actions will contribute to the State-wide natural resource management Targets by: maintaining and increasing native vegetation extent; increasing the information base informing management; decreasing threatening processes where they are identified as critical to recovery; preventing incursion of new invasive species; limiting the spread of emerging invasive species and controlling invasive species where they impact on threatened species and endangered ecological communities. |
<p>| <strong>Draft NSW Biodiversity Strategy 2010.</strong> | This strategy outlines state scale priorities for native vegetation management for 15 broad ecosystems in NSW. It includes a map of priority areas of 9 ecosystem types of which 8 occur in Namoi CMA. The draft Strategy includes an action to incorporate the state-scale priorities into revised CAPs. | The terrestrial biodiversity targets and actions will contribute to the targets in the draft Biodiversity strategy by channelling investment towards the Priority Areas identified in the NSW Biodiversity Strategy. Highest priority will be given to where actions contribute to Draft NSW Biodiversity Strategy priority areas and other priorities under CAP targets. |
| <strong>Priority Action Statements</strong> | Critical management actions for priority state-wide species. | Priority action statements will be considered when setting priorities for surveying, building knowledge regarding endangered and vulnerable populations and prior to any interventions being carried out. |
| <strong>NSW Fox Threat Abatement Plan 2010</strong> | Objective 1. Ensure that fox control programmes undertaken for conservation purposes in New South Wales focus on those threatened species which are most likely to be impacted by fox predation. | This CAP target and actions will contribute to the NSW Fox Threat Abatement plan by focusing fox control into areas where viable threatened species are most likely to be impacted by predation. |</p>
<table>
<thead>
<tr>
<th>Plan/Policy</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW Invasive Species Plan</td>
<td>Goal 1 – Exclude</td>
<td>This CAP target and actions will contribute to the NSW Invasive Species Plan by identifying new threats to the Catchment, strategically supporting control of emerging invasive species and contributing to control of invasive species where they are a key threat to threatened species, populations and communities, and increasing the capacity of the community and all stakeholders to manage invasive species.</td>
</tr>
<tr>
<td></td>
<td>Goal 2 – Eradicate or contain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goal 3 – Effectively manage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goal 4 – Capacity building</td>
<td></td>
</tr>
<tr>
<td>Murray Darling Basin Native Fish</td>
<td>Control and manage alien fish species.</td>
<td>The strategic approach to invasive species outlined in this target will apply to alien fish and water plants as well as terrestrial animals and plants.</td>
</tr>
<tr>
<td>Strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSW Diffuse Source Water Pollution</td>
<td>Address priority problems: 1. Sediment levels 2. Nutrient levels 3.</td>
<td>Maintaining intact Regional Vegetation Communities will contribute to these targets by reducing nutrient, pathogen and sediment loads in runoff.</td>
</tr>
<tr>
<td>Strategy</td>
<td>Pathogen levels</td>
<td></td>
</tr>
<tr>
<td>Biodiversity Priorities for Widespread Weeds</td>
<td>1. Identify and prioritise management sites containing the biological assets at risk from widespread weeds 3. Improve the current understanding of weed impacts to biodiversity for each region in New South Wales by collating existing knowledge and highlighting areas that require further investigation</td>
<td>The strategic approach outlined in the invasive species target and the actions proposed will support all 3 objectives outlined in the Biodiversity Priorities for Widespread Weeds.</td>
</tr>
<tr>
<td>NSW National Parks Establishment Plan 2008</td>
<td>Themes for reservation priorities in regional landscapes (bioregions) established for the next decade.</td>
<td>The targets outlined will support the approach outlined in the plan including through the delivery of actions aimed at increasing the area managed to support and sustain biodiversity including public land.</td>
</tr>
<tr>
<td>Principles for Regional NRM Planning for Climate Change</td>
<td>Set of principles to ensure NRM plans can guide where carbon bio-sequestration opportunities occur in the landscape to ensure maximum co-benefits</td>
<td>The targets, actions and mapping will support the implementation of carbon bio-sequestration activities. They have been developed in light of climate change as a key driver of change and can guide identification of co-benefits.</td>
</tr>
<tr>
<td>Plan/Policy</td>
<td>Target</td>
<td>Benefit</td>
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</tr>
<tr>
<td>Strategic Regional Landuse plans</td>
<td>A range of objectives outlined including protecting biodiversity through strategic regional land use planning</td>
<td>The targets and actions outlined in the CAP support the protection of biodiversity through maintenance of native vegetation, control of invasive species, and a range of other targets under the land and water themes including maintenance of groundcover, and protection of riparian zones and surface water and groundwater availability.</td>
</tr>
</tbody>
</table>
| NSW DPI Biosecurity Strategy | 1: Prevent the entry of biosecurity threats into NSW  
2: Contain and eradicate biosecurity threats before they become established and spread in NSW  
3: Effectively manage biosecurity problems to minimise their impacts in NSW  
4: Ensure cooperation between NSW DPI and other agencies, industry and the community to manage biosecurity threats and problems | This CAP target and actions will contribute to the DPI Biosecurity Strategy by identifying new threats to the Catchment, strategically supporting control of emerging biosecurity threats and contributing to control of biosecurity threats (particularly invasive species) where they are a key threat to threatened species, populations and communities, and increasing the capacity of the community and all stakeholders to manage invasive species. |
| National Biodiversity Strategy | 1. Engaging all Australians  
2. Building ecosystem resilience in a changing climate  
3. Getting measurable results | The targets outlined in this CAP will assist in building ecosystem resilience and deliver on the 3 priorities for action through: maintaining and increasing native vegetation extent; managing a diversity of vegetation types; increasing the information base informing management; decreasing threatened processes where they are identified as critical to recovery; and managing invasive species including preventing incursion of new invasive species and limiting the spread of emerging invasive species. |
<table>
<thead>
<tr>
<th>Plan/Policy</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| **National Wildlife Corridors Plan** | 1. Protect, maintain and restore native habitats and ecosystems and their critical processes and functions  
2. Protect natural stores of carbon in native ecosystems to minimise greenhouse gas emissions  
3. Enhance the resilience of Australia’s landscapes and their adaptability to climate change  
4. Support the global and national movement of animals  
5. Assist in managing and protecting Australia’s iconic landscapes and Indigenous and non-Indigenous cultures and heritage  
6. Increase community participation in wildlife corridors and connectivity conservation | The Biodiversity targets outlined in the CAP, along with actions relevant for both private and public land, will assist in delivering on these objectives for the Namoi Catchment, as part of the national approach to wildlife corridors. CAP maps can assist in identifying areas and links that can be nominated for the plan in future. |
| **Policy for sustainable agriculture in NSW** | **Objective 4.** Agriculture making a beneficial contribution to the protection and management of the State’s natural heritage and biodiversity. | The targets and actions outlined sustainable and profitable agriculture through the maintenance of biodiversity to ensure ongoing ecosystem services are maintained and by supporting collaborative efforts on farms to manage biodiversity. |
| **NSW 2021**                      | **Goal 22.** Protect our natural environment.  
**Goal 23.** Increase opportunities for people to look after their own neighbourhoods and environments | This CAP target and actions will contribute to the NSW 2021 goals by supporting collaborative action to: maintain and increase native vegetation extent; increase the information base informing management; decrease threatening processes where they are identified as critical to recovery; prevent incursion of new invasive species; limit the spread of emerging invasive species and control invasive species where they impact on threatened species and endangered ecological communities. |
4. Land

Definition: “healthy soils and functional landscapes that are managed in a way that maintains optimal choices for future generations”.

The functional importance of healthy soils is illustrated in Figure 4.

![Figure 4: Ecosystem services provided by healthy soils (after DPI Victoria)](image)

There is no asset in the Namoi Catchment that can be considered to be independent of the benefits of healthy soils. Soils play a critical role in the function of landscapes, underpin social activity (places to live), economic activity (provide resource base) and environmental services such as water quantity and quality, nutrient cycling, storage of organic matter and in particular carbon, and are a physical substrate for plant growth.

A conceptual model of how soil properties contribute to soil health is illustrated in Figure 5. An ‘arrow to’ represents a contribution to another asset. Organic matter, soil structure and soil type are considered the most important properties of soil health as they contribute to most other elements.

Detailed information on soil type, condition and thresholds support the conceptual model result in Figure 5 in that soil structure and organic matter play a critical role for soil health in the Catchment. Overwhelming evidence points to the maintenance or improvement of groundcover as an intervention that would have significant impact in relation to soil organic matter, soil carbon, soil structure, soil water holding capacity, soil permeability and nutrient cycling. Groundcover is taken to mean anything that covers the ground, not just living plants. Rocks, gravel, leaf litter, logs etc can contribute many of the same functions as living plants in relation to soil health.

The specifics of how climate change is likely to impact the Catchment suggest that the improvement and maintenance of ground cover will be very important. Due to climatic changes, it may be more difficult to establish or maintain in future. A buffer of groundcover established now may be critical to future Catchment function therefore a focus on establishing and improving groundcover across the entirety of the Catchment is an issue of overwhelming importance to the landscape function.
Figure 5: Conceptual model – Contribution of soil properties to overall health.
It is possible to increase or decrease groundcover and organic matter in soils readily most of the time. A wide range of land management practices and ensuring that land is being managed within its capability can influence this. Any decrease in groundcover means that it is more likely that a threshold will be crossed that can impact on soil sodicity, soil structure, permeability or water holding capacity. This may mean that a return to the previous state becomes impossible due to the effects on plant growth and soil biological function.

Salinity impacts may still act as a major shock to the Namoi Catchment. Salinity projections due to climate change are highly uncertain ranging from little impact due to reductions in rainfall, through to a worsening scenario due to increased movement and subsequent isolation of salts. For this reason, a key priority in the Catchment is to maintain engagement and knowledge regarding soil salinity within vulnerable land systems amongst the Catchment Community and natural resource managers in the Namoi.

For more information including the full detail of the analysis of system function, trends, drivers and thresholds for land, and other background information, refer to Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

One Catchment Target for land has been developed based on the critical threshold identified. This target is designed to prevent this threshold being crossed in the Namoi Catchment. Actions 25-30 describe broad activities that a range of partners can undertake to achieve the target set and thus maintain healthy landscapes in the Namoi Catchment.
4.1. Land Critical threshold

1. Groundcover is at least 70%.

4.2. Catchment Target Land 1

By 2020 there is an improvement in soil health as measured by an increase in groundcover at the paddock, sub-catchment and catchment scales.

Actions and who will be involved

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>DPI, Namoi CMA, OEH, Research organisations, Community groups, Crown Lands.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>26</td>
<td>DPI, Namoi CMA, OEH, Research organisations, Community groups, Industry groups, Crown Lands, Private landholders</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>27</td>
<td>Local Government, OEH, LHPA, Namoi CMA, DPI, Crown Lands, Community groups.</td>
<td>DPI</td>
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<td>29</td>
<td>DPI, Namoi CMA, OEH, Research organisations, Crown Lands, Community groups.</td>
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</tr>
<tr>
<td>30</td>
<td>DPI, Namoi CMA, OEH, Research organisations, Crown Lands, Community groups</td>
<td>Namoi CMA</td>
</tr>
</tbody>
</table>
Map 6: Land management units in the Namoi Catchment.
These Land Management Units contain soil types that have been identified as priorities for protection (by increasing groundcover through a range of land management approaches) due to soil sodicity. These priorities were established prior to catchment scale groundcover baseline mapping to identify priority areas for intervention based on proximity to the 70% groundcover threshold. Within these priority land management units, on-ground interventions can now be targeted further based on groundcover mapping at the catchment and sub-catchment scale.
Map 8: Catchment groundcover levels for 2011
This shows the median groundcover levels across the catchment, based on data gathered remotely for each season of the year and aggregated into an annual figure. It should be noted that 2011 was a particular wet year, so the groundcover levels were higher than had been observed during previous drier years as a result.
### 4.3. Benefit Statement

