



CARING
FOR
OUR
COUNTRY



A Resource kit for Rural Landholders

in the Northern Rivers Region



Introduction

Can I pump water from the river? Who can tell me why my cattle are doing poorly? What's that weed in my paddock? Do I need to control it?

What is the Native Vegetation Act? Why has the Livestock Health and Pest Authority sent me a rates notice?

Whether you are thinking of taking up rural life on the north coast of New South Wales, or have already done so, it is often hard to know where to turn to for such information. There is an enormous amount of material available but unfortunately it is scattered across many organizations and in many formats (e.g advisors' knowledge, training courses, books and web pages). The aim of this kit is to bring much of this information together in one easy to use guide for intending and existing landholders in Northern NSW, and to direct them to where they can obtain further help.

The kit briefly describes the natural resources (soils, water, native vegetation and pastures) of the area and major factors that impact on them (climate, drought, flood, fire and weeds). These play major roles in determining the potential and limitations of rural land and thus, how the land needs to be managed. More information on any of these topics, is available from the Landcare offices listed in this kit.

Other factors that will smooth the transition to rural life (including the multiplicity of legislation) for intending and new landholders are described in the section "Rural Life".

The kit also provides a selected guide to resources that will help you better understand your land and the enterprises you work with. While all attempts have been made to provide up to date information, this kit only provides general information as the rules and regulations affecting rural life are constantly changing. Hence, you should always seek professional advice for your specific situation. To aid your search for advice, the contact details of a range of government and non-government organizations are provided in the resources and contacts section of this kit.



Northern Rivers Region

The regional landscape

The Northern Rivers covers an area of 50,000 square kilometers from the Camden Haven River in the south, to the Queensland border in the north, and from Lord Howe Island in the east to Armidale and Glen Innes in the west.

Around sixty percent of the region is freehold tenure, with 21 500 km² managed as Crown Land, National Park and State Forest.

There are two distinct parts to the region - the coastal zone and the eastern slopes of the tablelands and several individual landscape types ranging from Coastal Floodplain to Volcanic Plateaus, Escarpments and Ranges.

The region is a National Biodiversity Hotspot, being the third most bio-diverse region in Australia and supports a large number of threatened species and ecologically endangered communities.

Landuse types

The Northern Rivers region is known for its agricultural (beef, sheep, dairy, sugar), horticultural, timber and commercial fishing industries and is an increasingly popular place to live and a destination for tourism, with an estimated 6 million visitors each year.

The region has more than 550,000 people and experiences a population growth of more than two percent a year along the coast. Major coastal urban centres include Port Macquarie, Coffs Harbour, Ballina, and Tweed Heads.

Key natural resource management issues include:

- threats to natural heritage values and biodiversity, including pest plant and animal invasion, wildfire and loss of habitat through other landuses
- pressures associated with population growth, such as rural and urban landuse conflict, loss of arable land to urban use, increasing impacts on natural areas from human activity
- land degradation through erosion and non-sustainable use
- threats to water quality from urban and agricultural run-off, sedimentation, loss of riparian vegetation and quantity through over-extraction and the impacts of climate change
- specific issues to this area such as acid sulfate soils, blackwater and cane toad invasion

A regional plan for action

In 2006, the Northern Rivers Catchment Management Authority (NRCMA) prepared a strategic plan to guide regional natural resource management priorities and investment. The Northern Rivers Catchment Action Plan (CAP) incorporates six years of community consultation and planning and centres on seven broad themes – Community, Land-use Planning, Biodiversity, Water, Coastal Management, Marine and Soil/Land Resources. To find out more about the NRCMA Region or the CAP visit <http://www.northern.cma.nsw.gov.au>

Aboriginal Acknowledgement

The Northern Rivers region of NSW is part of the traditional lands of Aboriginal people. As non indigenous Australians we are able to acknowledge that Aboriginal people are the traditional owners of the land and that Aboriginal people are the primary custodians of indigenous cultural heritage knowledge and expertise.

From the Booroongen Djugun College Aboriginal Natural Resource Agreement Kit (2007).....

“Traditional owners have a custodial relationship with the lands of their respective Nations. The custodial relationship includes ownership and responsibility for; lands, waters (including subterranean waters) airspace, minerals, plants, animals and cultural landscapes.

The custodial relationship extends to including ownership and responsibility for traditional stories, artwork, song, dances, ceremonies. It includes cultural practices and law, such as determining who may access an area, or when species may be harvested.”

“Removal of an element of the landscape, such as removal of forest to facilitate mining, forestry, or road building, may destroy the continuation of a cultural practice. It therefore removes a part of the cultural and spiritual relationship of the Traditional owners with their Land.”

“Traditional owners’ oral knowledge of seasons and events in their Nation are based on many thousands of years occupation, rather than the relatively short period of 200 years of written knowledge. Accordingly they bring knowledge and skills to decision making that other members of the community cannot.”

“Some Traditional owners have recognised rights to speak for their Nation as Registered Native Title Claimants. The Native Title Act 1993 (Native Title Act) provides limited rights to Registered Native Title Claimants such as a ‘Right to Negotiate’ on some activities and a ‘Right to comment’ on others. These are a limited subset of rights recognised in the custodial relationship outlined above.”

As non-indigenous Australians we are able to acknowledge indigenous places, particularly when contemplating the development of land. Aboriginal site officers can identify any culturally significant sites on your land if requested - a fee is generally charged for this service. At the discretion of the landowner and appropriate Aboriginal persons concerned, the details of some sites are recorded on a site register. The site register is only able to be seen by or known about, by very specific persons and is not a public document as such. The aboriginal site register is meant to assist in determining the extent and conditions to which development of lands may occur and more commonly applies to a Development Application for sub divisions, road building, forestry and mining etc. Work requiring approval from the Department of Water and Energy such as riverbank restoration involving earthworks, any vegetation removal etc., may also require inspection of the subject area. When applying for government funding it is usually a requirement to determine whether a project site has any cultural significance that may or may not be affected by the works to be carried out.

Traditional owners may be identified by contacting the Registrar of the Aboriginal Land Rights Act 1983 (NSW) who maintains a Register of Aboriginal Owners. Please note that assessment of applications to be registered as Aboriginal Owners under the Aboriginal Land Rights Act 1983 is limited by available resources.

Finally, Traditional owners not on either Register may be identified by contacting the Aboriginal Extension Project Officer in each Catchment Management Area (see resources and contacts section for Aboriginal Extension Project Officers, Local Aboriginal Land Councils and other useful contacts).

Definitions

Aboriginal Natural Resource Agreements

Aboriginal Natural Resource Agreements are agreements between Aboriginal Peoples and Governments, Corporations, or Individuals to deliver natural resource management outcomes, including agreements to communicate.

Aboriginal Land Council

Aboriginal Land Council means a Local Aboriginal Land Council constituted by the NSW Minister for Aboriginal Affairs or the NSW Aboriginal Land Council constituted by the Aboriginal Land Rights Act 1983. All members of Aboriginal Land Councils are Aboriginal people, but are not necessarily Traditional owners.



IMAGES: Artists: Richard Campbell, Dunghutti man and Martin Roberts, Bundjalung man.

Aboriginal people

Aboriginal people are people who are descendants of the original inhabitants of Australia, and identify as, and are accepted as, Aboriginal people.

Aboriginal Peoples

Aboriginal Peoples means all Aboriginal people, communities and groups in NSW and includes the Nations, Traditional owners, and all the Aboriginal people, whether from NSW or elsewhere in Australia.

Informed Consent

Informed Consent means the ‘free, prior and informed consent’ of the Traditional owners of the Nation. In the ANRA Kit ‘Informed Consent’ means at least a formal role in the decision making process, including a right of veto.

Nation

Nation means the area traditionally inhabited by a self governing group of Aboriginal people. Aboriginal people of a Nation have an obligation to care for the land, waters, plants and animals which form part of the landscape of their Nation.

Native Title

Native Title means the limited rights and interests in land and water of Aboriginal and Torres Strait Islander people that are derived from the traditional laws and customs of their Nations and are currently recognised under Australian law.

Natural Resources

Natural Resources means all the naturally occurring substances, creatures and systems of the world around us that are considered valuable in their natural form. Natural resources include sunlight, air, water, land, minerals, animals, plants, fungi and other living things, as well as their natural products and the ecological communities and natural energy systems that generate and sustain them.

Traditional owners

Traditional owners are the Aboriginal people who are descendants of the original inhabitants of a Nation. They have a spiritual, cultural, political and often, physical connection with the area of their Nation.

Aboriginal Natural Resource Agreement Kit (ANRA) - Booroongen Djugun College.

Copies of this kit are available from website: www.booroongencollege.nsw.edu.au or contact Amie McElroy, Aboriginal Extension Project Officer aco@booroongencollege.nsw.edu.au

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Rural living

Intending landholders

Are you currently searching for a rural property?

Many people who haven't come from rural communities may not realise what it is like to live in a rural area. Rural areas are not always peaceful: sometimes they can be noisy, smelly and dirty. To better understand what you might expect, and what is expected of you, research the area you are planning to move to.

Some things you may want to consider are:

- Do you want a bush block where you can relax or a production property?
- What type of rural industry do you want to be involved in (e.g. horticulture, beef cattle, cropping)? Remember, that if you are not happy with what you are doing, the undertaking is less likely to be successful.
- How long can you wait before earning an income? Some rural enterprises take 3 or more years before they generate income (e.g. Tree crops)
- How much do you need to earn from the farm: many properties on the north coast are not large enough to support a family without a supplementary income?



IMAGE: Soybean and sugar cane crop (J.Mousley)

- Where can you earn off-farm income?
- How far are you willing to travel between the farm and off-farm job?
- Do you want to live on the property or do you want a rural property, but live in town?
- How much time and energy do you have? Many enterprises involve long hours and require a lot of energy (e.g. dairying)
- Where will the kids go to school?

Once you've made these basic decisions you will need to gather information to help refine your ideas. For example, if you want to run an agricultural enterprise:

- What types of enterprises are undertaken in the area (e.g. beef cattle - store weaners, steer fattening or stud)?
- How profitable are the different enterprises in both the short and long term? All rural enterprises go through ups and downs in the market. Where in the pricing cycle, is the enterprise you are considering?
- Which parts of the region are best suited to your chosen enterprise?
- What types of soils or pastures are suitable for your chosen enterprise?
- Is irrigation required?
- What infrastructure and machinery outlays will be required to start the business? This can run into large amounts for some enterprises.
- What skills do you have and what are needed?

The best way to start gathering the knowledge you need is by reading through this kit and following its pointers to further sources of information.



All this will take time, but patient, detailed planning will save money and heartache in the end. As you amass information, don't be surprised if you need to reconsider what you want from your rural lifestyle. Rural living is usually a compromise between what you desire and what is practical and affordable. With the information you've amassed, you will be better placed to provide real estate agents with a list of your requirements

When inspecting properties, take notes on the soil type (samples if allowed) vegetation, water supplies, infrastructure and what enterprises are being conducted on adjacent properties. This will help you compare the properties that interest you. If you wish, use the "Property Checklist" to assess and compare properties.

When it finally comes to purchasing a property, it is a case of buyer-beware. You must fully assess its suitability for the purposes for which it is intended. This can include features which might not be readily evident and that vendors are not legally obliged to disclose; and which routine conveyancing enquiries may not uncover.

Be aware that government agencies can only provide information and advice about matters over which they have authority. They cannot break the confidentiality agreement they have with the current landholder and supply specific property advice to the buyer. It is the responsibility of the purchaser and the conveyancer to carefully inspect the property, examine the contract and ask all the right questions. Refer to Property check list.

Property checklist

Property address:	
Asking price:	Property size (hectares):
Nearest town:	Distance to town:
Condition and suitability of the residence:	
Is a residence permitted to be built on property? YES <input type="radio"/> NO <input type="radio"/>	
Condition and suitability of other buildings:	
Condition and suitability of the stock handling facilities:	
Condition and suitability of the fences:	Number and sizes of paddocks:
Services to property: Electricity YES <input type="radio"/> NO <input type="radio"/> Town water YES <input type="radio"/> NO <input type="radio"/> Garbage service YES <input type="radio"/> NO <input type="radio"/> Town sewerage YES <input type="radio"/> NO <input type="radio"/>	
Type, quantity and quality of domestic water supply (tank, bore, dam, creek, river, reliability):	
Type, quantity and quality of stock water supply (tank, bore, dam, creek, river, reliability):	
Type, quantity and quality of irrigation water (bore, dam, creek, river, reliability):	
Does the property come with an irrigation license? YES <input type="radio"/> NO <input type="radio"/>	Size of license:
Condition and suitability of irrigation equipment:	

Land types				
Wetlands%	Alluvial flats%	Gentle slopes%	Steep slopes%	
Soil description				
Depth	Colour	PH levels		
Vegetation				
Cleared %	Forest %	Pasture %	Crops%	Wetland%
Main forest types or species:				
Suitable shade for stock?				
Condition of riparian vegetation (river, stream) Poor <input type="radio"/> Fair <input type="radio"/> Good <input type="radio"/>			Condition of bush Poor <input type="radio"/> Fair <input type="radio"/> Good <input type="radio"/>	
Main pasture species (collect grass flower heads if not sure):				
Crops:				
Degradation Issues (weeds/feral animals/erosion):				
Other Notes:				

New Landholders

I've bought a property! What should I do now?