<table>
<thead>
<tr>
<th>Plan/Policy</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW State-wide natural resource management Targets</td>
<td>10 – By 2015 there is an improvement in soil condition.</td>
<td>This CAP target and actions will contribute to the State-wide natural resource management Targets by improving soil condition based on the impact of increased ground cover and its flow on effects to soil organic carbon, soil structure, water holding capacity, nutrient cycling and permeability.</td>
</tr>
<tr>
<td>Draft NSW Soil Policy</td>
<td>Objective 1: To improve community awareness and understanding of soils, to enhance commitment to better soil and land management. Objective 4: To design and implement institutional arrangements for soil management in NSW that encourage and support sustainable soil management and discourage practices that damage soil, in order to protect the principal functions of soil.</td>
<td>This CAP target and actions will contribute to the Soil Draft Policy by improving understanding and awareness of soil conservation, the role of groundcover and the risks associated with inappropriate soils’ management in a variable climate and through direct investment into changing soil and land management practices that will contribute to improved soil health and function.</td>
</tr>
<tr>
<td>NSW Diffuse Source Water Pollution Strategy</td>
<td>Address priority problems: 1. Sediment levels 2. Nutrient levels 3. Pathogen levels</td>
<td>Maintaining groundcover levels will contribute to these targets by reducing nutrient, pathogen and sediment loads in runoff.</td>
</tr>
<tr>
<td>NSW Salinity Strategy</td>
<td>Interim End of Valley Salinity Targets for 2010 (EC).</td>
<td>Maintaining groundcover levels will assist with reducing salinity levels by reducing saline discharge and maintaining hydrological function.</td>
</tr>
<tr>
<td>Principles for Regional NRM Planning for Climate Change</td>
<td>Set of principles to ensure NRM plans can guide where carbon bio-sequestration opportunities occur in the landscape to ensure maximum co-benefits</td>
<td>This CAP target and actions will: contribute to climate change responses by increased ground cover and its flow on effects to soil organic carbon, soil structure, water holding capacity, nutrient cycling and permeability; and support the implementation of carbon bio-sequestration activities in light of climate change as a key driver of change.</td>
</tr>
<tr>
<td>Plan/Policy</td>
<td>Target</td>
<td>Benefit</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Strategic Regional Landuse plans</td>
<td>A range of objectives outlined including protecting strategic agricultural land through strategic regional land use planning</td>
<td>The targets and actions outlined in the CAP support the protection of productive agricultural land, particularly through the maintenance of groundcover resulting in associated benefits to soil health and productivity.</td>
</tr>
<tr>
<td>Policy for sustainable agriculture in NSW</td>
<td>Objective 1. Profitable agricultural industries producing high quality agricultural products in an ecologically sustainable manner that meets consumer needs, and based on a better understanding of the relationship between product prices and production costs, including environmental costs. Objective 2. Agricultural land protected and managed for sustainable agricultural use with agricultural activity contributing to its protection and enhancement.</td>
<td>The targets and actions outlined in the CAP support the objectives designed to maintain sustainable and profitable agriculture through the maintenance of groundcover resulting in associated benefits to soil health and productivity, management of native vegetation to ensure ongoing ecosystem services, and protection of surface and groundwater assets.</td>
</tr>
<tr>
<td>NSW 2021</td>
<td>Goal 22. Protect our natural environment. Goal 23. Increase opportunities for people to look after their own neighborhoods and environments</td>
<td>This CAP target and actions will contribute to the NSW 2021 goals by supporting collaborative action to improve soil condition based on the impact of increased ground cover and its flow on effects to soil organic carbon, soil structure, water holding capacity, nutrient cycling and permeability.</td>
</tr>
</tbody>
</table>
5. Water

Definition: “Surface and groundwater systems consist of the riverine zone made up of stream bed and banks, wetlands and floodplains together with aquifers, both confined and unconfined. It also includes riparian vegetation, aquatic biota and water quality and covers access to water, both for people and environmental values”.

Water plays a critical role in the function of landscapes as it underpins social activity (recreation, human needs), economic activity (provide resource base), and supports biodiversity. Groundwater is one of the most poorly understood biophysical assets in the Namoi Catchment, despite the fact that the Namoi Catchment is one of the better understood across Australia. Difficulty was experienced in finding conceptual models that helped to explain how the basics of water quantity and quality function for people and ecosystem outcomes in the Namoi, particularly in a context relevant to individual aquifers.

The interactions of the various assets of the surface and groundwater systems are depicted in Figure 6. An ‘arrow to’ represents a contribution to another asset. Surface water quality and river geomorphology contribute to most other water assets. A range of CAP targets and actions all contribute to delivering improved water quality for the Namoi Catchment.

Detailed information that would clearly and unequivocally support the findings of the conceptual model relating to the critical functions of water was not able to be sourced. Thresholds were highly variable, and only a few could be sourced from the literature. It should also be noted that many of the thresholds relating to water assets have already been crossed. For example, a threshold is associated with a weir or dam being built on a river. The Namoi, Manilla and Peel Rivers all have major dams and the Namoi also has many weirs along its length. Another threshold is the presence and absence of weed species such as lippia. Where lippia is present, this threshold has been crossed.

The threshold of surface water flow at 66% of its natural regime including a sensitivity to natural wetting and drying cycles was sourced from the literature. For this reason it has been carried forward into the CAP. Similarly, the threshold of geomorphic condition being good (in comparison to a benchmark condition) is also underpinning of most assets and has been carried forward into the CAP. Priorities for floodplain management intervention have also been identified as actions for investment due to the role that floodplains play in geomorphic condition and natural flow, frequency and duration.

Thresholds regarding riparian vegetation will also be considered in the CAP due to the relationships between riparian vegetation, riparian buffering, water quality, geomorphic condition, water quality and aquatic species.

Groundwater thresholds have been set relating to depth to groundwater in relation to groundwater dependent ecosystems and quality not changing in a way that lessens beneficial uses. It is important to note that the original threshold relating to depth to groundwater for groundwater dependant ecosystems was drawn from the available literature but was not specific to the Namoi Catchment and thus required further specific investigation and adjustment based on local conditions. Based on further research and analysis of more recent and localised information, this threshold has been revised as part of this 2013 update.
A particularly important threshold that applies to alluvial aquifers is that the aquifer is never drawn down below historical maximum drawdown. In this way any further compaction or disconnection can be avoided. It should be noted that this threshold is a good example of where buffering might need to be applied. If aquifers are drawn down to historical maximum drawdown by extraction, which is then followed by an extended dry period, aquifers may inadvertently drop below the historical low level.

Wetlands were not identified as a specific asset in the water theme (unlike the biodiversity theme where wetlands are identified as an asset). Instead they have been included as part of the floodplain, local or in stream flows. Wetlands could be considered in a similar light to threatened species in the biodiversity theme. That is, if all other water assets are working as they should, wetlands will be functioning properly. The major threshold that applies to wetlands is presence or absence. Wetlands need to remain in the landscape and not be drained, dammed or otherwise physically removed. It should be noted that in relation to wetlands, the Regional Vegetation Community targets under the Biodiversity theme, and the groundcover targets under the Land theme, will also make significant contributions to their protection and maintenance.

Water is a point of vulnerability in the Namoi Catchment with much of the economy and wellbeing of people directly related to the availability of water and continued access to it for irrigation and human needs. There is likely to be a series of shocks to the water system in the Catchment. These include reductions in supply from policy change (e.g. Murray Darling Basin Plan), reductions in availability at times due to climate variability/change (for example, extended hydrological droughts), land use change (for example extractive industry use of water). This may be further exacerbated by a greater need for water for agriculture, industry and people due to increasing evapotranspiration rates brought about by a warmer climate.

Due to the reliance of the Namoi Catchment on its water resources, exceeding critical thresholds for water assets has the potential to cause significant changes right across the entire Catchment. Unfortunately, solid and quantitative information regarding thresholds for water assets in the Catchment proved difficult to source from the currently available information. A major focus for the future is to establish where the thresholds might lie in relation to using both ground and surface water such that these systems are not pushed into undesirable states. The revision of the threshold for depth to groundwater for groundwater dependant ecosystems, along with further analysis and mapping of surface water flow and groundwater transition zones undertaken since 2010 is a step in this process. Further efforts to refine our understanding of thresholds in relation to water assets will be ongoing.

For more information including the full detail of the analysis of system function, trends, drivers and thresholds for water, and other background information, refer to Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

Three Catchment Targets for water have been developed based on the seven thresholds that were able to be identified. These targets are designed to prevent these critical thresholds from being crossed in the Namoi Catchment. Actions 31-52 describe broad activities a range of partners can undertake to achieve the targets set and thus maintain water assets in the Namoi Catchment.
Figure 6: Conceptual model – How water assets contribute to overall water function
5.1. Water Critical thresholds

1. Surface water flow quantity is at 66% of natural (pre-development) condition with a sensitivity to natural frequency and duration.
2. Geomorphic condition is good (against benchmark condition).
3. Recruitment of riparian vegetation is higher than attrition of individual trees, shrubs or groundcover species.
4. Agricultural and urban supply aquifers do not cross into lower levels of beneficial use regarding quality.
5. Alluvial aquifers are not drawn down below long term historical maximum drawdown levels.
6. Groundwater is within 10m of surface where there are identified groundwater dependent ecosystems.
7. Wetland is not drained, dammed or otherwise physically modified.

5.2. Catchment Target Water 1

By 2020 there is an improvement in the condition of those riverine ecosystems that have not crossed defined geomorphic thresholds as at the 2010 baseline.

Actions and who will be involved

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Invest in data collection and analysis to establish where sub-catchment extraction is over 33% of natural flow (Map 11).</td>
<td>Namoi CMA, NSW Office of Water (NOW), DPI.</td>
</tr>
<tr>
<td>32</td>
<td>Support restructure, water efficiency programs, water planning and implementation programs and investment in reductions in water entitlement and allocations where extraction is over 33% of natural flow on a sub-catchment basis (Map 10).</td>
<td>Namoi CMA, NOW, DPI, Community groups.</td>
</tr>
<tr>
<td>33</td>
<td>Develop improved understanding of the role of farm dams in intercepting water from the Catchment.</td>
<td>Namoi CMA, NOW, DPI, Community groups.</td>
</tr>
<tr>
<td>34</td>
<td>Build adaptive capacity to reduce reliance on surface water sources that are unlikely to remain reliable under climate variability scenarios or need to be reduced to meet river health objectives.</td>
<td>Local Government, DPI, Namoi CMA, OEH, NOW, Community services agencies.</td>
</tr>
<tr>
<td>Action</td>
<td>Who</td>
<td>Leader</td>
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<tr>
<td>35</td>
<td>Increase the area of river reach that is managed to maintain or recover geomorphic condition where recovery potential is high or geomorphic condition is good against benchmark condition (Map 9).</td>
<td>Private landholders, Public land managers, Local Government, DPI, Namoi CMA, OEH, Research organisations, LHPA.</td>
</tr>
<tr>
<td>36</td>
<td>Identify areas of reach that are in good geomorphic condition that are acting as key refugia and prioritise for protection (Map 9).</td>
<td>Private landholders, Public land managers, Local Government, DPI, Namoi CMA, OEH, Research organisations, LHPA.</td>
</tr>
<tr>
<td>37</td>
<td>Increase the area of river reach that is managed to maintain and improve riparian vegetation condition and extent.</td>
<td>Private landholders, Public land managers, Local Government, DPI, Namoi CMA, OEH, LHPA.</td>
</tr>
<tr>
<td>38</td>
<td>Invest in implementing the actions of the Wee Waa Floodplain plan as a NSW Office of Water priority for floodplain functional contributions to natural flow, duration and frequency (Map 12).</td>
<td>Namoi CMA, NOW, DPI.</td>
</tr>
<tr>
<td>39</td>
<td>Support NSW Office of Water valley-wide floodplain planning as a priority in improving floodplains function contribution to natural flow, duration and frequency (Map 9).</td>
<td>Namoi CMA, NOW, DPI.</td>
</tr>
<tr>
<td>40</td>
<td>Invest in education, extension and community engagement to facilitate improved understanding of riparian health thresholds and priorities.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups.</td>
</tr>
</tbody>
</table>
### 5.3. Catchment Target Water 2

**By 2020 there is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses.**

**Actions and who will be involved**

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Invest in understanding of groundwater aquifers, recharge and likely impacts of climate variability including supporting the Namoi Water Study (Map 14).</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations, Industry groups.</td>
</tr>
<tr>
<td>42</td>
<td>Model aquifers across the Catchment and map those areas of the Catchment vulnerable to system changes such that groundwater supplies will become unreliable due to climate variability or impacts of resource management.</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations, Industry groups.</td>
</tr>
<tr>
<td>43</td>
<td>Model aquifers across the Catchment to identify those people and industries that are currently relying on possibly disconnected aquifers that have no likelihood of recharge.</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations, Industry groups.</td>
</tr>
<tr>
<td>44</td>
<td>Build adaptive capacity to reduce reliance on disconnected aquifers or those aquifers unlikely to remain reliable under climate variability scenarios.</td>
<td>Local Government, DPI, Namoi CMA, OEH, NOW, Community services agencies, Industry groups.</td>
</tr>
<tr>
<td>45</td>
<td>Investigate and support improved management of semi-connected (either to surface water or other aquifers) alluvial aquifers to ensure that extraction does not cause disconnection.</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations, Industry groups.</td>
</tr>
<tr>
<td>46</td>
<td>Invest in understanding the suggested 30m threshold relating to groundwater dependent ecosystems, particularly terrestrial vegetation (Map 15).</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations, Industry groups.</td>
</tr>
<tr>
<td>47</td>
<td>Invest in education, extension and community engagement to facilitate improved understanding of groundwater health thresholds and priorities.</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
</tr>
</tbody>
</table>
5.4. Catchment Target Water 3

By 2020 there is an improvement in the condition of regionally important wetlands and the extent of those wetlands is maintained.

Actions and who will be involved

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 Invest in data collection and analysis to establish where sub-catchment extraction is over 33% of natural flow and impacting on wetland health (Map 11).</td>
<td>Namoi CMA, NOW, DPI, OEH, Industry groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>49 Support restructure, water efficiency programs, water planning and implementation programs and investment in reductions in water entitlement and allocations where extraction is over 33% of natural flow on a sub-catchment basis and impacting on wetland health (Map 10).</td>
<td>Namoi CMA, NOW, DPI, OEH, Community groups, Industry groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>50 Invest in implementing the actions of the Wee Waa Floodplain plan as a priority for floodplain functional contributions to wetland health (Map 12).</td>
<td>Namoi CMA, NOW, DPI, OEH.</td>
<td>NSW Office of Water</td>
</tr>
<tr>
<td>51 Support valley-wide floodplain planning as a priority in improving floodplains function contribution to wetland health (Map 13).</td>
<td>Namoi CMA, NOW, DPI, OEH, Industry groups.</td>
<td>NSW Office of Water</td>
</tr>
<tr>
<td>52 Invest in education, extension and community engagement to facilitate improved management and understanding of the importance of wetlands (Map 16).</td>
<td>Namoi CMA, OEH, Research organisations, Community groups, Industry groups.</td>
<td>Namoi CMA</td>
</tr>
</tbody>
</table>
Map 9: Geomorphic Condition as mapped by NSW Office of Water

Green areas are those areas of river reach likely to be in good geomorphic condition and thus a priority for management.
Map 10: Risk to instream value as described by NSW Office of Water
Red areas are those areas that are in good geomorphic condition where there is a risk from disturbance, physical form or extraction.
Map 11: Surface water flow assessment for the Namoi
River reaches in red are considered to be under the 66% natural flow threshold based on available flow and extraction data and therefore are a priority for future water planning.
Map 12: NSW Office of Water Floodplain plan priorities for investment in floodplain function as a contribution to flow including frequency and duration
Map 13: NSW Office of Water proposed area for valley-wide floodplain planning activity
Map 14: Groundwater Management Areas of the Namoi Catchment
Map 15: Groundwater dependent ecosystems of the Namoi Catchment

Namoi Catchment Groundwater Dependant Ecosystems

Legend

<table>
<thead>
<tr>
<th>Dependence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Map Created by: Lethbridge - Namoi OMA - 09/2010
Printed 1/2011

NSW Catchment Management Authority

Disclaimer: Data has been extracted from digitised field information.
The State, NSW and the Namoi Catchment Management Authority
and its employees, officers, agents, or servants accept no
responsibility for the result of any actions taken on the decisions
made on the basis of the information, or for any errors, omission or
omissions contained in this map.

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Map 16: Wetland extent in the Namoi Catchment
## 5.5. Benefit Statement

<table>
<thead>
<tr>
<th>Plan/Policy</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW State-wide natural resource management Targets</td>
<td>5 – By 2015 there is an improvement the condition of riverine ecosystems.</td>
<td>This CAP target and actions will contribute to the State-wide natural resource management Targets by improving riparian condition including ecology, geomorphology and vegetation. This CAP target and actions will contribute to the State-wide natural resource management Targets by improving the ability of groundwater systems to support dependent ecosystems and human uses in the long term.</td>
</tr>
<tr>
<td>Water Sharing Plans</td>
<td>Various entitlement and allocation rules</td>
<td>Support alignment with sustainable yield principles and trading rules where appropriate.</td>
</tr>
<tr>
<td>NSW River Flow &amp; Water Quality Objectives</td>
<td>Namoi River water Quality and River Flow Objectives Various surface water quality standards</td>
<td>The Targets and actions outlined in this CAP will help to deliver on the Namoi River water Quality and River Flow Objectives outlined in the NSW Water Quality Objectives by maintaining water flow and improving water quality through a range of interventions.</td>
</tr>
<tr>
<td>NSW Groundwater Framework Policy</td>
<td>Slow and halt, or reverse any degradation in groundwater resources. Ensure long term sustainability of the systems biophysical characteristics. Maintain the full range of beneficial uses of these resources. Maximise economic benefit to the Region, State and Nation</td>
<td>The targets and actions outlined in this CAP are designed to prevent crossing critical thresholds in groundwater and maintain hydrological processes and so will help to deliver on the NSW State Groundwater Framework Policy objectives.</td>
</tr>
<tr>
<td>Diffuse Source Water Pollution strategy</td>
<td>Address priority problems: 1. Sediment levels 2. Nutrient levels 3. Pathogen levels</td>
<td>The water targets and actions will contribute to the DSWP strategy by reducing the risk for increased sediment and bed load, as well as sediment-attached nutrients entering the river as a result of accelerated erosion.</td>
</tr>
<tr>
<td>Plan/Policy</td>
<td>Target</td>
<td>Benefit</td>
</tr>
<tr>
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<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Basin Salinity Management Strategy</td>
<td>Maintaining the water quality of the shared water resources of the Murray and Darling Rivers. Controlling the rise in salt loads in all tributary rivers of the Murray-Darling Basin. Controlling land degradation and protecting important terrestrial ecosystems, productive farm land, cultural heritage and built infrastructure.</td>
<td>The Targets and actions outlined in this CAP will contribute to the targets in the Basin Salinity Management Strategy by maintaining water flow and quality</td>
</tr>
<tr>
<td>NSW Salinity Strategy</td>
<td>Interim End of Valley Salinity Targets for 2010 (EC).</td>
<td>Maintaining water flow and maintaining hydrological function will assist with reducing salinity levels and thus contribute to achieving end of valley salinity targets.</td>
</tr>
<tr>
<td>Draft NSW Biodiversity Strategy</td>
<td>13,425 ha of Forested Wetland are identified as high priority for the Namoi Catchment under this draft strategy.</td>
<td>The water targets and actions will contribute to the targets in the draft Biodiversity strategy by channelling investment towards the priority sites including Forested wetlands.</td>
</tr>
<tr>
<td>State Wetlands Policy</td>
<td>12 principles outlining decision making and approach to provide for the protection, ecologically sustainable use and management of NSW wetlands</td>
<td>The water targets and actions outlined will contribute to these targets and principles by ensuring important wetlands are protected, and the hydrologic regimes which sustain them are maintained across the Catchment.</td>
</tr>
<tr>
<td>Draft Fisheries Priority Action Statement and Recovery Plans</td>
<td>Critical management actions for priority threatened fish species and aquatic communities.</td>
<td>Priority action statements will be considered when setting priorities for surveying, building knowledge regarding endangered and vulnerable populations and prior to any interventions being carried out.</td>
</tr>
<tr>
<td>Murray Darling Native Fish Strategy</td>
<td>1. repair and protect key components of aquatic and riparian habitats; 2. rehabilitate and protect the natural functioning of wetlands and floodplain habitats; 3. improve key aspects of water quality that affect native fish; 4. modify flow regulation practices;</td>
<td>The targets and actions outlined in the CAP will support these objectives through maintenance of flow regimes, protection and management of river reaches in good condition, restoration of riparian vegetation and wetlands along other land based actions such as maintenance of groundcover which will improve water and habitat quality.</td>
</tr>
<tr>
<td>Plan/Policy</td>
<td>Target</td>
<td>Benefit</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Policy for sustainable agriculture in NSW</td>
<td>Objective 3. Agriculture as an efficient and productive user of water contributing to the achievement of water quality and environmental flow objectives.</td>
<td>The targets and actions outlined in the CAP support the objectives designed to maintain sustainable and profitable agriculture through the maintenance of groundcover resulting in associated benefits to soil health and productivity, management of biodiversity to ensure ongoing ecosystem services, and protection of surface and groundwater assets.</td>
</tr>
<tr>
<td>National Water Initiative</td>
<td>Objectives are 1. Prepare water plans with provision for the environment 2. Deal with over-allocated or stressed water systems 4. Expand the trade in water 6. Meet and manage urban water demands.</td>
<td>The targets and actions outlined in the CAP will assist in delivering on these NWI objectives through maintaining and restoring rivers and wetlands, ensuring enough water flow in rivers, managing surrounding land use to improve water quality and informing future water planning initiatives.</td>
</tr>
<tr>
<td>NSW Groundwater Dependant Ecosystem policy</td>
<td>5 management principles to protect and manage groundwater dependent ecosystems to maintain or restore ecological processes and biodiversity</td>
<td>The targets and actions in the CAP will support the management and protection of groundwater dependent ecosystems by identifying where they occur, and maintaining the hydrology that sustains them.</td>
</tr>
<tr>
<td>NSW groundwater quality protection policy</td>
<td>Principles to encourage ecologically sustainable management of groundwater resources in NSW</td>
<td>The targets and actions in the CAP will support land and water management and protection that will benefit groundwater quality though maintenance of hydrologic regimes and supporting management to avoid depletion of aquifers so quality is maintained.</td>
</tr>
<tr>
<td>Plan/Policy</td>
<td>Target</td>
<td>Benefit</td>
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</tbody>
</table>
| Water for the future | Key priorities: 1. Taking action on climate change  
2. Using water wisely  
3. Securing water supplies  
4. Supporting healthy rivers | The targets and actions outlined in the CAP will support these objectives through maintenance of flow regimes, protection and management of river reaches in good condition, restoration of riparian vegetation and wetlands, improved management of groundwater, working with stakeholders to maximise efficient use along with other land based actions such as maintenance of groundcover which will improve water quality. |
| NSW 2021         | Goal 22. Protect our natural environment.  
Goal 23. Increase opportunities for people to look after their own neighborhoods and environments | This CAP target and actions will contribute to the NSW 2021 goals by supporting collaborative action to improve riparian condition including ecology, geomorphology and vegetation and to improve the ability of groundwater systems to support dependent ecosystems and human uses in the long term. |
6. People

Defined as “the social and economic elements of the Catchment in relation to how they are underpinned by natural resources, an asset for increasing resilience and a driver of system changes”.

This theme relates particularly to the Social, Human, Manufactured and Financial Capitals in the context of their relevance to Natural Resource Management. These are defined below;

**Human Capital** - the value of people’s knowledge, skills, motivations and health. Human Capital attempts to capture the skills and assets that an individual can contribute to the Catchment.

**Social Capital** - the value of how people interact with one another, whether in a community sense or within the institutional arrangements and governance of the Catchment.

**Manufactured Capital** - the infrastructure and built assets of the Catchment including roads, buildings, the infrastructure of cities less the people and their relationships.

**Financial capital** - the money/economic functions of the Catchment. It is important to note that it has no real value in itself, but is a driver and a reflection of Human, Social and Manufactured Capitals.

Figure 7 illustrates the conceptual model of the five types of capital from which people derive the goods and services they need to improve the quality of their lives. The five capitals were initially used as the framework to assess and understand the resilience of people and communities in the Namoi Catchment. Subsequent work has focussed more on understanding what contributes to adaptive capacity and wellbeing for people and communities.

*Figure 7: The ‘five capitals’ (after Forum for the future – http://www.forumforthefuture.org/projects/the-five-capitalson)*
The ways in which the natural resource base underpins people, industries and communities has been considered. The ways in which trends in natural resources would impact on people has also been investigated.

Declines in the biodiversity assets of ecosystem connectivity, woody vegetation cover, wetlands, species populations and intact native vegetation communities would result in the following:

- reduced farm profitability
- impacts on aesthetics
- creation of greater regulatory pressure
- greater peer pressure
- threats to the identity of Aboriginal communities and other Catchment communities
- reduced options or choices for future generations
- reduced tourism opportunities
- impacts on spirituality
- a general decline in social and emotional wellbeing.

The degree to which any one of these outcomes might be realised is highly variable would depend on the particularities of farming and grazing systems being employed and an individuals’ sensitivity to loss.

The general downward trend in surface and groundwater assets is a cause of concern as it could ultimately result in:

- no drinking water
- no irrigation
- loss of tourism
- loss of recreation opportunity
- reduced habitation possibilities
- collapse of towns and cities due to lack of water
- reduced economic activity
- no water for industry
- collapse of social cohesion due to water scarcity
- loss of identity
- impact on spirituality
- a general decline in social and emotional wellbeing.

It is important to note that people may become disengaged or disempowered when confronted by a significant number of downward trends relating to critical resources such as water. Thus maintaining capacity and engagement in this situation is extremely important.
Soils are considered to be generally underpinning of all activity in the Catchment. Given that soils information is presented based on soil type that relates to productivity, the community and sectoral implications can be quite tightly and quantitatively tied to trend information. It should also be noted that most soils trends are stable or increasing.

Some very clear issues emerged from the expert workshop process, resilience assessment and consultation processes. These are:

- People of the Catchment are significantly reliant on their natural resources for economic activity, wellbeing and social cohesion.
- Most of the natural resources are declining in both condition and availability indicating key sources of vulnerability across the Catchment.
- People asset trends are variable and particularities relating to each individual’s situation are important to how the people systems function. Thus a detailed systems model of the people system is challenging to develop as it is likely to be so complex that it is meaningless or almost immediately out of date the moment it is completed.
- Dependence on agriculture within the Catchment is very high, and agriculture is vulnerable to declines in soil health and water quality and availability as well as commodity price and policy shocks. There are likely to be changes in soil health and water quality and availability related to the slow driver of climate variability. Consequently a focus on adaptive capacity in agriculture and related industries will serve the Catchment well.
- An overwhelming take home message from the literature reviewed was the importance of a ‘sense of place’ to people and societies.

Assessment and benchmarking of social wellbeing and adaptive capacity for the Namoi undertaken in 2012 found that members of the Namoi Community perceive themselves as having high levels of adaptive capacity, social capital and wellbeing. There was less agreement regarding the adequacy of local leadership. Health services, education services and community social life respectively were identified as the key drivers underpinning the decision to stay within rural communities. Analysis has shown that there is a possible threshold effect in relation to wellbeing and adaptive capacity which warrants further investigation. Importantly it has also shown that individual levels of adaptive capacity and wellbeing are good predictors for community level adaptive capacity and wellbeing.