Read this kit and know where to go for information. But first, a warning! Organizations and advisors will always try to answer your questions, but it often won't occur to them to tell you about things you haven't asked about. Hence, always ask,

- What information and services do you provide?
- What training, workshops, field days are available and how can I find out about future events that might be held?
- Are any funding opportunities available for training or on-farm works?
- Who else should I contact?
- Is there anything else I need to know about?

Let the Livestock Health and Pest Authority know that you have bought the property (if 4 hectares or more), so that they can start providing services to you. If you intend to own livestock, ask them about the National Livestock Identification Scheme (NLIS) – you'll need a property identification code and identification tags. Also, find out about any pest animal programs being run in your area.

Contact your local Landcare Network or Community Support Officer and join the catchment network, so that you can receive regular updates on funding, workshops, field days and other events for rural landholders in your catchment.

Start planning by buying an aerial photo of your property (see Map Sales in the Department of Lands). First, talk to the NSW Department of Primary Industries (agriculture) the Northern Rivers Catchment Management Authority or local Landcare officer to see if there are other ways to obtain an aerial photo (e.g. Land Management Planning courses or Property Vegetation Plans – NRCMA). Ask about how to use the aerial photo for mapping your properties' resources, problems and management.

Find out if you are in a bushfire prone area by contacting your Rural Fire Service. If so, ask how to prepare your property for bushfire and prepare a bushfire action plan (what to do when a fire comes). Become a Rural Fire Service volunteer to learn how to fight bushfires and manage fire on your property. Be aware of fire legislation.

Find out if you are in a flood prone area by contacting your local council. If so, ask if there is a local flood action plan. Obtain information from your local State Emergencies Service on how to prepare a flood action plan for your property. If your property is on a floodplain, ask your local council about the extent and level of acid sulfate soil risk on your property (they have acid sulfate soil risk maps).

Map and assess your properties resources. Determine how to manage them and what funding opportunities are available

- Soils – NSW DPI (agriculture)
- Pastures – NSW DPI (agriculture)
- Native vegetation - NRCMA
- Water – NRCMA and Department of Water and Energy

Map and assess your properties problems. Determine how to manage them and what funding opportunities are available

- Weeds – NSW DPI (agriculture) and Local Councils.
- Pest animals – LHPA and DECC
- Erosion – NRCMA and NSW DPI (agriculture)

If you are involved in a rural enterprise, ask advisors in NSW DPI (agriculture) about the issues relating to your industry (e.g. best management practices, regulations, training opportunities, etc). for new and emerging rural industries. Find out if there is a local producer network or discussion group available for your industry. See resources and contacts sections.

Join a producer association and learn from others in the industry. Find these groups through NSW DPI (agriculture), other producers or the internet (type "industry + association" into a search engine e.g. Alpaca association).



IMAGE: Lee Weatherstone (dairy owner) and Pauline Wallace (Waterlands Landcare) at 'Orana Dairy' in the Clarence Valley.

Determine if you are eligible for primary producer business status (this can provide tax savings) by contacting the Australian Tax Office or your local accountant or by typing "Australian tax office primary producers' essentials" into any internet search engine (to access the ATO's primary producer web page).

Remember to always check with your local council and NRCMA before undertaking any development on your property (no matter how small), as approvals are needed in many circumstances. This includes approvals which are required for riparian zones (riverbanks, streams, wetlands) which must be obtained before any work can be carried out (including weed removal). The last thing you want to do is cause erosion or negative impacts to land and water quality. There are also considerations for activities that may impact cultural heritage values of land and water.

The Department of Environment and Climate Change (formerly National Parks and Wildlife Service) administers a register of identified sites in NSW and nationally. Some local councils also have access to a register of culturally significant sites to assist with planning and development approvals.

Legislation

There are a number of pieces of legislation that affect rural land and rural enterprises. The following is a very brief outline of the Acts and where to go for more information.

Apiaries Act 1985

Controls keeping bees, identification and use of hives, importation of bees and disease control of bees. Contact local NSW DPI (agriculture) for more information

Companion Animals Act 1998

Makes provision for registration of dogs and cats (working dogs are exempt) and rights of landholders to destroy dogs and cats. Contact your local council for more information

Crown Lands Act 1989 and Crown Lands (Continued Tenures) Act 1989

Covers the lease and use of crown land. Established local land boards, who deal with dividing fences. Contact the crown lands division of the Lands Department for more information

Dividing fences Act 1991

Covers dividing fences and fencing disputes. Contact the crown lands division of the Lands Department for more information

Environment Protection and Biodiversity Conservation Act 1999

Provides for the protection of the environment, especially in relation to matters of national significance (e.g. RAMSAR wetlands). Also lists threatened species and prohibits the export of native species without a permit. Contact the Federal Department of Environment and Heritage

Environmental Planning and Assessment Act 1979

Controls the extent and conditions of development on all land in NSW. Administered by local councils. Contact your local council if considering any type of development (buildings, intensive enterprise)

Exotic Diseases of Animals Act 1991

Any animal suspected of having an exotic disease must be reported to the Livestock Health and Pest Authority or police as soon as possible. Contact the LHPA for more information

Firearms Act 1996

You must be licensed to own or use firearms and firearms must be registered and suitably stored. Contact the firearms registry at www.police.nsw.gov.au/firearms for more information

Fisheries Management Act 1994

Permits are required to carry out aquaculture. Contact the fisheries division of the Department of Primary Industries for more information



Impounding Act 1993

Animals straying off (or onto) your property may be Impounded. Charges incurred to have animals released. Contact your local council for more information

Inclosed Lands Protection Act 1901

Deals with trespassers on your property, but common law remedies are more commonly used in rural situations. Trespass in a recreation vehicle is covered by the Recreation Vehicles Act 1983. Contact your local police station for more information

Kangaroo Management Plan

No kangaroo can be shot unless the shooter has a licence from the National Parks division of the Department of Environment and Conservation. See them for more information

Local Government Act 1993

Councils levy rates for farmland and residential. If you disagree with your rating contact your local council

National Parks and Wildlife Act 1994

All vertebrate fauna is protected, except for some imported species.

It is an offence to harm any protected fauna without a permit. Landholders may pick native plants on their property, except if they are protected (as listed in Act). Contact the National Parks and Wildlife for more information.

Native Vegetation Act 2003

Native vegetation can only be cleared as part of a defined routine agricultural management activity or in accordance with a vegetation plan (PVP) or development approval (Environmental Planning and Assessment Act 1979). Contact the Northern Rivers Catchment Management Authority for more information

Noxious Weeds Act 1993

Occupiers must control the spread of noxious weeds on their land, whether private or public lands. Contact your local council for more information or weeds authority.

Occupational Health and Safety Act

Every employer must ensure the health and safety of all employees. Contact Workcover for more information

Pesticides Act 1999

Controls the use of pesticides. It is an offence to harm people or property or non-target plants and animals. All users of pesticides must be licensed. See the EPA division of the Department of Environment Conservation for more information.

Plant Diseases Act 1924.

Notifiable plant diseases and pests must be reported to NSW DPI (agriculture) inspectors within 24 hours. Regulatory Officers can make orders to landholders for the prevention, control or eradication of plant pests and diseases. Contact your local NSW DPI office for a list of notifiable diseases.

Plantations and Reafforestation Act 1999 (Code 2001)

Plantations greater than 30 hectares must be authorised and must apply with the Code. Plantations 30 hectares and less are exempt. See the NRCMA for more information.

Rural fires Act 1997

Sets out landholders' responsibilities in relation to fire. Permits are required to light fires during the bush fire danger period or where a burn could endanger buildings. Contact the Rural Fire Service for more information.

Rural Lands Protection Act 1998 and Rural Lands Protection Amendment Act 2008

On 1st January, 2009 RLPB's were replaced by 14 Livestock Health and Pest Authorities (LHPA's) whose functions included, providing animal health services, managing travelling stock and travelling stock routes, controlling pest animals, stock marking and administration of drought and disaster relief schemes. Landholders must control declared pest animals. Former RLPB offices will stay open as offices of the local LHPA's (with the same contact numbers). Their core functions of livestock health, pest animal and insect management will continue.

Soil Conservation Act 1938

Landholders can be served with, and must comply with, soil conservation notices where soil erosion or degradation is likely to occur and the effects can be mitigated. Contact the Northern Rivers Catchment Management Authority for more information.

Stock Diseases Act 1923 (Regulations 2004)

Covers the reporting and control of endemic diseases. Landholders must acquire a property identification code, use approved stock identification tags, report all property-to-property movements and any stock suspected of suffering from a proclaimed endemic disease. Contact the Livestock Health and Pest Authority for more information.

Threatened Species Conservation Act 1995

It is a criminal offence to harm a threatened species or its habitat, sell a threatened species or have one in your possession. National Parks has the power to issue stop work orders if any activity is considered likely to harm threatened species or their habitat. Contact the National Parks division of the Department of Environment and Conservation for more information

Water Management Act 2000

Sets out landholder's entitlements and obligations regarding water use covering streams, lakes, dams, bores and harvesting runoff. Contact water licensing in the Department of Water and Energy or the Northern Rivers Catchment Management Authority for more information.

Climate

Temperature

Summers in the Northern Rivers Catchment are relatively warm, with average maximum January temperatures of approximately 27 – 30°C. Greater temperature extremes are experienced away from the coast with maximum summer temperatures tending to increase by 1 – 2 °C for every 20km from the coast. For example, on average, Yamba experiences only one day above 35 °C each year, although warmer areas such as Lismore tend to experience more frequent summer extremes. Winters are cool to mild, with average maximum July temperatures of 19 – 21°C towards the coast and around 15 – 17 °C in more inland towns such as Nymboida and Bellingen . In summer, extremely hot drying conditions can be experienced throughout the valleys due to hot north-westerly winds from the inland. Temperature is also strongly influenced by elevation, with higher elevations having considerably lower winter temperatures.

Rainfall

Peak precipitation occurs between November and April with variability in rainfall from one year to the next being high. The catchments coastal areas receive approximately 1,350 – 1,650 mm of rainfall each year, while rainfall is significantly lower for example at Grafton with a median annual rainfall of around 980 mm. Local differences may also occur due to steep terrain altering the movement of clouds, in places and creating rain shadows.

Rainfall in the spring to autumn months is often associated with thunder-storms which build up over the mountains during the day and move eastwards in the afternoon.

Frosts are infrequent in coastal areas and when they do occur, are not usually severe (i.e. 0°C). Frost frequency and severity is highest further inland, with frosts rarely occurring within 1km of the coastline. Southern facing hillsides experience more frequent and severe frosts than do northerly facing slopes. Low elevation areas, subject to cold air drainage also have higher frequencies of frost and fog than surrounding areas.



IMAGE: Lightning over Mt. Warning (P.Hall)

Northern Rivers Region median annual rainfall

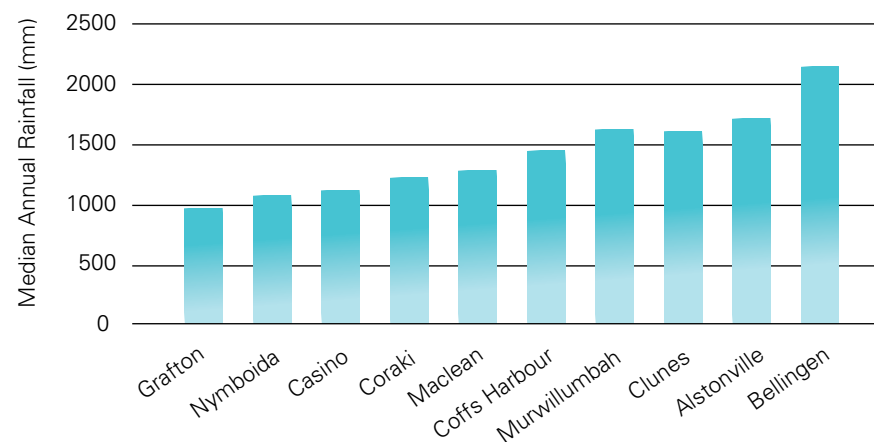


Figure 1: Northern Rivers Region Median Annual Rainfall

Source: Rainfall data from the Australian Bureau of Meteorology website 2009 (Approx. 40 years 1968 – 2008).