Key findings emerging from the survey of the Namoi Catchment community (when compared to other regional areas) were:
- The Catchment community of the Namoi were more likely (of several regions studied), to be satisfied about their future security and feel that they have a strong and viable future.
- The Namoi community however was less likely to agree that our community has all the expertise that it needs.
- Water was an important theme, which reflects the role water plays in the Namoi Catchment. In particular, people felt that community and industry rely on access to groundwater and that the quality and quantity of groundwater available is sufficient for their own needs. People surveyed felt that water for the environment is equally as important as provision of water for agriculture, towns and industry and that water allocation should change so enough water is available for the natural environment.
- There was also strong support for protecting and managing the remaining wetlands in the region.

Further work has been undertaken to look at the three sub-regions, or socio-ecological systems of the Namoi Catchment, consisting of the Tablelands, Slopes and Plains. A first step preliminary resilience assessment at this finer scale has been completed in collaboration with the Community Reference Panels based in each region. See Map 18 for an outline of the three sub-
regions across the Namoi which show the location of the Tablelands, Slopes and Plains socio-ecological systems. This analysis is ongoing, and will continue to be refined and developed as part of ongoing adaptive management. Based on the work completed to date however, there are some important and distinctive differences between the three sub-regions of the Catchment in terms of the natural resources and socio-economics which have a profound influence on and are influenced by those communities.

The Tablelands region is distinctive with a smaller and stable population size, less concern about availability of water and some concerns expressed through community consultation regarding potential migration into the region. The Slopes region is distinguished by a large and increasing population size particularly around Tamworth, a more diverse land use profile, greater diversity in the community with a major centre (Tamworth) at its heart, and thus a greater diversity of landuse, agricultural and other business activities. The Plains region is notable for a decrease in population, a greater reliance on water as a critical resource, less diversity of industries with agriculture as the main land use and a smaller less diverse population. The importance of local leadership identified at the Catchment scale has been reflected in the community consultation in all three of the sub-regional resilience assessments where Governance and leadership is identified as a critical issue and driver of change for all three sub-regions assessed.

The results outlined above which emerged from the expert workshops were validated in the literature reviewed for this theme and specific research commissioned in light of CAP priorities. No clearly one underpinning set of defined and meaningful threshold relating to the people assets emerged for the whole of the Namoi Catchment. Many thresholds were found to apply to people but their interconnected and variable nature means that one person’s threshold may prove to be another person’s opportunity. A focus on building adaptive capacity and sustaining wellbeing has been carried forward into the Namoi CAP as a priority under the people theme. Recent findings support the importance of these priorities and further work is underway to better understand potential thresholds and interventions in relation to adaptive capacity and wellbeing. Once completed this work can further inform the development of regional plans and programs to support communities across the Namoi Catchment.

For more information including the full detail of the analysis of system function, trends, drivers and thresholds for people, and other background information, refer to Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment.

Two Catchment targets have been developed for people based on the identified priorities of adaptive capacity and wellbeing. These targets are designed to ensure that natural resource management contributes to social wellbeing and increases adaptive capacity in the Namoi Catchment Community. Actions 53-66 describe broad activities a range of partners can undertake to achieve the targets set and thus maintain vibrant communities in the Namoi Catchment.
6.1. Critical thresholds

There is no one set of clearly defined threshold relating to people. Rather a focus on the generalities of building resilient social capital by increasing adaptive capacity and sustaining or improving wellbeing are considered important priorities.

6.2. Catchment Target People 1

Natural resource management decisions contribute to social wellbeing.

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>53 Invest in understanding and defining social wellbeing in the Namoi Catchment.</td>
<td>Namoi CMA, Community groups, Research organisations, State Government Agencies</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>54 Develop a robust set of indicators to measure social wellbeing.</td>
<td>Namoi CMA, Community groups, Research organisations, State Government Agencies</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>55 Develop Social-Ecological sub-region boundaries (Tablelands, Slopes and Plains) and engage Communities and science in a resilience assessment at this scale (Map 18).</td>
<td>Namoi CMA, Community groups, Research organisations, State Government Agencies</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>56 Develop knowledge products that provide for and assist in balanced (social, economic and environmental) decision making.</td>
<td>Namoi CMA, NOW, DPI, OEH, Research organisations.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>57 Engage with the community and encourage debate about system shocks, drivers, critical thresholds and interventions.</td>
<td>Namoi CMA, TAFE.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>58 Engage with stakeholders and natural resource managers to improve understanding of targets, thresholds and interventions.</td>
<td>Namoi CMA, TAFE, Industry groups, community groups.</td>
<td>Namoi CMA</td>
</tr>
<tr>
<td>Action</td>
<td>Who</td>
<td>Leader</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>59</td>
<td>Improve access to country for the Aboriginal Community.</td>
<td>Private landholders, Public land managers, Local Government, DPI, Namoi CMA, OEH, LHPA, Crown Lands.</td>
</tr>
</tbody>
</table>

6.3. Catchment Target People 2

*There is an increase in the adaptive capacity of the Catchment Community.*

**Actions and who will be involved**

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>Develop a shared understanding of targets, drivers, thresholds and appropriate adaptive capacity interventions.</td>
<td>Namoi CMA, Catchment Community, TAFE.</td>
</tr>
<tr>
<td>61</td>
<td>Develop a robust set of indicators to measure adaptive capacity.</td>
<td>Namoi CMA, DPI, NOW, Human services agencies, Industry groups.</td>
</tr>
<tr>
<td>62</td>
<td>Engage with stakeholders and existing social networks and build partnerships that will develop a collective understanding of adaptive capacity in the Catchment and appropriate interventions to assist people to withstand shocks and slow drivers of change.</td>
<td>Namoi CMA, TAFE, Industry groups, Community groups.</td>
</tr>
<tr>
<td>63</td>
<td>Identify communities that are vulnerable due to reliance on natural resource assets which may have already crossed critical thresholds, or be at risk due to system changes such as climate variability. Share this information with human services and local government.</td>
<td>Namoi CMA, DPI, NOW, Human services agencies, Industry groups.</td>
</tr>
<tr>
<td>64</td>
<td>Ensure that information moves through the Catchment about shocks, drivers and how they are likely to impact on the people of the Catchment.</td>
<td>Namoi CMA, TAFE, Industry Groups, Community groups.</td>
</tr>
<tr>
<td>65</td>
<td>Invest in supplying information about natural resources and how they underpin human activity including the implications of crossing thresholds.</td>
<td>Namoi CMA, OEH, NOW, DPI, TAFE.</td>
</tr>
<tr>
<td>Action</td>
<td>Who</td>
<td>Leader</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>66</td>
<td>Deliver education, skills and knowledge regarding natural resources and the resilience conceptual framework including working with schools and young people.</td>
<td>Namoi CMA, OEH, NOW, DPI, Community groups, TAFE, Department of Education and Training, Schools.</td>
</tr>
</tbody>
</table>
Map 18: Socio-ecological systems (sub-regions) of the Namoi Catchment: Tablelands, Slopes and Plains
## 6.4. Benefit Statement

<table>
<thead>
<tr>
<th>Plan/Policy</th>
<th>Target</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW State-wide natural resource management Targets</td>
<td>12 – Natural resource decisions contribute to improving or maintaining economic sustainability and social wellbeing.</td>
<td>This CAP target and actions will contribute to the State-wide natural resource management Targets by promoting a focus on social wellbeing and balanced and informed decision making.</td>
</tr>
<tr>
<td>Two Ways Together – NSW Aboriginal Affairs Program</td>
<td>Objective 1 - develop committed partnerships between Aboriginal people and Government. Objective 2 - improve the social, economic, cultural and emotional wellbeing of Aboriginal people in New South Wales.</td>
<td>This CAP target and actions will contribute by promoting a focus on social wellbeing and balanced and informed decision making that benefits all people in the Catchment and in particular improves access to country for Aboriginal people to address a key component of wellbeing.</td>
</tr>
<tr>
<td>Regional Development Australia Northern Inland Plan</td>
<td>Environmental achievement <strong>Goal</strong>: By 2015, Northern Inland NSW will be recognised among the top 40% of regions in environmental management and sustainable resource utilisation terms.</td>
<td>The targets and actions outlined in the CAP will support and promote collaborative action and prioritisation of effort to ensure that resources are managed sustainably and environmental management is based on best available evidence.</td>
</tr>
<tr>
<td>NSW 2021</td>
<td>Goal 22. Protect our natural environment. Goal 23. Increase opportunities for people to look after their own neighborhoods and environments</td>
<td>This CAP target and actions will contribute to the NSW 2021 goals by supporting collaborative action to promote a focus on social wellbeing and balanced and informed decision making.</td>
</tr>
</tbody>
</table>
7. Implementation

7.1. Planning Framework

Namoi CMA is a NSW statutory authority with a Board that reports directly to the Minister for Primary Industries. The Namoi CMA Board consists of a Chairperson and six Board Members, with appointments being skills based.

The CMA is subject to the control and direction of the Minister for Primary Industries. It is obliged to provide information and material to the Minister in relation to its policies, programs and procedures and to conduct its business as defined in the Catchment Management Authorities Act 2003. All Board members have undertaken Corporate Governance training and have passed the Australia Institute of Company Directors Course. Additionally, Board Members are subject to the Public Service Code of Conduct and the Corporate Governance and Financial Management Manual for Catchment Management Authorities.

The role of the Board includes setting policy and directions, assessing risk, approving budgets and financial reports, determining delegation, and approving minor variations to Property Vegetation Plan outcomes under the Native Vegetation Regulations 2005. The Board has established a Risk and Audit Committee, with authority delegated in accordance with Section 18 of the Catchment Management Authorities Act 2003. This Committee considers all matters dealing with sound business practices and is authorised by the Board to investigate any activity within its terms of reference and to make appropriate recommendations to the Board.

The General Manager and other staff are employed under the Public Sector Employment and Management Act 2002. The structure and reporting lines are shown in the organisational structure (Appendix E). Staffing of investment funded staff is dependant on the size of annual budgets and is therefore subject to change. NSW CMA’s corporate support services (including financial management, human resources, legal, information technology and fleet management services) are provided by Service First.

CMAs are currently undergoing a reform process and will be replaced by new regional organisations, called Local Land Services from January 2014. Future plans will be based on the new larger boundaries, and include planning for natural resource management, biosecurity and emergency response. The work completed to understand the sub-regions or social-ecological systems within Catchments by all CMAs means that this information at this finer scale will be able to be combined so as to match as closely as possible the new boundaries once finalised. More detail on the natural resource management Framework in NSW is provided in Appendix D.

7.2. Investment Planning

Namoi CMA intends to fund its involvement in the Actions listed in this CAP including community engagement, knowledge development and monitoring and evaluation through the successful development of Investment Plans for New South Wales and Australian Government funding bids.

Annual funding is variable and the amount of on-ground investment that Namoi CMA can deliver will depend on the size of the funding allocation in any given financial year. Together the NSW and Australian Government funding priorities and opportunities are balanced.
against each other to provide a comprehensive, targeted, priority focused delivery package for Namoi CMA based on CAP priorities

Every year a process of deciding on the priorities for Investment Plans is carried out by the Namoi CMA Senior Management Team for subsequent Board approval. All staff are actively involved in developing annual investment plans as part of an agreed development process outlined in Figure 8. Targets are assessed against funding body preferences and feasibility. Equity of program access is also taken into account and a final recommendation made to the Board. The Board then recommends changes and approves the Annual Investment Plan.

Namoi CMA continues to investigate and trial new technologies for developing rankings to prioritise targets and actions in any one year. Namoi CMA has engaged in trialling various approaches (such as INFFER, a program prioritisation package) and continues to seek ways to better integrate social and economic considerations into program priorities. A potential action for the future, given the availability of longer term funding cycles, is to include a more in depth community consultation process in the development of Investment Plans. This is now easier given the formation of the Community Reference Panels to assist with this process. A whole of Government reference panel currently under development will also assist with collaboratively reviewing and developing annual investment plans and programs.

Project priorities are decided through a comprehensive process of using spatial data, decision support tools and cost/benefit analysis, and based on evaluations and feedback from previous annual investment program achievements. Mid year and end of year program evaluations are undertaken to inform future planning on an ongoing basis as part of adaptive management.

Figure 8 demonstrates the process used to develop program plans based on this CAP. This is provided to assist in highlighting the difference in scale and detail applied when implementing the CAP in the form of program and project plans, versus the overarching strategic level of information contained within the CAP itself (which is designed to be an overarching ten year strategic document for the whole of the Namoi Catchment and all stakeholders). This flow chart shows how the CAP operates as a strategic framework within which to develop shorter-term, time bound and achievable (SMART) targets as part of annual investment programs and other collaborative initiatives with stakeholders and partners in natural resource management. This process has been reviewed annually, and minor improvements embedded based on two years of application, and signed off by the Board.
Figure 8: NCMA Annual Investment Plan development process flowchart

**THRESHOLDS**

- High: >5%
- Median: 2 - 5%
- Low: <2%

**Temporally risk of breaching threshold**
- Medium: 5 - 10 years
- High: <5 years
- Low: 10 years +

**Program Assessment**
- Impact of Actions
- Env-Soc-Eco
- Achievability
- Time lag to benefit
- Costs

**Draft Programs (Technical Team - project briefs)**

**PROJECTS**

- Initial Ranking (Macro IP DST)
- Critical Path

**Threshold contribution to Catchment critical functions**

Within 5% of threshold on decreasing trend or unknown status

Within 20% of threshold on decreasing trend

Within 5% of threshold and stabilised

Within 20% of threshold and stabilised

Stabilised condition outside threshold buffer zones

**Board Assessment**
- Socio-political filters/risks
- Investor preferences
- Catchment Equity

- Technical
- MERI
- Education
- PR & Awareness
- Business Systems (LMD & SAP)
- Project Management
7.3. Engaging Other Organisations

A key challenge facing Namoi CMA over the next ten years is how it will go about establishing a framework to facilitate cross-sector or other whole of landscape collaborations and investment. As a whole of government CAP, the co-ordination of the efforts and investment of a wide range of Government Agencies in delivering on Catchment priorities contained in this CAP is essential. Namoi CMA will explore establishing permanent Whole of Government reference groups that meet regularly and include a range of Government Agencies from across the Catchment. Namoi CMA will also continue to engage with the Namoi Local Government Group and Namoi Councils Group to facilitate and contribute to the development of a regional plan for the Catchment.

A particular goal for Namoi CMA is to establish relationships and work with planning authorities to ensure that the CAP is considered in their deliberations. The Namoi CMA has no power to enforce its CAP as it is a statutory but not regulatory document. There is no legal requirement for individuals, groups or agencies to implement the CAP. The CMA is therefore reliant on liaison and building robust relationships to engage the Catchment Community and other stakeholders in meeting targets contained within the CAP. As extractive industry development is a particular risk to the assets of the Catchment, an effort will also be made to engage the resources sector in thresholds, cumulative development impacts and risk management. Namoi CMA will use its comprehensive library of spatial data to inform planning processes wherever possible.

7.4. Community Involvement

Namoi CMA will continue to seek active and lively engagement with community groups and the general public. Opportunities to increase community engagement with resilience thinking concepts and thresholds will be delivered by developing a resilience perspective at a finer scale.

The tablelands, slopes, and plains areas of the Catchment have now been mapped and the community of each of these areas are now involved in defining the social-ecological systems, critical resources and thresholds that are likely to impact at that sub-regional scale. Community Reference Panels have been established in each of these areas and meet on a regular basis. These Community Reference Panels are an important mechanism for community engagement across the Namoi Catchment for the life of this CAP.

The Namoi Aboriginal Advisory Committee, which meets regularly to advise the Namoi CMA on Aboriginal involvement in natural resource management, also continues to play an important role in bringing perspectives and priorities for the Aboriginal Community to CAP development and implementation.

Namoi CMA will explore methods of including more community input into the annual investment planning and target prioritisation processes that mean the decisions about what gets funded (biodiversity, water, land or people) will continue to have the values of the community as a component of deliberations.
7.5. Adaptive Management of the CAP

Namoi CMA will review the CAP internally on an annual basis with a report on CAP implementation and adaptive management provided to the Namoi CMA Board in September of each year. This will provide the opportunity to review and include the results of various studies and analysis tasks outlined as Actions. The outcomes of ongoing Monitoring and Evaluation activities are also a key component of the reviews. Improved understanding and knowledge developed as projects are undertaken to fill knowledge gaps identified in the CAP will also inform CAP updates. The recommendations emerging from evaluations, research and audits will be tracked in a register (Namoi CMA Adaptive Management Register), and organisational responses and changes to plans and policies documented to provide a clear and concise evidence base for ongoing adaptive management of the CAP and the programs resulting from its implementation.

As new plans or policies are developed that impact on the Catchment and the implementation of this CAP, they will be reviewed with a view to achieving ongoing alignment and collaboration. Examples of this include the Murray Darling Basin Plan, the finalised NSW Biodiversity Strategy, Water Sharing Plan reviews and the Overarching Agreement on Aboriginal Affairs. As these emerge, they will be reviewed particularly in light of ongoing improvements in our understanding of the Catchment and the appropriateness of targets and actions contained within the CAP.

Given that the CAP is also a result of community engagement and consultation, reviewed versions will be delivered to the community on a biennial basis. Any significant change to the CAP will be re-submitted to the Minister for approval of the changes. A significant change is defined as a change to:
- one or more thresholds
- one or more targets
- three or more actions

The Namoi Local Government Group, Namoi Aboriginal Advisory Committee, proposed Whole of Government Reference Group and proposed Community Reference Panels will be engaged and consulted through ongoing CAP and Investment Plan reviews regarding these changes prior to submission.

7.6. Monitoring and Evaluation

Adaptive management is an important part of a resilience approach. It allows the re-testing and checking of results and assumptions as new information comes to light. It also allows the tracking progress against thresholds and provides the opportunity to review interventions if they are proving ineffectual, or even changing thresholds if they are found to be in error. Monitoring and evaluation are the building blocks of adaptive management, providing the data and information to inform improved practice and management.

The NSW Monitoring, Evaluation and Reporting Strategy provides guidance on how Monitoring and Evaluation will occur at a state-wide scale. Namoi CMA has revised its Monitoring, Evaluation, Reporting and Improvement Strategy (Namoi CMA 2012 - available at www.namoi.cma.nsw.gov.au) which provides guidance on how Monitoring and Evaluation will occur at the Catchment scale. The Namoi MERI Strategy was reviewed in light of this new CAP following Ministerial approval of the CAP so as to ensure it aligns with and supports the new directions proposed.
Considerable monitoring and evaluation effort will continue to be implemented regarding programs and projects that result from this CAP. This monitoring and evaluation will involve land managers, Namoi CMA staff, NSW agencies, Local Government, consultants and other experts as required. Whole of Government collaboration will be important not just for implementation of the CAP but also for monitoring the large scale resource condition trends across the Catchment.

Monitoring at point of investment on project sites will continue to be undertaken for all programs. Thus at the site scale a range of variables will be monitored on all projects on an ongoing basis, such as vegetation condition as part of vegetation management and restoration programs. This is a key part of the ongoing commitment to monitoring and evaluation, and the detail of Namoi CMA’s approach to this activity is outlined in the Namoi MERI strategy and supported by specific guidelines and tools for implementation.

The following table illustrates the large scale, resource condition trends that will be measured to track progress towards thresholds of potential concern. The trends to be monitored are listed against the Catchment Target to which the threshold is considered to apply. Relevant project scale monitoring that will be undertaken is also noted.

<table>
<thead>
<tr>
<th>Target</th>
<th>Threshold trend to be measured</th>
<th>Monitoring tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>By 2020 there is an increase in native vegetation extent and vegetation does not decrease to less than 70% in less cleared subcatchments and 30% in over cleared subcatchments and no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.</td>
<td>- woody vegetation extent %.&lt;br&gt; - regional vegetation class extent %</td>
<td>OEH State Landcover and Trees (SLATs) data.&lt;br&gt; Review of Namoi CMA vegetation extent mapping&lt;br&gt; Ongoing monitoring of vegetation management project areas.</td>
</tr>
<tr>
<td>By 2020 maintain sustainable populations of a range of native fauna species by ensuring that no further Regional Vegetation Community decreases to less than 30% extent as identified by 2010 baseline.</td>
<td>As above.</td>
<td>As above.</td>
</tr>
<tr>
<td>By 2020 contribute to the recovery of viable threatened species, populations and communities.</td>
<td>- Population size of individual species.&lt;br&gt; - Habitat area for species or population.&lt;br&gt; - Area of community.</td>
<td>Survey.</td>
</tr>
<tr>
<td>By 2020 no new invasive species are established in the Catchment and the spread of key emerging invasive plants and animals is limited.</td>
<td>- Presence of invasive species.&lt;br&gt; - extent of invasive species.</td>
<td>Survey.&lt;br&gt; DPI Invasive species mapping.&lt;br&gt; Ongoing monitoring of invasive species project areas.</td>
</tr>
<tr>
<td>Target</td>
<td>Threshold trend to be measured</td>
<td>Monitoring tool</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>By 2020 there is an improvement in soil health as measured by an increase in groundcover at the paddock, sub-catchment and catchment scales.</td>
<td>- % groundcover.</td>
<td>Catchment and subcatchment scale baseline with methodologies to be determined following the investigation of Catchment scale remote analysis techniques. Ongoing monitoring of groundcover project sites.</td>
</tr>
</tbody>
</table>
| By 2020 there is an improvement in the condition of those riverine ecosystems that have not crossed defined geomorphic thresholds as at the 2010 baseline. | - % 'naturalness' of surface water flow.  
- Proportion of river reaches in good geomorphic condition.  
- Riparian vegetation condition health. | New South Wales Office of Water flow and extraction data.  
NSW Office of Water river geomorphology mapping.  
Riparian vegetation condition assessment.  
Ongoing monitoring of riparian project areas. |
| By 2020 there is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses. | - Indicators developed to measure groundwater dependent ecosystems health.  
- Aquifer status for beneficial uses.  
- Maximum historical drawdown not exceeded. | New South Wales Office of Water monitoring data.  
Water resource reporting. |
| By 2020 there is an improvement in the condition of regionally important wetlands and the extent of those wetlands is maintained. | - Wetland health and presence.                                                                 | Survey – repeat Wetland mapping and prioritisation. Ongoing monitoring of wetland project areas.                                            |
| Natural resource management decisions contribute to social wellbeing. | No threshold identified.                                                                      | Develop indicators of wellbeing and undertake baseline study.                                                                                   |
| There is an increase in the adaptive capacity of the Catchment Community. | No threshold identified.                                                                      | Develop indicators of adaptive capacity and undertake baseline study.                                                                           |
8. References

This strategic document has been developed drawing on many decades of work in natural resource management across NSW and in the Namoi Catchment in particular.

A complete list of the references and bibliography is given in Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment. A wide range of reports and information on the Namoi Catchment can be accessed at www.namoi.cma.nsw.gov.au

The key documents referred to in this CAP are outlined below.


DoPI (2012). New England North West Strategic Regional Land Use Plan. Department of
Planning and Infrastructure, Sydney.
DPI & OEH (2011). *Biodiversity priorities for widespread weeds.* Report prepared for the 13 Catchment Management Authorities (CMAs) by NSW Department of Primary Industries and Office of Environment and Heritage, Orange.
DPI (2011) *Draft NSW Soils Policy.* Department of Primary Industries.
DPI (no date). *Biosecurity Strategy.* Department of Primary Industries, Sydney.
NSW Agriculture (1998). *Policy for Sustainable Agriculture in NSW.* NSW Agriculture.
NSW Office of Water - *Water Sharing Plans – various applicable to the Namoi.* Available at http://www.water.nsw.gov.au/Water-management/Water-


Appendix A: Objectives Established for Revised Catchment Action Plans

Namoi CMA participated in a pilot Catchment Action Plan (CAP) upgrade process with the Natural Resources Commission (NRC) in 2010 as the first step in developing a revised CAP for the Namoi Catchment.

The primary NRC objective in the initial Pilot Project for CAP Upgrades was to test whether the following assessment criteria for CAPs could be applied.

CAPs should:
- Be a quality strategic Catchment plan.
- Be a strategy for building resilient landscapes in the region.
- Contain regional priorities (targets) that are based on best available knowledge, the values of regional communities and the priorities of the NSW and Australian Governments.
- Express its priorities spatially, at appropriate scales and formats to meet the needs of CAP stakeholders.
- Be endorsed by the NSW Government and be supported by the commitment of NSW agencies to participate in CAP implementation where possible.
- Inform or consider all relevant NRM plans, investment and activities.

Additionally, Namoi CMA had a set of criteria it was interested in testing and these are outlined below:
- Integrate new data sets.
- Facilitate close alignment with policy, priorities and funding streams.
- Monitoring and alignment with other reporting systems.
- Plain English and accessible to community.
- Detail actions that can be picked up and enacted by any stakeholder.
- Utilise a resilience thinking conceptual framework.

The NRC subsequently revised its assessment criteria and attributes for CAPs following the results of the Pilot Project for CAP upgrades.

The revised assessment criteria and attributes for updated CAPs are as follows:

- CAP was developed using a structured, collaborative and adaptable planning process.
  - Strategic planning process was logical, comprehensive and transparent.
  - Planning process meaningfully engaged the community, governments and other stakeholders.
  - An adaptive planning process is in place to evaluate effectiveness of the CAP and guide improvements as knowledge improves and/or circumstances change.
• CAP uses best available information to develop targets and actions for building resilient landscapes.
  o CAP describes the socio-ecological systems operating in the catchment using best available science and knowledge of community values.
  o CAP integrates biophysical and socio-economic information to analyse the systems operating in the catchment and develop strategies for improving landscape function and resilience.
  o CAP proposes targets and actions that are logically nested and supported by the available evidence.

• CAP is a plan for collaborative action and investment between government, community and industry partners.
  o Plan aligns with relevant NRM policies and community aspirations.
  o Plan can meaningfully guide other governments, industry and the community to align effort across the region.
  o Plan specifies agreed roles and responsibilities for partners in the catchment.

The 2013 update of the Namoi Catchment Action Plan, in line with the adaptive management processes outlined in Chapter 7 of this document, is evidence of Namoi CMAs commitment to these criteria – in particular the establishment of an adaptive planning process "to evaluate effectiveness of the CAP and guide improvements as knowledge improves and/or circumstances change".
Appendix B: Namoi CMA’s Approach to CAP Development

Catchment Action Plans (CAPs) provide the strategic framework for natural resource management (NRM) in individual Catchment regions. CAPs guide NRM investment and actions towards regional priorities which promote the achievement of the state-wide NRM targets. Additionally, CAPs provide the basis for delivering incentive funding provided through the Australian and NSW Government NRM programs as well as other funding available to the Catchment community through partnerships and/or alternative funding opportunities.