Climate change

Information about Climate Change and the Northern Rivers Region can be found in the publication Climate Change in the Northern Rivers Region, prepared for the NSW Government by CSIRO and available from the NRCMA offices or visit the following websites for the latest information on climate change, it's consequences and tools for managing risk;

www.csiro.com.au

www.greenhouse.nsw.gov.au

www.northern.cma.nsw.gov.au

www.environment.nsw.gov.au/resources/climatechange/08501Northcoast.pdf

Up to date information about temperatures, rainfall, weather patterns, potential evaporation, prevailing winds, weather warnings and lots more can be found on the Australian Bureau of Meteorology website - <http://www.bom.gov.au>

Drought

What is drought?

Drought is a prolonged period of lower than average rainfall, which results in insufficient feed (feed drought) and/or water in streams and dams (water drought).

From the tablelands and westward, drought is usually associated with bare and browned-off pastures. However, on the coast many pastures remain green during drought, although ground cover and feed availability may be low.

What are the effects of drought?

On the coast, there is typically a minor drought every 10 years and a major drought every 15-20 years. Droughts can be short and sharp or long and sustained. The last drought on the coast lasted from 2001 to 2004; this was a long and severe drought that caused both feed and water shortages.

During drought, pastures often become overgrazed and stressed; plant energy reserves are reduced and plants more easily succumb to pressures that they would normally survive in good times. Hence, it is essential to reduce stocking rates before pastures become overgrazed, and when coming out of drought, to carefully manage pastures to allow energy reserves and seed banks to rebuild.

Ground cover is reduced during drought and overgrazing exacerbates this. If management decisions are solely made on animal condition, drought strategies will be implemented too late. Serious pasture and soil degradation can then occur through wind erosion or water erosion.

Excessive erosion of manure and soils into water supplies may make it unsuitable for use. This is made worse by shallower, warmer and slow flowing water common in drought; nutrients or pest organisms (e.g. Algae) are not diluted and the warmer waters are ideal for algal growth.

Animals are obvious casualties of drought, not only through starvation, but through disease during and after drought. During drought illnesses are often related to supplementary feeding (e.g. Grain feeding) and/or the weakened condition of animals. Animals are also more likely to suffer plant poisoning as feed becomes scarce. Wet cold conditions are often associated with drought breaking rains (even in summer) and this will badly affect animals in poor condition. Stomach upsets and plant poisonings are also common after drought.

Sudden changes in feed are associated with pulpy kidney, enterotoxaemia and other diseases.

During drought, river pumping restrictions are often necessary, this limits water supplies for irrigation, stock and domestic use, just when it is most needed. For information on river pumping restrictions, contact the resource access officer in the Department of Water and Energy at Grafton.

Animals are less likely to be properly cared for during drought. If you see an example of animal cruelty (starvation or lack of water), contact the Royal Society for the Prevention of Cruelty to Animals, who will try and rectify the problem with the owner of the animals.

Wildlife injuries, and hence the number of orphans, increases as animals are drawn to roadsides looking for food. If you find an injured or orphaned native animal, contact FAWNA/WIRES, who are experts in their management.

How do you know when a drought is coming?

Unlike floods, droughts can sneak up on you. Sometimes it is obvious when a drought is developing; its hot, dry and short and long-range forecasts predict no useful rains. However, at other times the development of drought is very gradual. Periods of rain, interspersed with long dry periods, can make it appear that drought has been averted, but water and feed supplies are showing a longer-term downward trend.

How do you prepare for drought?

Action plans for drought should be developed for properties as surveys of producers who survived the 2001-2004 drought reasonably well had plans that incorporated de-stocking, feeding and financial budget strategies.

Most importantly, they stuck to their plans. For more information on this read "Lessons from the drought – North Coast report" at www.agric.nsw.gov.au/reader/drought-lessons/north-coast-report.htm. Secondly, constantly monitor feed and water supplies and know how many days supply you have available if no further rains come.



How do you develop a drought action plan?

To develop a drought action plan for livestock producers, you need to know how to assess your pastures and livestock, know the likely diseases to watch for and how to undertake supplementary feeding of animals. Check with your local Landcare office, the Northern Rivers CMA or the nearest NSW DPI (agriculture) for information about courses being run in your area.

NSW DPI (agriculture) also has extensive information on planning for drought, and managing during and after a drought, including:

"Managing Drought". A free book for NSW farmers covering most aspects of drought, including planning, feeding, farm management and assistance.

"The Drought Recovery Guide 2005". A free book for NSW farmers that helps producers develop drought recovery strategies a make other important management decisions.

See the drought section in the NSW DPI publications web site at www.agric.nsw.gov.au/reader/drought.

For horticulture crops, discuss the likely affect of drought and drought preparedness with your horticulture officer, NSW DPI (agriculture) at Coffs Harbour and Wollongbar.

Where can you get more information?

The Australian Bureau of Meteorology provides weather forecasts and radar images on its website (www.bom.gov.au) to help determine short-term weather patterns.

More information on animal health issues can be obtained from the booklet "Beef Cattle Health for the North Coast", available from the North Coast Livestock Health and Pest Authority formerly the Rural Lands Protection Boards) or by visiting the NSW DPI (agriculture) web site at www.agric.nsw.gov.au/

How to manage pastures and crops

Information on pasture and crop management during and following drought is available from agronomists in NSW DPI (agriculture) or from private agronomists (produce stores).

If your area is drought declared by the Minister for Agriculture, drought relief may be available to primary producers. The main forms of drought relief are transport subsidies for stock and water. This and other forms of assistance can be found on NSW DPI's (agriculture) web site.

To help determine if you are eligible for drought relief, for help with processing of drought subsidies and to provide support information, contact the Rural Financial Counselling Service NSW Northern Region at <http://www.rfcsnsw-northernregion.org>

To determine how much water you have available on your property and how to increase these water reserves, consult the water section in this kit.

Floods

The State emergency Service (SES) is the primary agency that deals with floods and coordinates the evacuation and welfare of communities affected by flood. If you are unsure whom to contact regarding a flood issue, try your local SES first.

Is flooding a serious problem?

In Northern NSW floods may result from various weather influences and prolonged or very heavy rainfall. General flooding is associated with east coast low-pressure systems, rain depressions and monsoonal low-pressure systems that bring rain for days or weeks, often over entire catchments.

The most severe floods are generally the result of the passage of degraded ex-tropical cyclones from the north during summer and autumn or east coast low pressure systems occurring during autumn and winter. When depressions such as these are characterised by very low central pressures, raised sea levels (storm surges) can occur. This exacerbates flooding when sea waters invade coastal areas and when flows in the river are retarded.

People, who live near rivers, or in low-lying coastal areas, live with the greatest threat of floods. Periods of heavy rain, not necessarily in their area, can lead to rises in the water level of streams and rivers to a point where channels can no longer hold the volume of water. Thunderstorms normally only result in local flooding, but these “gully rakers” can cause extensive localised damage; washing away fences, soils and livestock.

Because of the rapid flow of floodwaters down valleys, the time available for landholders to take action may be short (sometimes only $\frac{1}{2}$ to 1 day for floodwaters to peak). Flooding is usually of short duration and confined to areas close to rivers and their tributaries in the upper and steeper parts of the valleys. However, river heights may rise by 10 - 20 metres in these areas and damage may be severe due to the speed of the water flow. Stormwater flooding by itself can inundate extensive areas as well.

On the floodplains nearer the coast, floodwaters spread out and are much shallower and slower flowing, but extensive areas can remain inundated by water for weeks or months.

Very heavy rainfall, in excess of 225mm in 24 hours and more than 400mm over the course of an event, are quite common for example in the Clarence River catchment. Dorrigo, in the far south of the catchment, has a recorded 24-hour rainfall of 809mm and monthly total of 1395mm and an average annual precipitation of nearly 2000mm.

Flooding not only leads to the loss of life and possessions, but it also creates a host of other short and long term problems, for example: loss of income; loss of pastures; fence damage; weed and pest invasion; livestock starvation and disease (e.g. Pulpy kidney and bloat); isolation from food and medical services, lack of drinkable water; and failure of sewage systems.

Insurance policies generally do not cover flood damage. If your property is in a flood-prone area, you should ensure you are protected as thoroughly as possible.

How do you know when a flood is coming?

The Bureau of Meteorology flood warnings are broadcast on all local radio stations. The SES will indicate in these warnings the likely consequences of the predicted flood height for local areas and advise on appropriate action. Warnings are also provided on the Bureau of Meteorology’s web site www.bom.gov.au/hydro/flood/nsw

What should you do to prepare for floods?

First, determine if you are in a flood-prone area or an area likely to be isolated by flood; if so, prepare a flood action plan for your property. To find out whether your property is susceptible to flooding and what critical flood heights are, talk to your local shire council and SES.

Know Your Local Flood History

Ask your local council or State/Territory Emergency Service about the following:

- What the terms major, moderate and minor flooding mean to your area and at what official river height your home becomes isolated or inundated.
- Local flood plans: whether you may need to evacuate; how to find the nearest safe location.



IMAGE: Grafton and South Grafton, March 2001 floods (courtesy of Clarence Valley Council)

How do you develop a flood action plan?

A starting point is to obtain a copy of your local “FloodSafe” guide from your local SES or Council Office or on the web at <http://www.ses.nsw.gov.au/infopages>.

These guides describe local flood problems, evacuation procedures and emergency contacts for the area.

- Consult your local SES and neighbours who have experienced previous floods, to find out about local flooding idiosyncrasies. For instance, your property may not go under until a certain flood height, but by that time all of escape routes may be inundated.
- Obtain advice from the nearest Livestock Health and Pest Authority and NSW Department of Primary Industries (agriculture) to develop a livestock Flood Action Plan. For example, factors you’ll need to consider for livestock are where can stock be evacuated to, how will they be evacuated (livestock transport trucks are likely to be in short supply during floods), what animal health issues may occur, how stock will be fed, how much feed is needed when pasture is not available and how long will livestock need to be away.

As SES flood action plans cover a large local area, you will need to modify them specifically for your property. Your property flood action plan should cover the people, possessions, machinery, pets and livestock and specify what you will do, how you will do it and what flood height triggers you will use. It should also cover the period immediately after the flood, as water quality, pastures, electricity, sewerage, etc can take a long period to return to normal.

If a disease outbreak does occur during or after a flood, contact the vet in the Livestock Health and Pest Authority or other private veterinarians.



IMAGE: Flooding (Tim Ryan)

What can you do to reduce the negative impacts from flooding on your land?

- Replant riparian areas to reduce erosion of river banks and subsequent loss of pastures.
- Fence off stock from the creek and its banks to allow native plant regeneration and reduce erosion.
- Put in off-stream water troughs to eliminate the need for stock to enter creek areas.

Where can you get more information?

A useful reference for understanding cattle diseases is “Beef Cattle Health for the North Coast” by P. Freeman (2002), which is available from the livestock Health and Pest Authority or NSW Department of Primary Industries (agriculture) will also help producers understand the feed requirements of livestock and how to maintain their health through supplementary feeding and has information on property management during and after floods at www.agric.nsw.gov.au/reader/flood-frost.

Each branch of the SES has information on preparing for floods and other disasters, flood photos and volunteering .

For more information on flooding in your catchment area visit the flood web page at www.mhl.nsw.gov.au.

Many communities now have flood prevention or reduction strategies such as: restricting or not approving floodplain development; use of dams, diversions and levees; and building-raising or flood-proofing.

Soils

Why care about soils?

Soils are the basis of all life; providing the matrix that supports homes, dams, plants and soil life, while providing the nutrients, water and structure that supports plant growth. Soils also regulate water flow across the landscape and filter water; thereby, controlling stream flows and water quality.

Without healthy soils we would not have productive pastures, crops and livestock, water quality would deteriorate, fish stocks would be reduced and our lifestyles degraded. Management of soils at a local level has catchment-wide effects.

Maintaining or improving the quality of soils should be a key goal of all landholders. Hence it is vital for all landholders to understand the potentials and limitations of their soils and how different management activities affect them.

What are the soil characteristics of the northern rivers region?

The following are descriptions of Australian Soil Classification orders that occur within the Northern Rivers. The erodibility and erosion hazard are also described for each classification.

Anthrosols

Anthrosols are soils resulting from human activities. Their extent is very limited, generally being concentrated in urban areas and mineral extraction/quarry areas. These soils are extremely varied and can pose many management considerations.