The initial Namoi CAP was developed in 2005 and subsequently approved by the Minister for Natural Resources in January 2007. Namoi CMA worked in partnership with government agencies, industry groups, scientists and the Catchment community in developing this CAP. Notwithstanding this, CAPs need to be living, breathing documents and Namoi CMA had always intended to review its CAP in light of new spatial and scientific information together with a fresh analysis of the most significant factors impacting on the CAP.

The following information outlines the approach taken by Namoi CMA in reviewing the Namoi CAP. This was done initially as part of the NRC Upgrading Catchment Action Plans Pilot Project and subsequently for submission of a revised CAP.

The Catchment Action Plan was developed in the following stages:

- Stage 1: Review of current CAP
- Stage 2: Review of resilience thinking theory
- Stage 3: Completion of a resilience assessment for the Namoi Catchment
- Stage 4: Draft targets based on thresholds from resilience assessment
- Stage 5: Mapping of priorities
- Stage 6: Alignment with State priorities
- Stage 7: Consultation with stakeholders and the Catchment Community
- Stage 8: Incorporation of Catchment Community, expert, agency & stakeholder feedback and submissions.

**Stage 9 – Ongoing adaptive management and updates to CAP**

Each of these stages is described in more detail below.

**Stage 1: Review of Current CAP**

A motivation for Namoi CMA to review its existing CAP was the understanding that it was ‘dated’ and did not adequately address issues like climate change and new policy directions. There was also a perception that the CAP was difficult to align with investor preferences due to targets that did not align on a one-on-one basis with the State Targets. Also the current CAP was perceived as being ‘uninviting’, and ‘hard to understand’ by the Catchment Community – as indicated in the various surveys and studies undertaken.
To test the above assumptions and also to ensure that any mistakes from the first Namoi CMA CAP were not carried forward, an internal review of progress against the actions in that CAP and the applicability of the Catchment and Management Targets was undertaken. This process and the results of the review were endorsed by the NCMA Board in the early stages of the CAP development process.

Activities in the existing CAP were categorised as completed, achieved but needing to continue on an ongoing basis, not completed or no longer relevant. Surprisingly few of the actions were no longer relevant or completed and not needing to continue. The detailed nature of the actions did however mean that as specific knowledge products were developed, some actions were no longer relevant.

The first CAP did not capture climate change issues well, and also did not encapsulate issues such as emissions trading, policy initiatives such as the Murray Darling Basin Authority’s planning processes, or the marked increase in concern regarding extractive industry developments in the Catchment. It was, however, extremely comprehensive in dealing with those Catchment issues that existed at the time of writing.

Targets in the first CAP were not particularly measurable and thus it was difficult to make a definitive statement that they were achieved or not achieved. In particular, the Targets were not sensitive to the time delays and magnitude of change required to see a shift in the resource condition to which the target applied.

For these reasons it was determined that the Targets developed in a new CAP must align with State Targets in a directly reportable manner. These Targets also needed to be developed to facilitate measurement at the end of the life of the CAP and any change in the Target status reported.

Actions needed to be written in a way that, as much as possible, avoided the premature dating of the document but still provided some guidance to the community of the Namoi. They needed to be ‘inviting’ and in plain English so that an individual, community group or organisation could pick up an ‘Action’ and do something about it, even at the smallest scale.

The outcomes of the NRC’s CAP Implementation review, and agreed adaptive management responses implemented, were also considered as part of this first stage of the development of a new CAP to inform the new approach and build on lessons learnt to date.

**Stage 2. Review of Resilience Thinking**

“Resilience thinking” and the conceptual framework underpinning resilience approaches were reviewed. This involved looking at the application of resilience thinking across a range of disciplines including, but not limited to NRM. The review was undertaken both through direct discussion with recognised resilience experts, and by accessing and analysing the existing published literature.

A workbook prepared by the Resilience Alliance, “Assessing and managing resilience in social-ecological systems: A practitioners workbook” (available at: www.resalliance.org) was reviewed, and the steps proposed in that document modified and adapted to the specific needs of the Namoi CMA CAP development process. Namoi CMA relied heavily on the guidance of Paul Ryan, an independent consultant, in the design and application of the resilience framework. As a result, a much condensed version of the “workbook process” was employed. On advice from
Paul Ryan, Namoi CMA varied from the process employed in the workbook by using expert workshops to define assets and to gather a large amount of information as quickly as possible.

Namoi CMA took as a given previous research, evaluations and assessments undertaken across the Catchment to understand what the Catchment Community values about the Namoi Catchment. Namoi CMA also took as a given the values of the general public as indicated by various policy positions and legislative platforms. For example, it was assumed that biodiversity was a value that the public held so consequently the assessment then focused on how to protect that value, rather than involving itself in the debate about whether or not it be classed as a value.

Given the available literature and following discussion with leading resilience experts in Australia (including Brian Walker & Paul Ryan), several key principles of resilience thinking were identified as being most relevant to the Namoi Catchment. These were then explained and described in clear and simple terms in order to facilitate discussion with other stakeholders. (See Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment).

At this early stage, both formal and informal discussions were undertaken with a range of experts including researchers and managers in NSW Government Agencies, independent experts and Local Government. This was done throughout the process to test and check our thinking and gauge reactions and responses from key Catchment stakeholder groups, NRM and resilience experts.

**Stage 3 – Completion of a Resilience Assessment for the Namoi Catchment**

A resilience assessment of the Namoi Catchment was undertaken to generally:

- Understand the complexity and resilience of the Social-Ecological systems of the Namoi Catchment; and

The resilience assessment focussed on specified resilience (i.e. resilience to specific changes that can be identified) in the first instance. It was always the intention that a general resilience assessment would also be completed, however this did not occur primarily due to time and resource constraints.

The resilience assessment was titled as “preliminary” in recognition of the fact that further work could be done. Clearly further information and analysis could be incorporated, however time constraints and gaps in data limited how deeply researchers were able to delve into any particular aspect of the Catchment’s social-Ecological systems.

Each of the four themes within the current Namoi Catchment Action Plan (biodiversity, water, land and people) were analysed separately. This is clearly a step away from a key tenet of resilience - that is the system is assessed in its full complexity. However, this approach was used for several reasons. Firstly it would facilitate a result that would align with State Targets and secondly, it provided a structure that worked for the facilitation of expert workshops. It was the intention that the final results of all theme team meetings would be pulled together in a general resilience workshop, however time and resources did not allow for this extra step.
A series of workshops facilitated by Paul Ryan were held on each theme, bringing together experts including researchers, NRM managers, private and public sector researchers and Government Agencies.

The workshops involved an introduction to resilience thinking to set the scene and provide the context, followed by facilitated discussion so as to define the assets for each theme, and then elicit information regarding those assets. Once assets had been defined for each theme, the workshop groups discussed trends, drivers of change, variables and the implications of a trend continuing in relation to these assets.

At each facilitated theme discussion the following information was gathered:

- Asset description and the identification of appropriate scale.
- Current state of the asset.
- Trend in condition of the asset (either upwards, downwards, stable or unknown) – also noting any particular evidence or concerns on the trend e.g. levels of confidence, sources of supporting data etc.
- Key drivers & threats behind the identified trend.
- The available evidence base.
- Thresholds (known or suspected).
- Controlling variables identified.
- Linkages and feedback loops to other themes or assets.

The People Theme workshops varied markedly from the biophysical themes. These workshop participants struggled to define assets and deliver on quantitative trend information. An alternative approach was eventually used in the People workshops whereby participants were asked to describe the impacts of continuing trends relevant to biophysical assets and describe what the resultant impact on “people” might be. Subsequent discussions then focused around how people might respond to these impacts with the focus being on adaptive capacity. Following this, participants were then asked to return to the assets they had identified as ‘people’ assets, and consider how identified trends would impact on adaptive capacity.

Following the workshops, further research was undertaken to build on the workshop outcomes. The aim was to document the available evidence supporting the views that had emerged and fill any knowledge gaps. This involved a literature review of all available published material, plus further discussions with relevant experts. This literature review prioritised the identification of:

- Trend information.
- Thresholds (which in some cases were not necessarily expressed as thresholds but could be interpreted or implied as such).
- Conceptual models (a visual representation of how a system or parts of a system function).

Wherever possible, information specific to the Namoi Catchment was utilised. In other cases, where this was not possible, results were extrapolated from research undertaken on a similar system(s) in other regions.
All this information was then compiled into the preliminary resilience assessment document. This document was structured so as to treat each theme and the associated assets as consistently as possible.

The preliminary resilience assessment document was set out so that for each theme (biodiversity, land, water and people) the following information was detailed:

- Definition.
- Conceptual model of how assets interact to deliver each theme.
- Concluding comments that outline what gets carried forward into the CAP on the basis of the information presented.
- Reference lists.
- Appendices.
- Expert workshop results.
- Background information.
- Further references.

For each asset identified within a theme, the following information was provided:

- Definition.
- Trend in condition.
- Notes on trend.
- Impacts of continuing trend.
- Drivers and threats.
- Conceptual models.
- Thresholds known or suspected.
- Controlling variables.

Through a process of checking and re-testing a range of assumptions commonly made by natural resource managers about how the Catchment works, the resilience assessment highlighted several key points in relation to each theme. Key lessons learnt through this part of the process are outlined in Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment. It should be noted that whilst none of these key points were necessarily new, the resilience assessment confirmed the importance of those issues most critical to the functioning of the socio-ecological system.

Thresholds were identified on the basis of the resilience assessment – in particular the thresholds relating to the most critical assets. Assets deemed “most critical” were those having the greatest number of key linkages or underpinning functions contributing to other assets. These thresholds were then described as clearly and succinctly as possible and outlined in Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment. These critical thresholds were then carried forward into the CAP. It is these thresholds that are the linkage between the evidence in the resilience assessment and the CAP.

It should be noted that the authors of the Resilience Assessment document were broad with their interpretations of what might be a “threshold”. Any hard evidence of a system change or ‘flip’ in the scientific literature was assumed to indicate the
presence of a threshold. Benchmarks were also assessed with a view to re-thinking them as “thresholds”. Notwithstanding this, every attempt was made in the resilience assessment to clearly outline where a threshold was a qualitative one, or alternatively the opinion of the authors.

**Stage 4: Draft Targets Based on Thresholds from Resilience Assessment**

Once the most critical thresholds were defined, assessment was made on what needed to occur to prevent them being crossed. Targets were initially drafted generically to respond to the threshold and then firmed up over time. For example, in response to the 30% and 70% thresholds relating to woody vegetation extent, the target “maintain woody vegetation extent” was developed.

Progressively given the results of modelling the impact of targets, the targets were tightened up. It should be noted however, that a close alignment of the targets with the State Targets was maintained throughout. The example below (Figure A) illustrates the kind of progression that the Targets underwent (30% and 70% thresholds for woody vegetation and 61% of regional ecosystems maintain 30% of extent).

*Figure A: An Example of the evolution of Catchment Targets:*

1. **Maintain woody vegetation extent**
2. **Maintain woody vegetation extent and regional vegetation community extent**
   - Recognition that this target would at best, maintain the status quo and not provide an increase in the buffering of assets against future shocks. Also recognition that the State Target could be modified by removing reference to condition and changing the date, therefore achieving a pure alignment.
3. **By 2020 there is an increase in native vegetation extent.**
   - Recognition that the purest form of alignment with the State Target was problematic for some stakeholders. Also this was not seen as measurable by some stakeholders.
   - By 2020 there is an increase in native vegetation extent and vegetation does not decrease to less than 70% in less cleared sub catchments and 30% in over cleared sub catchments and no further Regional Vegetation Community decreases to less than 30% extent as

This final target, whilst long and complicated, is measurable and also provides a baseline that progress can be measured against. Additionally, this target is also specific to the thresholds it addresses without breaking the “one-on-one” link with the relevant State Target.
Some targets were further modified at the insistence of NSW Government Agencies so as to achieve Whole of Government endorsement although in some cases it must be acknowledged that this was a departure from a strict application of the “resilience thinking” conceptual framework.

Actions were then developed to deliver on these targets. These actions have been amended over the CAP drafting process to ensure that they were, where possible, measurable and understood by the community. Some actions have been carried over from the previous CAP where they remained relevant.

It should be noted that not all actions are driven by the need to avoid thresholds. Some key strategies and plans have been included in the CAP at the request of the NSW agencies. In particular the Draft NSW Biodiversity Strategy and the Floodplain Planning priorities have been included and actions developed to promote delivery of these plans and strategies in the Catchment.

Actions have also been amended as a result of input from the community and other stakeholders. Actions were also varied based on the results of the initial mapping of priorities if it appeared impossible to deliver or the priority category was not appropriate. For example, initial priority categories for some actions identified very small areas of the Catchment.

Stage 5: Mapping of Priorities

Following the identification of actions, an external consulting company was employed to complete the analysis of priorities for those actions that had appropriate data sets. The following analysis and mapping tasks were completed:

- Sub-catchment woody vegetation extent.
- Sub-catchment priorities for maintenance and improvement of woody vegetation extent mapping.
- Percentage Regional vegetation communities remaining.
- Mapping of priority regional vegetation communities.
- Priority Land Management Unit.