Erodibility: highly variable.

Erosion hazard: highly variable.

Chromosols

Chromosols have a marked textural contrast but are mildly acid to alkaline, this being the major difference to the closely related Kurosols. These soils occur throughout the same areas as the Kurosols but tend to be more common in the drier parts of the region.

Erodibility: moderate to high.

Erosion hazard: moderate to very high on slopes; generally low to moderate on plains.

Dermosols

These are well structured soils that are commonly formed on basalts, but by no means restricted to them. Their depth is variable, generally up to 1 m, with a topsoil of clay loam to light clay and a subsoil of light medium to heavy clay. They are often dark and include the soils also known as Chocolate Soils. They are found west of Dorrigo, at Ebor, and east and northwest of Lismore including Kyogle and up to the McPherson Range. They are common soils of the steeper basaltic country, but also occur within alluvial plains and on other rock types.

Erodibility: Moderate to high.

Erosion Hazard: Moderate to high on slopes; generally low to moderate on plains.

Ferrosols

Ferrosols are friable red soils generally derived from basalt. As the name suggests, these soils are high in iron. Their red colour is due to high iron oxide content, which promotes good structure. The soil profile grades from a clay loam topsoil to a medium clay subsoil. These soils are often very friable and crumbly. Ferrosols are the dominant soils of basaltic plateaux at Cudgen, Alstonville, Dorrigo and Comboyne. They have also formed on high level alluvial terraces, such as at Jackadgery, and on other iron-rich rocks.

Erodibility: moderate to high. The excellent structure of these soils enhances water infiltration which offsets the effects of erosive overland flow, however the crumbliness of Ferrosols makes them very prone to water erosion if left bare.

Erosion hazard: generally moderate but can be very high to severe on cleared sloping land.

Hydrosols

These are wet soils of coastal and inland swamps and other poorly drained areas. Those on the coastal floodplains often contain potential acid sulfate soil materials. These wet soils are generally characterised by a bluish grey subsoil, a reflection of the lack of oxygen available. Inland, Hydrosols are generally localised soils that occur throughout the region in poorly drained areas, such as backswamps. Coastal occurrences of these soils can be extensive, with most of the cane growing country on the Tweed, Richmond and Clarence Rivers being dominated by these soils.

Erodibility: variable.

Erosion hazard: Given their location they are highly unlikely to erode. However, acid scalds associated with extreme acidity in some acid sulfate environments may be subject to wind erosion.

Kandosols

These soils are generally uniform throughout the profile and lack structure. They usually grade from a loamy topsoil into a clayier subsoil. These soils have an earthy fabric and have previously been called 'earths' (e.g red earths). Kandosols generally occur on the north coast as soils associated with a variety of other soils. They are more common on sedimentary, metamorphic and acid igneous rocks and their sediments. Kandosols are generally permeable, well drained and moderately to highly erodible. Areas within the region where Kandosols are more common include north west of Dorrigo, west of Sawtell, Bostobrick, and throughout the Burringbar and Blackwall Ranges in the Tweed and Richmond catchments.

Erodibility: variable, but generally high to very high.

Erosion hazard: Highly erodible

Kurosols

These strongly acid soils have a marked textural difference between the topsoil (usually a sandy loam) and the subsoil (a clay). They are also described as duplex soils because of this texture difference. They generally develop from sedimentary and metamorphic rocks, and acid igneous rocks such as granite or rhyolite. Kurosols can also develop on alluvial plains. These soils are extremely erodible once vegetation is removed so are best left under natural forest cover. Kurosols are widespread throughout the region, being a common soil in all the catchments. They are common in the high rainfall areas of the North Coast and may be associated with Chromosols and Sodosols.

Erodibility: moderate to very high.

Erosion hazard: Generally moderate to very high on slopes; low to moderate on plains. Very high in drainage depressions and drainage lines.

Organosols

Organosols are highly organic soils commonly known as peats. They are composed of vegetation matter in various stages of decomposition. Throughout the Northern rivers they are very localised and are often closely associated with Hydrosols. Main occurrences are the poorly drained swale areas within the coastal sand bodies, estuarine areas and other wetlands throughout the region.

Erodibility: low, but very prone to wind erosion if dry and exposed.

Erosion hazard: generally slight.

Podosols

Podosols are sandy soils with a bleached (white) horizon overlying subsoils that have accumulated organic matter and/or iron oxides. Subsoils of younger Podosols are usually weakly coherent coloured sand, those of older Podosols are often dark, compacted layers ('coffee rock'). The bleached horizon can vary from several centimetres thick in young soils to several metres in older soils. Podosols are the typical soil of the extensive coastal sand bodies, such as in Bundjalung and Yuraygir National Parks, but can also be found inland, derived from granites and quartz sandstones and their sediments.

Erodibility: high to very high, particularly prone to wind erosion.

Erosion hazard: High to very high on exposed, non-vegetated dunes and other sand bodies.

Rudosols

Rudosols are soils that lack any distinctive evidence of soil forming organisation (generally the development of horizons) other than a thin dark topsoil layer. Apart from the lack of soil horizons their properties are variable. They range from stony, shallow soils on steep slopes, to deeper sandy or earthy soils in areas of recent deposition, such as floodplains and dunes. Rudosols are best left under natural cover to reduce erosion hazard. These soils occur throughout the region, their location being governed by landform and landscape position more so than parent material. Rudosols will often grade into Tenosols.

Erodibility: variable, but generally high.

Erosion hazard: generally high.

Sodosols

Sodosols are mildly acidic to alkaline duplex soils with high levels of exchangeable sodium cations in the subsoil. They are similar to Chromosols and some Kurosols, the higher amounts of sodium being the main difference. When sodic soils are wetted, each clay particle becomes surrounded by a significant water film which forces the particles away from each other. When this happens, the clay particles are said to have dispersed. The dispersed particles are seen as cloudy water in runoff. Dispersible soils are of concern to farmers because they are easily eroded by water. Erosion in sodic soils is often in the form of gully and tunnel erosion. Sodosols are generally localised soils that occur within the lower parts of the landscape (where sodium accumulates) such as drainage depressions



IMAGE: Gully erosion- erosion in sodic soils is often in the form of gully and tunnel erosion.

and floodplains. Usually occurring as an associated soil with Chromosols and Kurosols, they are generally derived from sedimentary and metamorphic rocks, and acid igneous rocks.

Erodibility: very high.

Erosion hazard: high to extreme.

Tenosols

Tenosols are soils with some rudimentary soil development. They are similar to Rudosols but have better developed A horizons and some evidence of a B horizon, such as a change in colour. Like Rudosols, these soils are variable and have similar modes of occurrence. Can range from shallow stony soils to deep sandy or earthy soils. Tenosols occur in locations where soil development has progressed beyond that of Rudosols and/or parent material is dominated by quartz. They have developed throughout the region on footslopes in quartz sandstone country, on alluvium, on recent dunes and sand bodies and on some quartz sandstone and granitic rock.

Erodibility: variable, generally high.

Erosion hazard: generally moderate to very high.

Vertosols

These soils are also known as cracking clays due to their tendency to develop distinctive cracks when dry. Vertosols within this region are clay soils that have commonly developed on basalt and basaltic sediments. The main occurrence of Vertosols within the region occurs on the Richmond River floodplain upstream of Coraki, and on lower slopes and fans within basaltic hills of the Richmond catchment. The main clay mineral in these soils is montmorillonite which promotes significant shrinking and swelling with changing soil moisture contents. Gilgai ('melonholes') are a phenomenon associated with the high shrink - swell. Some Vertosols are described as self-mulching due to the development of a fine aggregate assemblage on the surface.

Erodibility: moderate to high.

Erosion hazard: generally slight to moderate on plains but high to very high on cleared lower slopes and fans.

How agricultural production and soil structural stability are affected by the geology of each catchment can be complicated and is best discussed with advisors in the NRCMA or Department of Primary Industries (agriculture) offices.

Geological maps of the region are available from www.dpi.nsw.gov.au/minerals/geological/geological-maps.

Why is soil acidity important?

Soil pH is a measure of the acidity or alkalinity of a soil. The pH scale ranges from 0 (most acidic) to 14 (most alkaline). Soil pH is commonly measured in three ways, using a: field test kit; 1:5 water solution (pHW) or; weak 1:5 calcium chloride solution (pHCa). A field kit is useful as a rough guide as to whether there are likely to be acidity problems in a paddock; these can be purchased from most produce stores.

However, laboratory pHCa tests should be used for management decisions, as they are more accurate than test kits and are less affected by fluctuations in soil salt concentrations due to rainfall or fertiliser application than pHW tests. Most agricultural soils in Australia have a pHCa of 4.5 to 9.

However, most hillslope soils in the region are moderately to strongly acidic (pHCa 4.0 to 5.0), with a tendency for the acidity to increase with depth. This is lower than the ideal for plant growth of pHCa 5 to 7. Alluvial soils of streambanks and floodplains, and soils derived from limestone or calcareous shale tend to have pHCa of 5 or more, but this is no guarantee and should always be checked.

Soil acidity affects the availability of essential and non-essential elements to plants and hence, their growth and survival. In the acid conditions of the coast:

- Large quantities of aluminium and manganese often become available. These can be toxic to plants if they occur in excessive amounts
- Bacterial activity is reduced. These microbes fix nitrogen in legumes and break down organic matter to available forms for plants, so less nitrogen and sulfur is available for growth
- Phosphorus becomes bound chemically to aluminium and so is unavailable to plants
- Less calcium, potassium and magnesium is present;
- Manganese can become available at toxic levels if the pHCa drops below 4.5
- Molybdenum becomes less available if the pHCa drops below 4.5

Many pastures and horticultural crops grown on the coast are tolerant of the acidity levels that occur on the coast. However, failure to address increasing acidity levels reduces the options of what can be grown and in the longer term can degrade soils so much that there is a permanent reduction in soil fertility.

The most common methods for addressing acidity problems are:

- Applying lime to neutralise surface acidity and prevent future subsurface acidity
- Building up organic matter to make more nutrients available and improve soil structure
- Replacing the nutrients that are removed by livestock or crops
- Choosing nitrogen fertilisers carefully and applying them in smaller split applications

To determine whether acidity is likely to be a problem for you and how to best manage it, seek advice from one of the advisory services (listed in the resources and contacts section) to find the best guides to correcting soil problems.

Why are acid sulfate soils important?

Acid sulfate soils are a special case of soil acidity peculiar to much of the floodplains. During the last major sea rise that occurred about 10,000 years ago, new coastal landscapes formed through rapid sedimentation. Bacteria in the organic rich sediments converted sulfates in the tidal waters and iron in the sediments to iron sulfides. As sea levels dropped, river-born sediments covered these iron sulfide rich sediments. As long as the iron sulfides layers remain waterlogged they cause few problems (called potential acid sulfate soils). However, if they become exposed to air (e.g. by drainage) the iron sulfides oxidise to form large amounts of sulfuric acid (actual sulfate soils). One tonne of iron sulfides can produce about 1.5 tonnes of sulfuric acid.

The release of sulfuric acid produces widespread environmental problems. As the acid moves through the soil it strips iron, aluminium, manganese, cadmium, etc from the soil. This can create soils that are so acid and toxic that few plants can survive. It can make water unsuitable for domestic, stock or irrigation use and corrode concrete, iron and steel structures. If sulfuric acid and aluminium reaches waterways in sufficient quantity, it can affect the entire aquatic food chain: altering plant composition, increasing fish diseases and occasionally causing massive fish kills.



IMAGE: Measuring soil pH using a field test kit (J.Mousley)

Because of the environmental risk from acid sulfate soils, councils have placed controls on any activities that are likely to disturb, expose or drain acid sulfate soils (e.g. dam building and drain cleaning). Developments requiring council approval are listed in Local Environmental Plans available through your local council.

The best way to manage acid sulfate soils is to know where they occur on your property and how far they are below the surface. This information can be obtained from environment officers in the shire councils, who can help determine your properties risk to acid sulfate soils (they have acid sulfate risk maps developed by the Department of Natural Resources), how they are best managed and what developments require approval.

Why is soil fertility important?

With some exceptions (e.g. alluvial soils on the floodplains and along rivers), coastal soils are mostly old, leached and of low to moderate fertility. Generally, there are multiple nutrients that are less than optimal for plant growth. These deficiencies: reduce the productivity of the land; limit the type of agricultural enterprise that can be run; make it harder to maintain high levels of ground cover; and increases the risk of erosion.

Soil tests are the most reliable way to determine what nutrient deficiencies are present. Soil analyses can be processed through local produce stores or directly with the testing companies. It is best to talk to an agronomist to determine the pros and cons of different tests.