Some mapping was already available to Namoi CMA and this included:

- Wetlands Extent and Priority.
- Groundwater Dependant Ecosystems.
- Land Management Units of the Namoi Catchment.
- Surface and groundwater values.

Other priority areas were supplied as mapping data by the NSW Office of Water and DECCW and these included:

- Draft NSW Biodiversity Strategy Priority Areas for Investment.
- Geomorphic Condition – Namoi Catchment.
- Namoi – Risk to In stream Value.
- Floodplain Plan Priorities for Investment.
• Valley-wide Floodplain Planning Area.
• Aquifers of the Namoi Catchment.

The intention behind the mapping of priorities was to clearly show where investment should be directed to ensure that the relevant thresholds were not crossed. Areas where thresholds had already been exceeded have not been mapped as a priority unless they were included as a priority in the NSW Office of Water or DECCW mapping. The intention behind the maps presented was that despite being based on complex data and analysis, they be clear and easy to read by members of the Catchment Community.

Stage 6 – Alignment with State Priorities

An attempt was made to review all of the relevant existing State Plans and priorities listed by the NRM Senior Officers Group as needing alignment. Alignment with State Plan priorities was an important priority as part of this CAP review for the reasons stated previously in Stage 1. A closer investigation of the plans and policies under consideration revealed that several were still being drafted or no longer relevant. Those that were possible to align with included:

• Draft NSW State Biodiversity Strategy.
• NSW Draft Soil Policy.
• Water Sharing Plans.
• NSW River Flow Objectives.
• Two Ways Together.
• Murray Darling Basin Native Fish Strategy.
• DECCW Threatened Species Priority Action Statements.
• NSW Invasive Species Plan.
• NSW Fox Threat Abatement Plan.
• NSW Groundwater Policy Framework.
• Biodiversity Priorities for Widespread Weeds.

The plans and policies not included in the CAP as they are still under development or not relevant to the Namoi Catchment or did not provide direction applicable to the scale or priorities of this CAP include:

• Cold Water Pollution Strategy for NSW – no point of action for the CAP.
• State Weirs Policy - no point of action for the CAP.
• Annual Environmental Watering Plans – not relevant.
• Estuary Management Plans – not relevant.
• Urban Floodplain Management Plans – not relevant.
• Public Land Management Statement - under preparation.
Stage 7: Consultation with Stakeholders and the Catchment Community

Consultation was undertaken in various stages including initial workshops with NRM experts, NSW Government Agencies and Local Government representatives. NCMA also consulted directly with the Namoi Local Government Group (NLGG), Namoi Councils and individual Councils. Additionally general community consultation meetings were held in 12 locations throughout the Catchment. Formal feedback was also sought from the NRC and NSW agencies via the NRM Senior Officers Group. These individual consultation processes are outlined below.

Expert Workshops

Throughout March and April 2010, Namoi CMA conducted workshops with NRM experts from across the Catchment and beyond. These workshops focussed on drawing together the available collective knowledge to help in identifying the assets critical to each theme (water, biodiversity, land, people) and to draft a conceptual model on how these assets interact and function.

Once these assets were identified, the next phase focussed on getting detailed information about each asset. The workshop participants developed a description for the asset, identified the appropriate scale, current state of the asset, trend in condition (downwards, upwards, stable or unknown), noted any particular evidence or concerns around that trend (e.g. levels of confidence, sources of supporting data), identified key drivers and threats behind the trend. They also noted any potential conceptual models that might exist to explain/document the processes involved, identified any known thresholds (known or suspected), identified what the controlling variables might be for the asset, described linkages and feedback loops to any other assets or themes and commented on what the impacts of these continuing trends might be.

Local Government

NCMA consulted directly with the NLGG, Namoi Councils Group and individual Councils.

The NLGG was consulted regarding CAP development methodology and the targets and thresholds. A presentation was given to Namoi Councils regarding the CAP methodology and a request was made for advice on how best to engage with the elected representatives of Local Government. It was suggested that each Council should be approached individually.

A series of presentations were given to all Councils (excluding Walgett and Narrabri due to their inability to nominate dates). An explanation was provided as to why the CAP was being reviewed, how this would occur and where it had relevance for Local Government. Additionally Local Government staff also attended the consultation workshops.

One formal written submission was received from a Local Government entity - Tamworth Regional Council.
Community Consultation

A series of community meetings (12 in total) was held across the Catchment in August 2010. The purpose of the meetings was to inform the community of the new CAP, the thinking that sits behind it and also to consult on the new CAP activities and their achievability. Meetings were promoted via local and regional newspapers, radio, posters and personal invitations to over 500 people currently engaged with Namoi CMA.

These meetings consisted of three sessions. The first session included a re-visit of the 2005 CAP and Namoi CMA operations to date. This was important as it set the context for the meeting and demonstrated that the new CAP targets had been adapted from the 2005 CAP targets. Further, it informed the community of the works and activities that had been conducted across the Catchment over the past 5 years.

The second session included the majority of the technical content, including introducing the CAP review process and Resilience Thinking, outcomes of the resilience assessment and an overview of the new CAP Targets.

The third session involved a workshop to enable the community to comment on the CAP targets and discuss the activities the community could engage in to achieve the CAP targets. After the information sessions on the CAP, participants were broken up into groups (i.e. a group for each theme; Biodiversity, People, Water and Land) depending on their interests.

Small groups were run through all 4 themes together (e.g. Nundle, Walgett, Pilliga and Mullaley), medium sized groups were split into two groups and run through two themes each with participants given the option of choosing to swap between groups depending on interest levels (e.g. Narrabri and Manilla). Larger groups (e.g. Tamworth, Quirindi and Gunnedah) were split into each theme and the session was run twice so that participants had the opportunity to cover two themes. In this way, all participants had opportunity to comment on at least two themes of their choice.

Throughout the three week consultation period some changes were made to the agenda, particularly after the first workshop. The presentation of Resilience Thinking and the draft CAP targets generally remained unchanged apart from the decision to only take questions at the end of each segment to allow more time for the workshop stage.

Supporting Documentation

To help the community participation within each workshop, supporting documentation was tabled to enable participants to gain better understanding of the CAP review process. This documentation included:

- *What is a Catchment Action Plan?* (Draft CAP Summary).
- *Namoi CMA Achievements 2004 – 2009* (a booklet covering the highlights of Namoi CMA work over past 5 years).
- *CAP Summary Tables* (demonstrated the detail of the CAP Targets, Interventions and Activities etc without the distraction of pictures or graphs/tables).
Evaluation of Workshops

Following the completion of each community meeting, attendees were requested to complete an evaluation form. This provided meeting attendees with an opportunity to comment on the following key points:

- was the Resilience presentation useful;
- did they understand the CAP targets & activities;
- were they were given adequate opportunity for input;
- was the CAP relevant;
- was the meeting useful to them;
- would they recommend meeting attendance to others.

As a whole, the responses received were mostly positive. For example, “Great group of presenters - knew their stuff! I wished that more Government Departments/ Community representation groups would open their doors of information as do CMA.”

Namoi CMA staff also conducted an observational evaluation of the workshops. The majority of participants across all the workshops were middle aged or older and mostly male. However some venues had almost a 50/50 mix of sexes (e.g. Nundle, Tamworth, Walgett and Woolbrook). Farmers (including irrigators) and graziers were the predominant attendees, however at the larger centres, representation also included the following:

- Local Government.
- Aboriginal Community.
- Landcare and other community groups.
- Namoi CMA Board Members.
- Ex CMA Staff members.
- NSW Industry and Investment.
- NSW Office of Water.
- Natural Resources Commission (NRC).
- Current CMA staff.

Collectively it was concluded that the community understood resilience thinking to some degree. Resilience thinking was seen as logical or sensible. People appeared to be at ease and accepting of the targets and activities with no real opposition observed. There was broad acceptance of the logic of the CAP and the resilience approach.

Further detail on the results of the evaluations is available on request.
**Stage 8 – Incorporate Catchment Community, Expert, Agency and Stakeholder Feedback and Submissions**

An integral intention of the workshop process was to encourage people to participate in the formal submission process. Submissions were advertised as open from the 9th August 2010 and closed on the 10th of September 2010.

The number of written submissions received through the 2010 public exhibition process was very low with a total of 7 formal submissions from individuals, state agencies and Local Government. Comments from Namoi CMA Board Members were also received as were some informal comments from the NRC.

Changes to the draft CAP were also made on the basis of the results from feedback provided directly at the workshops held across the Catchment.

NSW Government Agencies provided formal feedback to the Namoi CMA on the pilot draft CAP via the NRM Senior Officers Group. This feedback was carefully reviewed and incorporated where possible. Detailed discussions were held with all of those who provided feedback on the draft CAP to fully explore the issues raised and resolve them wherever possible via negotiated solutions. In some cases the changes requested in that feedback was not consistent with the application of a “resilience thinking” conceptual framework. Thus complete alignment with existing plans and strategies was not always possible.

Formal feedback from the NRC on the pilot draft CAP was also received, including an independent assessment of the CAP against the proposed standards and criteria. This feedback was also carefully considered and recommendations reflected in the development of the final Namoi Catchment Action Plan (2010-2020).

**Stage 9 – Ongoing adaptive management and updates to CAP**

As per the adaptive management processes outlined in this CAP, the plan is designed to be a living document, regularly updated in light of latest evidence, changes to Government policy and improved understanding of the Namoi Catchment as a system. The update process involves:

- review and evaluation of CAP implementation to date
- inclusion of latest evidence and research to inform knowledge gaps identified in the initial resilience assessment (and embedded as actions in the CAP) and to incorporate further information and analysis
- Updating of maps based on latest available data, inclusion of new maps based on targeted research as per CAP actions
- review of existing State and National plans and priorities – to ensure ongoing alignment
- consultation with Community, Government, industry and expert stakeholders through workshops, and feedback on draft updates
- resubmission to Minister for endorsement where scale of change triggers this action as outlined in chapter 7 of the Namoi CAP
Appendix C: Alignment with the Standard for Quality Natural Resource Management

A key requirement of the Natural Resources Commission is that Catchment Action Plans align with the Standard for Quality NRM. Detail on what has been undertaken in the development of this CAP in relation to each required outcome to meet that standard is provided below:

1. Collection and Use of Knowledge

This CAP has been developed using the best available knowledge on the Namoi Catchment. The Namoi CMA in partnership with other stakeholders from across the Catchment has developed extensive resources including:

- Vegetation extent mapping.
- Soils landscape mapping.
- Pre-European vegetation modelling.
- Wetland priority mapping.
- Groundwater dependant ecosystem mapping.
- Regional vegetation class descriptions, maps and extent remaining.
- Threatened species survey results and reports.
- Groundwater models for strategic locations.
- Nature Conservation Strategy mapping and report.
- Riparian footprint mapping and condition assessment.
- Salinity outbreak mapping.
- Industry point source pollution mapping.
- Weed infestation mapping.
- Various reports outlining management actions and best management practice.

Also in the five years since the last CAP was drafted, other stakeholders and research organisations have continued to develop information that is applicable to the Namoi Catchment. Namoi CMA has considered the information listed above and as much other reference material as possible to develop the CAP. The opinions of relevant experts and stakeholders have also been used in the development of the thresholds and targets outlined in the CAP.

Since the CAP was approved in 2011, further resources that have been developed and used to inform the CAP update. The Evidence and Knowledge Program for 2010/2011 and 2011/2012 delivered information products to the community and also developed new datasets to fill gaps. Considerable investment was made into the development of knowledge products over the past 12 months. This is particularly in light of the resilience assessment of the Namoi Catchment and the subsequent new resilience-based CAP that was completed in 2010. These initiatives have allowed for the identification of some important knowledge gaps which can now be addressed to allow improved targeting of effort for Namoi CMA and
partners in the Catchment. Noteworthy research and analysis projects completed that have informed the update of this CAP in 2013 include:

- Catchment Scale Groundcover Assessment Options And Methodologies
- Defining Social Wellbeing and Developing Indicators for Social Wellbeing and Adaptive Capacity in the Namoi Catchment
- Namoi Living Culture Study
- Cumulative Risk of Mining in the Natural Resource Assets of the Namoi Catchment — A scoping study
- Biodiversity Management Plan for the Namoi Catchment
- Catchment and Sub-Catchment Scale Groundcover Baseline Study
- Survey of Wellbeing and Adaptive Capacity in the Namoi Catchment
- A Study to Assess Flow and Extraction Rates by Sub-Catchment
- Proposed Framework for Assessing the Cumulative Risk of Mining on the Natural Resource Assets in the Namoi Catchment
- Prioritisation of Invasive Species in the Namoi Catchment
- Groundwater Mapping and Transition Zones
- Regional Vegetation Community updated mapping, profiles and benchmarking
- Namoi Catchment Management Authority Stakeholder Survey 2013

2. Determination of Scale

The determination of the appropriate scale to develop a Resilience Assessment and thus the CAP involved balancing time frames, the availability of information and adequacy of the final result in successfully informing the CAP. A decision was made to use ‘whole of catchment’ scale given most of the data sets and trend information was applicable at this scale.