While soil tests are the best way to determine the fertility status of soils, the colour of the soil (darker soils are usually better than lighter soils) and what plants are present can act as a guide in many situations. For example, carpet grass and spotted gum are most abundant on acid, lower fertility soils, while kikuyu and flooded gum are more abundant on soils with good water availability and higher fertility. However, plants composition can also be influenced by other past and present factors, so it is best to seek further advice.

Nitrogen and phosphorus are the most widespread and limiting nutrients to plant growth in the region. Nitrogen can be obtained from legumes, which fix nitrogen from the air, or from fertilisers. However, in pasture situations it is rarely economical to apply nitrogen fertilisers.



IMAGE: Looking at soil fertility in the field (J.Mousley)

To maintain the fertility of your soil:

- Test the soil regularly. How often the tests need to be taken depends on how much product is being removed from the property (e.g. dairies and croppers need to test every year, high stocking-rate beef cattle every 2-3 years and low stocking-rate beef cattle every 4-5 years)
- Replace the nutrients that have been removed
- Correct soil acidity to make nutrients available
- Recycle the soils nutrients.
- Try to ensure that livestock manure is returned to the paddock where the original feed was grazed – rotational grazing helps here
- Encourage soil organisms, such as earthworms and dung beetles
- Increase soil organic matter by such practices as retaining stubble, growing cover crops, mulching, including a pasture phase in a cropping system, and keeping soil disturbance to a minimum
- Include legumes in the pastures. This boosts nitrogen availability.

All fertilisers, whether natural or man-made, have the potential to cause environmental problems such as ground water pollution, eutrophication of waterways or soil acidification. Problems usually occur when fertilisers are applied too close to dams or streams, just before heavy rains especially when the ground cover is low) or too high a rate is applied.

Always seek advice on suitable rates and types of fertilisers to use from an agronomist or soil advisory service (listed in the resources and contacts section of this kit)

Why is organic matter important?

Organic matter is any living or dead animal or plant material and on farms it is primarily composed of plant litter and animal manures. It acts as a major source of nutrients for plants and as glue that improves soil structure. This in turn, reduces the chance of soil erosion, improves drainage and increases water storage. Organic matter is concentrated towards the soil surface. Any reduction in organic matter (from regular cropping, soil inversion by ploughing, over-grazing, etc) can lead to poorer plant growth and increased soil erosion.

Soil organic matter levels can be maintained or increased by: including a pasture phase in a cropping system; incorporating green manure crops; growing productive perennial pastures; not overgrazing pastures; adding manure and bulky organic manures (e.g. chicken litter); encouraging dung beetles and earthworms; and keeping soil disturbance to a minimum.

Why are soil depth and soil structure important?

When some house bricks are ground up and their nutrient content analysed, they appear to have the right balance of nutrients for plant growth. Obviously, however, house bricks are poorly structured for growing plants. The same is true of soils; they may have a good nutrient balance, but be poorly structured for plant growth.

Soil structure refers to the arrangement of soil particles into aggregates (the small clumps or clods that soils break up into when they are dug up) and the spaces between the aggregates. Soil structure determines how easily air and water can penetrate the soil and drain away, and whether the aggregates hold enough water for plant growth.

Soil structure combined with soil depth determines a soil's suitability as a growing medium for plants (also known as a soil's physical fertility).

Soil structure can be maintained or improved by:

- Increasing soil organic matter levels
- Removing stock from wetter paddocks
- Keeping vehicles and farm machinery off wet paddocks
- Maintaining a dense cover of perennial pasture
- Placing fences strategically, so that stock can be kept off wetter areas when needed
- Slashing or mulching paddocks rather than burning them
- Minimising soil disturbance
- Cultivating only when the soil moisture is right
- Deep ripping only if a compaction layer is present

How should soils be managed to keep them healthy?

Because of the variability in soils across the region, the potential of your property and the limitations of its soils should always be assessed before undertaking any land management activities. For further information on managing soils your local NSW DPI (agriculture) agronomist and Northern Rivers Catchment Management Authority can provide advice on these matters. (Listed in the resources and contacts section).

Landholders are encouraged to attend "Soil Health" field days (which gives landholders some simple tools to assess the chemical and structural fertility of their soils) and other workshop series that show landholders how to assess the natural potential and limitations of their properties using soil, slope and aspect.

One of the most useful overviews of soil management north coast is provided by the book "Soil Sense: Soil Management for NSW North Coast farmers. It describes the main soils on the north coast; the soil management techniques needed for each of the region's main agricultural enterprises and provides a farmer's A-Z of soil terms. Another useful publication, specific to soil erosion management is Saving Soils – A Landholders Guide to Preventing and Repairing Soil Erosion. Both publications are available from Northern Rivers Catchment Management Authority and NSW DPI.

There are also numerous free soil related publications on the NSW DPI website (www.agric.nsw.gov.au).

High levels of plant ground cover are essential for most soils on the coast to reduce erosion and sustain the production potential. Ground cover percentages that are required will depend on the erodibility of the soil and steepness of the land. However, most coastal soils require a minimum year-round cover of 90-95%. Drainage lines and steep areas are more prone to soil erosion due to greater volumes of water flow and higher flow rates, respectively. These areas should have 100% ground cover year-round.

In essence, maintaining healthy soils is about: maintaining healthy vegetation, high levels of ground cover and appropriate levels of fertility; addressing acidity; minimising soil disturbance and avoiding compaction or erosion.

Pastures

What terms do you need to know?

When discussing pastures it is useful to understand the following terms, as they are often confused:

- Native species are those that were present before European settlement (e.g. kangaroo grass and pitted bluegrass). Native pastures are pastures where native species predominate.
- Introduced species are plants that have been introduced from outside Australia (e.g. setaria and Rhodes grass).
- Improved pastures are where some management practice has substantially lifted production or quality (e.g. where clover and superphosphate have been oversown into native pastures or introduced species have been sown into a ploughed paddock)
- Naturalised species are plants that were originally introduced, but now do not require the intervention of people to persist (carpet grass and paspalum). Naturalised pastures are where production is dominated by naturalised species, but native species may still be abundant.

Why do I need to know about pastures?

For most landholders it is essential to be able to identify pasture species and know how to manage them as pastures form the basis of much of the agricultural production of the region. Mismanagement can lead to weed invasion, soil erosion and loss of profits.

Pasture species composition is a major determinant of pasture productivity, and hence, the type of stock enterprise that can be run and likely performance of the stock. Pasture species also provide information about the soils and/or previous management on a property (e.g. elastic grass grows on compacted soils, blady grass is abundant where pastures are regularly burnt and kikuyu prefers high fertility conditions).

A number of pasture species are noxious weeds (e.g. giant parramatta grass) and are required to be controlled under the Noxious Weeds Act 1993 (see "Weeds" in this kit). Controlling noxious and other problem weeds also makes for good neighbour relations. Other pasture species can cause stock problems at certain times of the year (e.g. white clover and bloat in cattle, setaria and bighead in horses).

Knowing these potential problems helps in managing the pastures. Native pasture management is regulated by the Native Vegetation Act 2003 (see "Native Vegetation" in this kit) and certain management activities (e.g. ploughing) need a permit. See your local Northern Rivers CMA for more information.

What are the characteristics of the pastures of the north coast region?

Due to the high, summer-dominated rainfall and relatively warm winters, pasture production in the area is best suited to, and is dominated by, tropical and subtropical warm-season perennial grasses. Most of the more fertile land and lower slopes are dominated by sown and naturalised species; the most common of which are Kikuyu, Setaria, Rhodes Grass, Paspalum and Carpet Grass. Kikuyu dominates fertile and deeper soils, where drainage is reasonable (e.g. floodplains and basalt plateaus), while Paspalum, Setaria and Rhodes Grass tend to occur where fertility or moisture are lower. Carpet Grass is most abundant on low fertility, shallow soils that have previously been disturbed.

In the earlier days of agriculture, virtually all potentially productive land was sown to introduced species. Hence, native pastures are only common where the soils are poor (shallow, steep or rocky), machinery can't gain access and/or rainfall is low. This tends to mean that they are most common in the steeper upper parts of catchments, in the west of the region and on sedimentary-based soils. Swamps are also dominated by native species: wetlands being a valuable grazing resource, as well as providing major bird habitat and fish breeding grounds. Even though native pastures tend to be less common than naturalised and sown pastures, far more species are present and they form an important store of native biodiversity. Some of the more common species are Kangaroo Grass, Blady Grass, Red Grass, Love Grasses and Barbed-wire Grass.

The dual challenges of pastures of the region are related to quantity and quality. Most pastures have a relatively short growing season (mostly late spring to early autumn) and produce little or no growth over winter. During the growing season, pastures can quickly get away from stock and rapidly lose quality as they mature. Slashing is one of the main tools used to maintain a better level of pasture quality (and control weeds).



Legumes are desirable to have in pastures as they provide nitrogen for grass growth and are high quality pasture components. While summer-growing legumes often do well in the north of the region, the growing season is too short and frosts too severe in the south for them to thrive. It is also relatively difficult to maintain winter-growing legumes at desirable levels, due to adverse climate (rain at wrong time of year) and soils (too acid and low in phosphorus).

The two main ways of meeting these challenges is 1) by matching stock enterprises to the pasture production cycle (e.g. weaner production) and 2) modifying pasture production to match the stock enterprise needs (e.g. using lime and phosphorus fertilisers to lift legume production, and silage making).

While winter-growing grass species could fill the winter feed-gap, the region's low winter rainfall and hot wet summers are generally unsuited to winter-growing perennials. While species such as Phalaris, Fescue and Cocksfoot were sown in the past, they rarely survived for more than 1 or 2 seasons, except on the higher plateaus. Winter-growing annual grasses have been more successful, with annual ryegrass and oats commonly sown.

How do I know what pastures I have?

Your NSW DPI agronomist can identify pasture plants for free. See your local NSW DPI (agriculture) for more information about "How to Collect Plants for Identification". While samples can also be identified by the National Herbarium, they charge landholders. Samples sent through NSW DPI (agriculture) incur no charge.

- The botanic gardens at Coffs Harbour also identifies plants for a small donation
- Northern Rivers Landcare Networks and other organisations and agencies commonly support and refer landowners to one-day workshops and various courses being conducted across the region for landholders. See your list of contacts for more information about workshops and courses in the supplementary section of this kit. Ask to be placed on the mailing list so you can be sent information regularly about courses and workshops that may be of interest to you. Most of these are free or subsidised to keep costs for landholders to a minimum.
- NSW DPI (agriculture) have produced a wide range of publications that can help you identify your pasture species and these are listed in their publications catalogue found at: www.agric.nsw.gov.au/reader/pastures. "Native and Naturalised Grasses" and "Paddock Plants", "Floodplain Grazing Project" is some of the topics covered in their publications and workshops.

How do I manage my pastures if I don't have stock?

If you are living in a bushfire prone area, a build-up in pasture mass can be a serious fire hazard for you and your neighbours. You need to maintain firebreaks and asset protection zones (see fire management later).

To control pasture build-up, consider:

- Agisting stock, if your external fences are in good condition (see your stock and station agent for more information). Having a written agreement stating all conditions of the agistment avoids misunderstandings. Note that if your boundary fences aren't in good condition, you may be liable for any damages caused by stock wandering from your property
- Slashing, if you only have a small area or you are not mechanically minded, contract slashing may be the best option: your neighbours will probably know a local contractor. If you intend to buy your own tractor and slasher, consult experienced neighbouring farmers as to the most appropriate machinery for the job (e.g. in steep or boggy country a 4-wheel drive tractor may be needed)

- Fire can be used as a hazard reduction tool in particular situations (see fire management later), but is not recommended as a general pasture management tool across a property. Burning can lead to adverse changes in pasture composition (e.g. increased percentage of the fire tolerant blady grass), increased erosion (as ground cover is reduced or lost) and weed invasion (reduced pasture composition unless great care is taken)
- Always control noxious and other problem weeds (see "what weeds have I got?"). Your control options will depend on the weed species and level of infestation. See your NSW DPI (agriculture) agronomist for more information
- Consider whether you need pastures at all. Is the area better suited to any other types of production and/or revegetation with local native species? Investigate all opportunities.

How do I manage pastures if I have stock?

While it is possible to run stock on pastures with only limited pasture knowledge, it is more likely that: adverse changes will occur without your realising the causes (e.g. regular burning causing the spread of blady grass, loss of biodiversity and soil erosion); it will be more difficult to get through the hard times; and profitability will be reduced. What pastures should be grown, where they should be grown and how they should be managed is a complex topic that depends on what mix of enterprise, landscape and soils are present.

General principles for good pasture management include:

- Thoroughly plan before undertaking pasture improvement.
- Always spend money first on areas which will give the greatest return – these are generally the flats, but only soil testing will tell.
- Always maintain appropriate levels of groundcover (in most situations 90%)
- Fence for better stock management and better pasture utilisation.



- Supply adequate watering points so that livestock utilise as much of the pasture as possible. The further pasture is from a watering point, the less likely it is to be utilised.
- Assess soil chemical and structural fertility to know what the most limiting factors to plant growth are.
- Apply sufficient fertiliser (man-made or organic) to meet the needs of the pasture species that are present.
- Know what pasture quantity and quality livestock require (and when), to help determine what type of pasture management would best match their needs.
- Sown and naturalised pastures need a well adapted and persistent legume component. Without it, desirable grasses will often be replaced by less desirable ones and stock performance reduced.

There are a number of sources available to build the knowledge that is needed for good pasture management:

- Your local NSW DPI (agriculture) agronomist or produce store agronomists can provide property specific advice as well as generalised advice.
- Various workshops, courses and field days run by NSW DPI (agriculture), Landcare and others are designed to develop skills in pasture and livestock assessment and management, help landholders develop skills and knowledge to assess their natural resources (pastures, vegetation, soils and topography) and better manage land and use.
- Check your local paper to find out when and where these courses and workshops will be held.
- NSW DPI (agriculture) publishes a wide range of information on pasture management. These are available from your local office and on the web at www.agric.nsw.gov.au/reader/pastures. Primenotes CD is a collection of about 5800 information sheets dealing with agriculture and natural resource management.



Native vegetation

What is native vegetation?

Native vegetation is any plant species that existed in NSW before European settlement. This includes trees, saplings, shrubs, scrub, understorey plants, groundcover (any type of herbaceous vegetation) and wetland plants.

What is the value of native vegetation?

Just part of the value of native vegetation is that it;

- provides pasturage for stock in difficult areas, where introduced pastures are unsuitable
- shelters stock from rain, wind and heat, improving their comfort and performance
- protects horticultural crops, increasing their yields
- shades and cools streams and dams, providing better quality drinking water and fish habitat
- filters water runoff, reducing nutrients leaving the land and causing algal blooms in streams and dams
- harbours wildlife; many of which help control agricultural insect pests
- stabilises soils and reduces erosion
- improves the value of properties
- provides aesthetic value
- supports biodiversity and ecosystem function

How are native and introduced vegetation different?

While introduced vegetation provides many of the same functions (see above) as native vegetation, it usually lacks certain valuable aspects such as;

- native pastures are adapted to low nutrients, acidity and drought and so can provide ground cover and stock feed on steep, unfertilised and shallow soils, where introduced pasture is unsuitable or too expensive to sow
- native grasses often form tall erect tussocks with spaces between plants; this provides valuable habitat for ground living birds, lizards, etc. Many introduced grasses are too dense or low growing to form a useful habitat (e.g. low dense mat of carpet grass)

- native forests typically have a high plant diversity. Few species tend to be sown in introduced plantations and their more uniform age and structure provides a less diverse habitat for other species to exploit (e.g. epiphytic orchids and ferns).
- native vegetation maintains a higher diversity of animals than its introduced equivalent. Many native animals are adapted to a diet of particular native plant species (e.g. koalas). The greater number of plant species and ages in native vegetation also provides a more diverse food source that is spread throughout the year.

What types of native vegetation are there in the northern rivers region?

The north coast has a very diverse range of native vegetation communities including rainforest, wet sclerophyll forest, dry sclerophyll forest, grassy woodlands, heathland, swamp sclerophyll forest, freshwater wetlands, estuarine and saline wetlands and grasslands.

The type of plant community can be a useful indicator of soil type and water availability. Rainforests occur on soils with the highest phosphorus and water availability. As soil fertility drops, eucalypts become more common. Wet sclerophyll forests (understorey with softer leaves such as rainforest plants and ferns) occur on the more fertile soils with good water availability.

On drier low-phosphorus soils dry sclerophyll forest (understorey with tough leaves such as acacias and heath) becomes more common. An abundance of kangaroo grass, blady grass and bracken in the understorey of sclerophyll forests is usually a sign of too frequent burning.

Heathlands occur on very low fertility soils, usually sands along the coast. However, it is not unusual to see scattered heath growing in hillslope pastures where soils are shallow and periodically waterlogged.

Swamp sclerophyll and wetlands occur on the floodplains where soils are periodically or permanently waterlogged.

Native grasslands are usually a good indication of soils that are unsuitable for intensive agriculture (e.g. crops or sown pastures). They mostly occur on soils that are not suitable for cultivation (e.g. steep, rocky) or are agriculturally poor (e.g. sandy, very acid, shallow or waterlogged soils). At the start of European settlement grasslands were not common (mostly along rivers), although grassland species also occurred in the understorey of forests. Extensive forest clearing for agriculture up until the 1940's, expanded the distribution of grasslands.



IMAGE: Flooded Gum

However, cropping and intensive pastures removed most native species, except where these practices were not suitable. Today grasslands dominated by native species usually only occur where machinery couldn't be taken or where it was uneconomical to plough.

What are the hazards to native vegetation?

In the early days of settlement, the greatest hazard to native vegetation communities was widespread clearing. Early settlers cleared large tracts of forest, mostly for beef cattle and sheep grazing. Towards the end of the 1800's dairying was taken up and rapidly expanded, until by the 1930's there were more than 1200 dairies in the Macleay alone. This increase in farming intensity led to further clearing; pasture improvement; and cropping in areas where today it wouldn't be considered viable. Frequent burning was also widely used to promote early spring pasture growth and for bushfire hazard reduction. This further reduced the extent of some communities (e.g. rainforests) and changed the structure of most others. For example, forest understoreys became grassier; there was less diverse habitat (e.g. fallen logs and tree hollows) and fewer species, while native grasslands were increasingly dominated by blady grass, a fire tolerant species.

The coastal floodplains also underwent significant changes. Originally, the floodplains were naturally inundated by water for long periods and wetlands covered much of the area. This limited the use of the fertile soils for dryland agriculture. Hence, in the 1900's, large-scale drainage works (mostly in the Macleay, Clarence and Richmond) were undertaken to remove floodwaters more rapidly and allow for the expansion of dryland agriculture such as dairying and later, cane farming. This led to the loss of considerable tracts of wetlands and more recently, acid sulphate soil management issues.

Since the mid 1900's, the profitability of agriculture has declined and less profitable areas have been taken out of production. In these areas widespread forest regrowth has occurred. Today, the greatest hazards to native vegetation communities on the north coast are no longer widespread clearing, but the degradation of what is left.

Many communities are fragmented and substantially modified by disturbances such as grazing, overly frequent fire, logging and weeds. Modified forests are not as valuable to biodiversity as the original old growth forests. Old growth forests are mature or over-mature forests that contain large old trees with many hollows and dead branches. They tend to have a more diverse understorey structure and species composition than other forests. These forests have been substantially reduced from their original extent and need to be conserved wherever present, as their loss has serious consequences for biodiversity.

Where native vegetation has become fragmented the patches created become isolated, especially where the land between is substantially altered for farming activities. This leads to a breakdown in species migration, dispersal, pollination and other functions required for functioning of the habitats. Ultimately, as the patches shrink, biodiversity declines, sensitive species become locally extinct and weeds invade.

To maintain the functioning and value of native vegetation these patches need to be linked by corridors within properties, between properties and at the regional level.

How can native vegetation be identified?

Unless you are experienced with plant identification, it is often most efficient for landholders to have an advisor identify their plants.

However, no agency deals with all plant communities and the species they contain, so you may need to visit several sources including

- Coffs Harbour Botanic Gardens Herbarium
- Botanical information service, Royal Botanic Gardens, Department of Environment and Climate Change, Sydney
- Agronomists in NSW Department of Primary Industries (agriculture) mainly for pastures.
- Environmental officers in local councils.
- National Park Rangers in the National Parks division of the Department of Environment and Climate Change.
- Most Landcare Offices will have species lists and publications for locally occurring species and plant communities.

It is best to ring ahead to ensure that someone can identify your plants (see resources and contacts section).

Alternatively, if you develop a Property Vegetation Plan (see management) through the Northern Rivers Catchment Management Authority, you will receive a property map and an assessment of the native vegetation present.

There are a number of useful books/CDs to help landholders identify native plants. Many of these are available from local libraries - Here are a few titles to get you started;

- *“Eucalypts and Angophoras of the North Coast of NSW”* by C.L. Bale (1996). Available from the United Campus Bookshop, University of New England, Armidale.
- *“Wildflowers of the North Coast of New South Wales”* by B. Kemp (2005).
- *“Grasses of the North Coast of NSW”* by H & C Rose and Tac Campbell (2006). Available from NSW DPI.
- *“Trees and Shrubs in Rainforest of New South Wales and Southern Queensland”* by J.B. Williams et al (1984). Available from the United Campus Bookshop, University of New England, Armidale.
- *“Rainforest Climbing Plants”* by J.B. Williams and G.H. Harden (1984). Available from the United Campus Bookshop, University of New England, Armidale.
- *“Field Guide to Eucalypts”* Volume 2 by M.I.H. Brooker and D.A. Kleinig (1990).
- *“Waterplants of New South Wales”* by G.R. Sainty and SWL Jacobs (1981). Available in libraries.
- *“Wetland Plants of Queensland. A field Guide”* by K.M. Stephens and RM Dowling (2002).

NSW DPI (agriculture) runs “Native and Naturalised Grasses” workshops, which covers how to identify and manage native species. Other workshops and field days on native vegetation are run by many different organizations in the region, so it is worthwhile joining your local catchment network to stay informed (contact your Landcare or NRM Community Support Officer).

How can the quality of native vegetation be assessed?

Assessing the health of your remnant vegetation is the first step in restoring the health of the native vegetation on your property.

Unlike other areas of the farm, untidiness is a positive feature of native vegetation: over-mature trees, dead trees, fallen logs, bush rocks, tree hollows and a diverse understorey of saplings, bushes and groundcovers are all vital to conserving biodiversity. For further information on how to assess the quality of native vegetation contact your nearest NRCMA office or Landcare Office.



IMAGE: Foambark seeds (J.Mousley)

How can native vegetation be best managed?

Expert advice in all aspects of the management of native vegetation is somewhat fragmented, partly because there are different goals (production, conservation) and many types of habitats. The best initial contacts are the Northern Rivers Catchment Management Authority and Landcare, as they have networks of contacts in native vegetation management and can advise as to what funding and training is available.

Other useful sources of information and advice can also be obtained from:

- National Parks division of the Department of Environment and Climate Change for conservation of most habitats. They also offer a range of conservation schemes (view at www.nationalparks.nsw.gov.au/npws.nsf/Content/conservation_partners)
- Agronomists in NSW DPI (agriculture) for production and conservation of native pastures
- Environmental officers in councils
- Private consultants (see “Environmental and/or Pollution Consultants” and “Natural Resource Consultants” in the yellow pages) for all habitats and management goals

While there are many books that are relevant to vegetation management, much of the information is available on the web.

Nearly all organizations provide their information on the web, which is now becoming the best place to access information. There are enormous numbers of articles available on every aspect of native vegetation management. The following will help you quickly link to them:

- www.northern.cma.nsw.gov.au for rules on vegetation clearing and many other issues
- www.npws.nsw.gov.au for biodiversity information and conservation management
- www.environment.gov.au for links to local, state and federal information
- www.wetlandcare.com.au and www.naturalresources.nsw.gov.au/care/wetlands/ for wetland management
- www.rivers.gov.au for riverine vegetation management and river landscapes free publications
- www.threatenedspecies.environment.nsw.gov.au/tsprofile/ for threatened species and endangered communities in the northern rivers region.
- www.greeningaustralia.org.au/index - native vegetation assessment, seed collection, free publications
- www.florabank.org.au/ seed collection and revegetation design information

What rules control the management of native vegetation?

While there are many pieces of legislation that may impact the management of native vegetation in rural NSW, the two major pieces of legislation are the; 1) Environmental Planning and Assessment Act 1979 and 2) Native Vegetation Act 2003.

The Environmental Planning and Assessment Act 1979 controls the extent and conditions of development on public and private land. Councils administer the Act at the local level through the development of local environment plans. The planning laws are quite complex and undergoing change, so it is best to refer to council before undertaking any development.

The Native Vegetation Act 2003 is the principle legislation controlling the management of native vegetation in rural NSW and is administered by regional Catchment Management Authorities. The key objective of the Act is to prevent clearing unless it improves or maintains environmental outcomes. Details of the legislation can be obtained from the Northern Rivers Catchment Management Authority, who has published a series of information sheets on the Act. The following is a brief outline of the Act and some of its implications for landholders.