It is recognised that a more appropriate scale for community and operational purposes is that of subregions. The Namoi Catchment can be segmented into Tablelands, Slopes and Plains regions. Future work outlined in the actions of this CAP seeks to define the social-ecological systems of these regions in co-operation with the community. A resilience thinking approach can then be applied at that finer scale. These regions have now been defined and delineated. A preliminary resilience assessment at that finer scale looking at the Tablelands Slopes and Plains has now been completed, with work continuing on this task to further refine our understanding of those social-ecological systems in collaboration with community and stakeholders. The results of that assessment to date have been embedded into the CAP and associated Supplementary Document. This information will be used to inform ongoing implementation of programs, and future updates of the CAP, or whatever variation of a regional plan may replace it in future.

It should be emphasised that whilst this CAP is based on a ‘whole of Catchment’ scale, every attempt has been made to take actions down to a scale most appropriate to the delivery of individual priorities. For this reason, mapping and priority setting has been completed at the subregion, ecosystem, land management unit, river reach, floodplain, aquifer and community scale as appropriate.

3. Opportunities for Collaboration

Identifying where partners may be interested and able to collaborate in delivering the CAP was a key goal in its development process. Collaboration and consultation has occurred with
NSW Government Agencies, Local Governments and key stakeholder and community groups throughout the process of CAP development. Identifying who can be involved in delivering each action, along with a lead organisation to drive that action, has been possible because of this. Feedback on who can be involved and who should lead or drive the process has further guided CAP development and allowed for clearer understanding of the opportunities for collaboration. An ongoing process of adaptive management in collaboration with stakeholders will ensure sustained opportunities for collaboration throughout the life of the plan.

4. Community Engagement

There have been several initiatives to engage the broader community and key stakeholders in the CAP developmental processes.

Initially, a series of expert workshops pulled in resources from research organisations, agencies, Local Government and community groups. These groups set the basic shape of the CAP by identifying assets, trends and thresholds applicable to the Catchment.

Local Government entities were engaged via the Namoi Councils Group and the Namoi Local Government Group and at the individual council level.

Ongoing discussions were held with NSW Government Agency staff regarding the best way to use agency information and priorities.

A series of community workshops was also held across the Catchment in August 2010. These workshops included a review of targets and activities delivered under the old CAP. Also presented was the theory of Resilience Thinking and the results from the Resilience Assessment. An overview of the proposed targets and activities was provided and then a workshop session facilitated to collect comment and feedback from the community.

Stakeholder groups such as the Natural Resources Advisory Council (NRAC) and Namoi Water have been addressed regarding the CAP.

Finally, the CAP was made widely available for public comment with submissions closing on the 10th September 2010. Many of the changes suggested during these engagement activities were incorporated into the CAP.

Community and stakeholder engagement has also been undertaken in relation to the 2013 update of the Namoi CAP, so as to ensure feedback is received and incorporated into the updated document. In this way, the CAP can remain relevant in light of changes to policy and legislation, latest data and mapping, and shifts in community attitudes and priorities. Thus ensuring that the Namoi CAP remains a whole of Government and whole of Community plan.

5. Risk Management

As this CAP is based on the Resilience Thinking conceptual framework it takes a different approach to risk compared to traditional risk management. Rather, risk has been encapsulated as targets and actions related to ensuring that thresholds are not crossed despite the possible onset of one or more shocks or drivers of change. This is based on an understanding of the functions of the Namoi Catchment as a Social-Ecological system – analysed by theme (biodiversity, water, land and people). Thus the approach taken refers to
drivers of change rather than “threats” which is an aspect of the resilience approach that differs from previous methods of developing landscape scale natural resource management plans.

6. Monitoring and Evaluation

Namoi CMA has a strong commitment to monitoring and evaluation activities which extend from on-ground programs to stakeholder partnerships and collaboration. Namoi CMA has a comprehensive Monitoring and Evaluation Strategy and detailed mapping of monitoring tools to each resource condition target, program and project intervention.

Monitoring and evaluation activities are well advanced in the Namoi with on ground projects having monitoring sites and established benchmarks. Resource condition baselines have been set for all resources except groundwater connectivity and condition. Resource condition monitoring is resource intensive and therefore has been scheduled for repeat assessments over time.

- Evaluations are undertaken on all programs, projects and Namoi CMA operations. Examples include an evaluation on the effectiveness and delivery of Namoi Investment Plans, a partnerships evaluations and an evaluation on a sub catchment planning program along with mid year and end of year whole of Investment Program evaluations which undertaken each year.

- The Namoi CMA MERI strategy has been reviewed and revised in light of this new CAP. The resource condition monitoring applicable to the targets outlined in this CAP is detailed in Section 7.6 of the Namoi CAP.

7. Information Management

The information that has been used to inform this CAP is available as Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment. This information is available from the Namoi CMA website (www.namoi.cma.nsw.gov.au). The development of thresholds and related targets and interventions is heavily science based and the reference materials used to justify targets are available in the Supplementary Document 1: The first step – preliminary resilience assessment of the Namoi Catchment. Other information that has informed priority setting and mapping is available from either the Namoi CMA website or on request from Namoi CMA, in particular, digital mapping data sets.

Namoi CMA has a comprehensive business information management system that provides performance and financial tracking of all investment activity. Monitoring information and project details are stored using a series of databases including the Land Management Database and Monitoring Database. Namoi CMA maintains a comprehensive and digitally recorded library across its offices and provides web access to this information.
Appendix D: Natural Resource Management in NSW

1. What is Natural Resource Management?

Although natural resource management can be described in general terms as managing natural resources for improved environment, social and economic outcomes, for simplicity in NSW natural resource management has been defined in legislation. Section 5 of the Natural Resources Commission Act 2003 (NRC Act) states that:

Natural Resource Management extends to the following matters:

(a) water  
(b) native vegetation  
(c) salinity  
(d) soil  
(e) biodiversity  
(f) coastal protection  
(g) marine environment (except a matter arising under the Fisheries Management Act 1994 or the Marine Parks Act 1997)  
(h) forestry  
(i) any other matter concerning natural resources prescribed by the regulations

The Catchment Management Authorities Act 2003 (CMA Act) also adopts this definition.

2. Natural Resource Management Legislation

The NSW Government’s partnership approach to implementing natural resource management in NSW is supported by a strong statutory framework. The statutory framework includes both NSW Government and Commonwealth legislation that provides the scope within which natural resource management on ground action, policy and regulation is governed.

The legislation and governance arrangements regarding natural resource management in NSW are currently undergoing some significant changes. In particular the formation of new Local Land Services organisations to replace CMAs and incorporate natural resource management, agricultural extension activities, biosecurity and emergency response functions. These reforms are still underway with the detail of governance, funding and boundaries yet to be resolved at the time of writing.

Currently the NRC Act and the CMA Act are the two key pieces of legislation that guide the NSW Government’s input to natural resource management. The NRC Act establishes the NRC, while the CMA Act establishes the CMAs and governs their operation.

The main legislation governing natural resource management in NSW is:

- Catchment Management Authorities Act 2003
- Native Vegetation Act 2003
- Threatened Species Conservation Act 1995
- Protection of the Environment Operations Act 1997
- Marine Parks Act 1997
- National Parks and Wildlife Act 1974
- Wilderness Act 1987
- Water Management Act 2000
- Hawkesbury-Nepean River Act 2009
- Water Act 1912
- Fisheries Management Act 1994
- Noxious Weeds Act 1993
- Crown Lands Act 1989
- Soil Conservation Act 1938
- Western Lands Act 1901
- Environmental Planning and Assessment Act 1979
- Sydney Water Catchment Management Act 1989
- Natural Resources Commission Act 2003
- Rural Fires Act 1997
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
- Water Act 2007 (Commonwealth).

3. Who are our partners in natural resource management?

The role of the community, and in particular private land holders and land managers, is critical as 73% of NSW is managed for agricultural use. As reported in the NSW CMAs’ Celebrating 5 Years of Achievements publication, CMAs have attracted a further $2.20 in cash and in-kind support from landholders, private sector, industry and organisational partnerships for every $1 invested by Government. Furthermore, almost 80% of this funding has been invested in on-ground activities. These figures highlight the important role that these partners play in delivering natural resource management in NSW.

The contribution and collaboration of industries, producer organisations, landholders, Aboriginal and other community groups, Local Government, non-government organisations and the Australian Government along with the NSW Government is critical to achieving good natural resource management in NSW.

The Australian Government invests natural resource management funding in NSW through its Caring for our Country initiative and has identified six national natural resource management priorities and a range of the areas identified for investment under these priorities are located in NSW. The Australian Government also provides NSW CMAs with base-level funding on an annual basis through Caring for our Country.
4. What are the roles of the NSW Government in natural resource management?

This Section outlines some of the roles and responsibilities of the relevant NSW Government Agencies and organisations.

4.1 The Premier and Ministers

The Premier is the head of the New South Wales Government and is ultimately responsible for the policy and decisions of government.

The Deputy Premier, Minister for Primary Industries and the Minister for the Environment have carriage of the primary natural resource management legislation in NSW.

4.2 Natural Resources Commission

The Natural Resources Commission (NRC) has a general function to provide independent advice to the NSW Government on natural resource management matters. It is also required to provide the Premier with a report on all of its activities, including the outcomes of audits and on progress in achieving compliance with State-wide standards and targets. These reports are also required to be made public within a reasonable time after they are provided to the Premier.

Part 3 of the NRC Act sets out the functions of the NRC. These functions are to:

- recommend State-wide standards (i.e. the Standard for Quality natural resource management) and targets for natural resource management issues;
- recommend the approval, under the CMA Act, of CAPs of CMAs that are consistent with State-wide standards and targets adopted by the Government for natural resource management issues;
- undertake audits of the effectiveness of the implementation of those plans in achieving compliance with those State-wide standards and targets as it considers appropriate;
- undertake audits of those plans and other natural resource management issues as required by the Minister;
- co-ordinate or undertake significant natural resource and conservation assessments as required by the Minister;
- undertake inquiries on natural resource management issues as required by the Minister;
- assist in the reconciliation of particular complex natural resource management issues that are referred to the Commission by the Minister;
- advise the Minister on priorities for research concerning natural resource management issues;
- arrange for information to be gathered and disseminated on natural resource management issues.
4.3 Catchment Management Authorities

Catchment Management Authorities (CMAs) are regional organisations established by the NSW Parliament under the Catchment Management Authorities Act 2003, to improve the management and preservation of our natural resources. They bring together community and government perspectives to create plans and actions that reflect the unique and distinctive character of each catchment and its communities.

As statutory authorities reporting directly to the Minister for Primary Industries, CMAs are the key bodies to manage natural resource management (NRM) decision-making and investment at the regional level. CMAs also administer and manage native vegetation agreements under the Native Vegetation Act 2003.

CMAs provide for integrated NRM planning to achieve a fully functioning, resilient and productive landscape. CMAs have a statutory role to develop whole-of-community and whole-of-government Catchment Action Plans (CAPs) that promote community values, state-wide targets and the Standard for Quality NRM as established under the Natural Resources Commission (NRC) Act 2003.

In developing CAPs, CMAs involve their communities, make the best use of catchment knowledge and expertise, take into account appropriate catchment issues and apply sound scientific knowledge. CAPs are regularly revised to reflect new science, knowledge and experience. CAP targets must focus on the most serious risks to landscape health addressing the attributes that underpin landscape function.

CMAs use CAPs as their framework to directly deliver NSW and Australian Government incentive and financial assistance funding programs for NRM; largely focused on encouraging landscape stewardship, behavioural change, building the capacity of communities and delivery of practical environmental outcomes at the local level.

CMAs work with urban and rural communities, farmers, Landcare and other ‘care’ groups, Aboriginal communities, local government, non government organisations, industry, business and government agencies to review and respond to the key NRM issues facing their catchments. CMAs leverage additional funds and effort to complement government investment, in the social, economic and environmental interests of the State and local communities.

As noted above, CMAs are currently undergoing a reform process and will be replaced by new regional organisations, called Local Land Services from January 2014. These new entities will be based on new boundaries, and will incorporate natural resource management, agricultural extension activities, biosecurity and emergency response roles. The detail of the governance, funding and boundary arrangements are still being finalised at the time of printing.

4.4 State Agencies

NSW agencies have a major role to play in natural resource management in NSW. They are largely responsible for the development, implementation and evaluation of natural resource management legislation, plans, policies and strategies relevant to CAPs. Agencies also hold a significant amount of knowledge and science, which can be utilised in the CAP upgrade process. Consequently, in order to develop whole of government plans which support resilient landscapes, agencies collaborate with each other and CMAs to develop the upgraded CAPs.

NSW currently has nine cluster agencies consisting of:
- Department of Premier and Cabinet
- Treasury
- Department of Attorney General and Justice
- Department of Education and Communities
- Department of Family and Community Services
- Department of Finance and Services
- Department of Health
- Department of Trade and Investment, Regional Infrastructure and Services
- Department of Transport

The broad areas within these clusters involved in the CAP upgrades include: Catchment Management and Natural Resource Management; Environment and Heritage; Agriculture, Fisheries and Forestry; Water; Aboriginal Affairs; and Planning and Infrastructure.

Relevant agencies in NSW include: Office of Environment and Heritage, Department of Primary Industries, NSW Office of Water, Crown Lands, and Department of Planning & Infrastructure
Appendix E: Namoi CMA Staff Structure

Staffing is subject to change depending on funding availability. Updates are available from www.namoi.cma.nsw.gov.au