The Act defines three types of native vegetation: remnant, protected regrowth and unprotected regrowth.

For the north coast, remnant vegetation is defined as any vegetation that has regrown before the 1st January 1990. However, remnant vegetation also remains remnant if it has regrown following illegal clearing or following clearing by natural causes (flood, drought, etc).

Regrowth is any vegetation that has regrown since 1st January 1990.

Protected regrowth is native vegetation that has been grown or protected for biodiversity conservation purposes with the assistance of public funds or is recognised as protected growth in a property vegetation plan, environment plan, natural resource management plan or interim protection order. If none of these circumstances apply, then it is classed as unprotected regrowth.

The Act makes it an offence to clear native vegetation unless:

- there is an approved property vegetation plan
- development consent has been obtained
- the vegetation is unprotected regrowth
- for certain types of groundcover
- for approved routine agricultural management activities (RAMAs)
- for continuation of existing cultivation, grazing or rotational farming practices; or for sustainable grazing

The Act does not apply to certain types of clearing authorised under other legislation, such as the Rural Fires Act 1997, State emergency and Rescue Management Act 1989, etc.

A property vegetation plan is a voluntary, but legally binding, agreement developed in conjunction with your catchment management authority. It may address matters such as thinning, clearing, identification of regrowth and the continuation of farming practices. A property vegetation plan is the primary means by which landowners can take advantage of funding being offered by the government for conservation on private land (e.g. fencing, off-stream water supplies and weed control).

RAMAs are farming, safety and other activities where necessary clearing of native vegetation does not require approval under the Native Vegetation Act 2003. These activities and the extent of clearing permitted on the north coast is defined in the information sheet "What are the exemptions for routine agricultural management activities in coastal CMAs?" available from the NRCMA website. www.northern.cma.nsw.gov.au or from CMA offices.

Where illegal clearing is occurring, CMA officers have the power to stop the work, order remedial work and undertake criminal prosecutions.



IMAGE: Cat's Claw Creeper (*Macfadyena unguis-cati*) showing the thick main vine which has been cut and the vine still clinging on the tree.

Weeds

What is a weed?

Weeds are simply plants growing where they are not wanted. They may be any species of plant, including algae, ferns, grasses, forbs, vines, shrubs and trees.

Why care about weeds?

28,000 plant species have been introduced to Australia since European settlement. This is more than the total number of native plant species - 25,000 (source Weeds CRC, 2005). Over 2500 of these introduced plants are now established in the wild, and this is increasing at 10% per year, 65% of these established invasive plants have escaped from parks and gardens, and many are still traded. Of the 460 pastures and legume species trialled in northern Australia between 1947- 1985, 21 proved useful and 60 became weeds – 13 of these are now serious crop weeds. Others have become serious threats to the ecology of Australian landscapes. The cost of weeds to Australian agriculture now exceeds \$4 billion per year - no estimate has been made of the cost to the environment.

Invasive plants and pests are second only to clearing as a cause of biodiversity loss. Invasive plants out-compete natives, change the habitat, and force out the Australian animals and birds. This can lead to local extinction of rare plants and animals. Invasive plants threaten the integrity of some of our most valued places.

The Northern Rivers Invasive Plant Action Strategy is one of the first documents of its type to pull together the needs of various weed managers; and to facilitate a coordinated and catchment approach to invasive plant management. It recommends actions which will enable a strategic approach to the management of weeds, and their capacity to rapidly establish, travel downstream of catchment's headwaters, and spread across regions. This strategy, emphasises the importance of preventing new weeds from establishing and the need to respond quickly to incursions as these are the most cost-effective techniques for managing weeds. The document is available from local councils and the NRCMA offices and website.

Rural landholders need to be aware of the different weeds on their properties as different species can

- poison stock (e.g. red lantana)
- reduce pasture production and quality (e.g. giant Parramatta grass)
- harbour pest animals (e.g. lantana and rabbits)
- cause injury (e.g. spear thistle and Honey Locust)
- degrade natural habitats (e.g. cat's claw creeper smothers Riverine vegetation)
- increase soil erosion (e.g. willows and camphor laurel along streams and annual weeds in pastures)
- taint milk and meat products (e.g. Hexham Scent)

Weed control often represents a considerable cost in both time and money. This is because the climate is ideal for weed growth and weeds often grow in areas that are difficult to access. Control costs tend to rapidly increase, and available control options decrease, with weed density and extent.

What types of weeds are there?

There are several terms for weeds that are often confused by landholders and which can have important implications for actions landholders need to take.

Noxious weeds are plants that are declared to be noxious under the Noxious Weeds Act 1993. To be declared noxious, a weed must have a detrimental effect or cause serious economic loss to agriculture, to the environment or human health. However, a weed meeting these criteria will only be declared noxious if there is a reasonable and enforceable means of controlling the weed (e.g. although fireweed is a serious weed of pastures, it is not declared noxious in the Macleay or Hastings as it is no longer regarded as feasible to control it). The declarations may be on a state or local basis, each district on the north coast having its own declarations.

The Noxious Weeds Act 1993 requires that landholders and/or the occupiers of land must control noxious weeds on land under their control. Occupiers may also be responsible for noxious weeds along riversides or other watercourses and on adjoining unfenced roads even though the land is not their property. Each noxious weed is given a category that specifies the degree of control that is required (see "Noxious Weed Guide") provided with this kit or available from local council offices and weed authorities listed in the resources and contacts section.

On the north coast, local councils are responsible for enforcing control of noxious weeds on council land, private land and vacant crown land.

Each council or weeds authority employs weeds officers whose duties include the inspection of private land for the presence of noxious weeds on private property. Where noxious weeds are found, the officer will notify the landholder and provide control advice. If they are not satisfied reasonable and effective measures have been undertaken they can resort to legal action, issuing fines or undertaking control measures at the owner's expense.

Noxious weeds are costly for rural landholders and the environment. Poisonous weeds are weeds that are toxic to stock and/or humans. There is no legal obligation for poisonous weeds to be controlled unless they are also declared noxious,

but it is in the best interests of landholders who are carrying stock to do so. Many stock die each year in the region from eating poisonous plants, so an animal's natural instinct to know which plants are good for them cannot be relied on. Poisoning can occur whether an animal has been on the property its entire life or has just been moved from another area. The seriousness of a poisonous weed depends on the weather and the plant's toxicity and palatability (e.g. mother of millions is highly toxic, but rarely eaten: however, during drought it may be eaten as nothing else is available).

Some of the most prevalent poisonous weeds for rural landholders on the north coast are red-flowered lantana, bracken, green cestrum and crofton weed (for horses).

Environmental weeds are plants that invade natural areas. Some of the effects of environmental weeds are that they: impede or suppress natural vegetation; prevent regeneration of indigenous plants; disrupt or displace native animals; and create habitat for pest animals. Environmental weeds are the major threat to conserving, restoring and rehabilitating native vegetation on the north coast. Generally, plant communities will naturally regenerate if weeds are suppressed: hence, weed management is the primary tool for conserving native vegetation.

Some of the most costly and aggressive weeds for rural landholders on the north coast are red and pink flowered lantana, cat's claw creeper, madeira vine, coastal morning glory, cocksbur coral tree, small and broadleaf privet, camphor laurel and water hyacinth. Your local Landcare office, local council and NRCMA office will be able to provide you with a list or fact sheet on how to recognise and appropriately control environmental weeds in your locality.

Agricultural weeds are plants that have a detrimental affect on agricultural production. They may affect grazing enterprises by replacing desirable species e.g. Giant Parramatta grass, inhibiting stock from grazing e.g. dense stands of spear thistle or poisoning e.g. fireweed. Some of the agricultural weeds that are widespread and resulting in significant costs are red and pink-flowered lantana, giant parramatta grass, fireweed and spear thistle.

Riparian corridors are particularly susceptible to weed invasion and are often invaded by multiple weed species. This susceptibility to invasion is a result of the natural disturbance processes associated with flooding, favourable environmental conditions and the continued input of weed propagules from upstream and adjacent areas. The impacts of human activities have also increased the likelihood of weeds establishing in



IMAGE: Cats Claw Creeper smothering riparian vegetation (D. Repschlager)

riparian areas. However, well designed weed management programs can achieve positive outcomes in riparian areas. For more information on managing weeds in riparian areas (and links to riparian management advisors) visit the NRCMA website www.northern.cma.nsw.gov.au/publications_project_report_library and download "Habitat Management Guide: Weed Management in Riparian Areas" and other useful publications or contact your nearest NRCMA or Landcare office.

Whether a weed is declared a noxious, environmental or agricultural weed will depend on the location or district within each state.

How can weeds be identified?

Where weeds are found it is essential to get them positively identified as the species determines;

- the seriousness of the weed (giant parramatta grass is far more serious than african parramatta grass);
- how it is spread (fireweed has wind blown seed, while parramatta grasses have sticky seeds that are spread by stock and vehicles);
- what management practices may need to change to prevent re-infestation (spear thistle flourishes where there is high nitrogen availability)
- the timing and methods of weed control (much money is often spent using the wrong chemical on the wrong weed).

There are no guides that cover all the weeds of the north coast. Hence, it is often most efficient for landholders to have one of the following advisors identify their weeds and provide management advice:

- Agronomists in NSW Department of Primary Industries (agriculture) for pasture and cropping weeds;
- Horticultural Officer in NSW DPI at Coffs Harbour for horticultural weeds;



IMAGE: Cat's Claw Creeper flowering (Queensland DPI and Fisheries 2000)

- Noxious Weeds Officers located in councils and Far North Coast Weeds Authority for noxious weeds;
- Agronomists at local agricultural produce stores for agricultural weeds;



Fire Weed



Giant Parramatta Grass



Spear Thistle

- Private consultants (see “Environmental and/or Pollution Consultants” and “Natural Resource Consultants” in the yellow pages) for all weeds
- Landcare officers for all types of weeds (see contact list for nearest office)

Where the above advisors cannot identify the weeds, samples can be forwarded to the Coffs Harbour Botanic Gardens herbarium and Botanical information service (Royal Botanic Gardens, Department of Environment and Climate Change) in Sydney for identification. However, these organisations do not provide management information. Ensure weed samples collected are suitable for identification.

There are a number of useful books to help landholders identify weeds. Many of these are available from local libraries and bookshops. The following will be useful;

- *“Weeds: An Illustrated Botanical Guide to the Weeds of Australia”* by B.A. Auld and R.W. Medd. (1987)
- *“Noxious Weeds of Australia”* by W.T. Parsons and E.G. Cuthbertson. (1992)
- *“Poisonous Plants: Handbook for Farmers and Graziers”* by E.J. McBarron (1983)
- *“Bush Invaders of South-east Australia: a Guide to the Identification and Control of Environmental Weeds Found in Southeast Australia”* by A. Muyt (2001)
- *“Weeds of the South – East. An Identification Guide for Australia”* by F.J. and R.G. Richardson and R.C.H. Shepherd (colour photographs and descriptive text).

Two useful publications for the Richmond Catchment -

- *“Subtropical Rainforest Restoration”* (1998). A practical manual for landowners and land managers on caring for rainforest remnants and establishing rainforest plantings (1998) - produced by the Big Scrub Rainforest Landcare Group.
- *“Common Weeds of Northern NSW Rainforests”* (1998). A practical manual on their identification and control - produced by the Big Scrub Rainforest Landcare Group.

The following are available from NSW Dept of Primary Industries district offices;

- *“Noxious and environmental Weed Control Handbook”* by R. Ensby (2005).
- *“Weed Control in Lucerne and Pastures”* by J. Dellow et al (2004).

IMAGE: Madeira Vine (*Anredera cordifolia*) flowering (J. Mousley)

A range of weed information sheets and booklets are listed in the “NSW DPI publications catalogue”

Various organisations run “Weed Identification and Management” field days.

Some of the most useful weed identification and management web sites (containing photos) are;

- North Coast Weeds Advisory Committee at www.northcoastweeds.org.au
- NSW Department of Primary Industries at www.agric.nsw.gov.au/reader/pests
- CRC for Australian Weed Management at www.weedscrc.org.au
- Weeds Australia at www.weeds.org.au

How can weeds be managed?

Weed management does not equal weed elimination. It is rarely physically or economically possible to fully remove all weeds and their seeds and exclude further entry. Weed seeds are constantly being imported by means over which landholders only have limited control (e.g. wind, water, vehicles and animals).

Like all plants, weeds need light, water and nutrients to grow. Situations that free these resources up increase the opportunity for weed establishment. Hence, the principles of good weed management are to limit the availability of weeds to be able to utilise these resources and limit the availability of these resources to weeds that are present.

Common situations in rural landscapes that make these resources available to weeds on the north coast are;

- **Poor ground cover** – most weeds need an open area to establish, as this provides them with light, water and nutrients to grow. Often the openings do not need to be for long periods or large in size. Hence, maintaining high ground cover year-round is necessary to limit weed establishment. This can be achieved by: using stocking rates, fertiliser rates and species that are best suited to the conditions; controlling bushfires; limiting the use of fire as a management tool; fencing conservation areas and streams; and mulching. Sometimes decreases in ground cover can't be helped, as during (and after) droughts, floods and fires. However, good management (early destocking in drought, provision of sacrifice areas, provision of firebreaks, extra vigilance, etc) can greatly minimise these effects.
- **Soil disturbance** – most areas have a large buried weed seed bank, even in what appears to be pristine native vegetation. However, most weed seeds won't germinate unless they are brought to the surface by soil disturbance, as many seeds require light to germinate. Disturbance also frees up nutrients and water for weed growth. Always consider the consequences of any action that are likely to cause soil disturbance and whether a better alternative is available.

- **Fertiliser usage** – most native vegetation is adapted to low nutrient soils and can't fully utilise high levels of nutrients. Hence, adding moderate to high rates of fertiliser to native pastures often just frees up nutrients for use by weeds. Conversely, many introduced plants (e.g. kikuyu; a common and desirable pasture species) require high nutrient levels to be vigorous and competitive. If nutrient levels become sub-optimal, the vigour of the desired plants can drop, releasing resources for the use by weeds.

Basing fertiliser applications on soil tests and plant needs will minimise weed invasion.

Weed management strategies should limit the:

- 1) entry of weeds onto the property
- 2) establishment of new weeds
- 3) spread of established weeds between areas within the property
- 4) abundance of established weeds (if they are causing problems).

Unfortunately, many landholders only address established weeds, yet this is the most costly and time-consuming strategy.

Good farm hygiene can go a long way towards limiting weed entry, spread and establishment on a property

- Keep new stock in a holding paddock for up to a week to allow weed seed to pass through their system
- Don't let machinery drive across a property unless it has been thoroughly cleaned. Machinery and stock are the main means by which giant parramatta grass is spread around the coast.
- Keep machinery to set tracks if it must be driven on the property
- Regularly slashing along the main entrance to the property
- Use equipment in the cleanest paddocks first. Paddocks with noxious weeds should always be last.
- Have a washdown area and thoroughly cleaning equipment after use on weedy paddocks

- Only feed out introduced feeds (hay, silage) within set areas. These areas should preferably be arable, in case it needs to be resown.
- Regularly inspect for new occurrences of weeds, especially around holding yards, washdown areas, sheds, tracks, creeks and feedout areas.

Often several weed control methods will be needed, varying with the location, density and area of weed infestation, as well as the vegetation community in which the infestation occurs. Always obtain advice on the best strategy (see advisors under "How can weeds be identified?").

The main control methods available are;

Hand – cheap and useful for small infestations, but time consuming e.g. hoeing, hand pulling

Mechanical – moderate to high cost, but useful for large continuous infestations e.g. slashing, mowing or ploughing

Cultural – cheap to expensive. Often has beneficial side effects, such as more productive and profitable pastures e.g. grazing, competitive pastures or cropping in extremely weedy situations

Biological – introduced pests and diseases of weeds

Chemical – cheap to expensive, but has environmental and human hazards (the Pesticides Act 1999 places conditions on the use of herbicides – see Pesticide usage). Generally used where the above methods are ineffective.

Other points to consider in weed management are;

- If weeds are to be removed, what will fill the gap in the short-term (e.g. placing mulch over a bared area) and long-term (re-invigorated pastures or native species to replace weeds), otherwise weeds will keep returning.
- Established agricultural weeds (e.g. fireweed) in production situations are not always economical to control until they reach a certain threshold density.



IMAGE: Green Corps team removing weeds from bushland (J. Mousley)

Bush regeneration

Bush regeneration involves the control of weed species in situations where the recovery of native vegetation (rainforests, riparian areas, remnant bushland etc.) requires careful treatment and specific outcomes. Bush regeneration is usually carried out by experienced operators who are able to assess and implement the required weed control, usually in accordance with a management plan that is prepared for the areas rehabilitation. Bush regenerators often work in teams of 2 – 4 people depending on the extent of the work and will use various methods to achieve the weed control without harming the native vegetation or causing erosion. Initial work often requires follow up treatment to control emergent weeds – the soil beneath large weed infestations (e.g.; camphors, cockspur coral tree, privet, lantana, vine weeds, etc.) can be full of weed seed or propagules along with native species. Vine weeds such as cat's claw creeper have a serious network of underground tubers that can grow back even when the vines are removed or cut. Other weeds may have varying survival mechanisms - making their control difficult and costly e.g.; Mother of Millions can grow from a single leaf that falls to the ground. Be sure to remove all weed seed and potential growth from the site to help prevent the re-establishment of weed species.

If you have noticed certain plants are taking over your patch of bushland, wetland, rainforest, river or creek bank then seek advice on the situation as soon as possible. There are various funding opportunities available for landholders who wish to undertake activities that control the spread of invasive plant species.

(See resources and contacts section of this kit for bush regeneration advice - including all Landcare offices). There are various publications which cover how to identify and control weed species available on the websites listed in the section on How Can Weeds be Identified?



IMAGE: *Ochna serrulata*, weed of rainforest and riparian zones (B. Jarman)

What approvals may be needed to undertake weed control?

Whether an approval is needed will depend on the location, type of weed and form of weed control being undertaken.

Listed below are the approvals that are, or may be, required from different bodies.

- Rural Fire Service approval is required to burn off in the bushfire danger period
- Council approval is required from all councils to; work on roadsides, on land zoned as Environmental Protection and areas identified as significant vegetation and wildlife corridors, for some tree species covered by a Tree Preservation Order and for earthworks (e.g.; on floodplains because of acid sulphate soils disturbance and Riverine zones because of the possibility of bank erosion)
- Northern Rivers Catchment Management Authority approval may be required for the control of native weed species e.g. native peach and blady grass, for the control of non-native weed species where the works will also clear native vegetation and to carry out certain earthworks within 40m of a watercourse.
- Department of Lands approval is required for all activities affecting crown land unless specified in the lease.
- National Parks (Department of Environment and Climate Change) approval is required if your work will affect threatened species, populations or ecological communities or aboriginal relics or sites.
 - Consult with National Parks if you will affect flora/fauna and require consent from councils or other departments.
 - Consult with Department of Water and Energy if weed clearing or any vegetation disturbance is to be carried out on a river or stream bank. www.dwe.nsw.gov.au
- Department of Urban Affairs and Planning approval is required if undertaking development affecting wetlands, littoral rainforests or koala habitat
 - Environmental Protection Authority (Department of Environment and Climate Change)
 - A licence is required if you will pollute waterways (including herbicides)
 - A permit is required to use an unregistered pesticide, or a pesticide contrary to the label

Pesticide usage

The Pesticides Act 1999 regulates the transport, storage and use of pesticides. Pesticides include bactericides, baits, fungicides, herbicides, insecticides, lures, rodenticides and repellents. Under this act, training is compulsory for commercial users of pesticides. (see "New Law for Training People Who use Pesticides in Their Work").

If a landholder employs a contractor to apply chemicals on a property, it is their responsibility to ensure the contractor is suitably qualified. Be aware that the landholder can be held liable if they fail to provide essential information, provide wrong or misleading information, or coerce or pressure a contractor so that pesticide misuse occurs (see "Pesticides Act 1999: your Responsibilities").

Pesticides are often toxic to non-target organisms. Always follow the instructions on the label and never apply herbicides close to waterways unless the product is specifically designed for that purpose.

Chemical users face the problem of what to do with their empty chemical containers. Since 1999 chemical users have paid a 4c a litre levy on pesticide products to fund drumMUSTER; a program to help chemical users dispose of containers. Normally drumMUSTER collections are organised by local councils. Enquire with the local council or reseller to determine when the next collection will be run. All that is required of the user is that the containers are cleaned immediately after use and stored in a safe location until collection.

For more information on pesticide usage, talk to local advisors listed under "How can weeds be Identified" or visit NSW DPI's website at www.agric.nsw.gov.au/reader/pests.

NSW DPI (agriculture) also regularly publishes the free "Noxious and environmental Weed Control Handbook" and "Weed Control in Lucerne and Pastures", which are available from their offices.

Information on the Pesticide Act 1999 is available from the Environmental Protection Agency at www.epa.nsw.gov.au

Pesticide training courses are organised by NSW DPI (agriculture) and TAFE (www.lg.tafensw.edu.au/smarttrain), ChemCert (NSW) Ltd. (02 93874714 or www.chemcert.com.au) and NSW farmers Association (0268848822 or www.nswfarmers.org.au). Other training organisations are listed in the yellow pages under training organisations.

Information about DrumMuster is available at DrumMUSTER (www.drummuster.com.au)



IMAGE: Nymboida River - D. Repschlager © Clarence Landcare Inc.

Water

Why worry about water?

While the north coast has a high annual rainfall, it does experience extended dry periods, usually from late autumn to late spring. During this time, rain is often light, with little runoff to replenish streams and dams, and domestic water usage typically exceeds water-tank replenishment.

Predictions (based on climate modelling) suggest there will be a slight increase in summer and autumn rainfall and a decrease in winter - spring rainfall. Evaporation rates will be higher due to the increased temperatures, further reducing the effective rainfall, particularly in the spring. The impacts of climate change will mean more prolonged dry periods, particularly in inland areas of NSW.

Even during the high summer rainfall period, water usage can exceed storage, as water usage rises dramatically. The north coast also suffers from drought. While it isn't possible to totally drought proof your property, rural landholders that plan their water supply are much less susceptible to the affects of dry periods than their unprepared neighbours. The alternatives to good planning can be expensive (e.g. reliance on water carriers, selling off stock during unfavourable prices, death of horticultural crops, etc).

The quality of the waters in our rivers and aquifers is naturally influenced by inputs of salt and nutrients from the surrounding landscape and its geology. However, water quality can also be degraded by a wide range of factors including point source activities (such as sewage discharge, mine wastes) and diffuse source activities such as land clearing and cultivation, urban and agricultural development.

How landholders manage their water supplies also affects: the quality and quantity of domestic, stock and irrigation water for downstream users; fish stocks; wildlife (e.g. waterbirds); and the recreational and aesthetic values of waterways throughout the catchments.

What regulations control rural water usage?

The Water Management Act 2000 and Water Act 1912 control the extraction and use of water, construction of dams and activities in or near water courses in NSW. Extraction of sand and gravel from waterways is only allowed under an approved DWE permit. However, local environment plans also place controls on what activities can be undertaken. Hence, it is always best to contact the resource access officer in the Department of Water and Energy (DWE) at Grafton and local shire council to obtain the latest information and determine what approvals are needed for activities that extract or use water or occur near water sources (including floodplains).

As part of the national water reform process, the Water Management Act 2000 is gradually replacing the Water Act 1912. Only a brief summary of the Acts implications for landholders is provided here.

The latest copy of the Water Management Act 2000 is available from the NSW government legislation site and NSW DWE website at http://www.dwe.nsw.gov.au/water/leg_policy.shtml

The Water Management Act provides for NSW to be divided into areas, each of which will have a water management plan. Currently, there are several water sharing plans in place on the north coast, information on these can be accessed on the Department of Water & Energy website; www.dwe.nsw.gov.au/water/sharing

Water management plans address water sharing, drainage and floodplain management and water source protection.

All rural landholders in NSW currently have rights to access water for their basic needs. These are domestic and stock rights, harvestable rights in farm dams and native title rights.

Landholders, who own or occupy land that includes a riverbank or lake edge or that overlies an aquifer, can take water without a licence for stock (not intensive industries) and domestic use. However, the water cannot be used for irrigation, crops that will be sold or bartered or for washing down machinery sheds; these still require a water use licence.

Landholders are also allowed to capture up to 10% of the average regional rainfall runoff on their property; capture in excess of this requires licence (see dams). The captured water must be stored in dams, but can be used for any purpose, including crop irrigation.

However, the amount stored is unlikely to be sufficient for a significant area of irrigation. Anyone who holds native title rights to water under the Native Title Act 1993 can take water for personal, domestic and non-commercial needs.

During dry times, restrictions may be placed on the amount of water that can be extracted. Prior to water management plans, commercial use (e.g. irrigation, dairies, aquaculture and intensive animal production) of water requires a licence. When water management plans are put in place, licences will be converted to water access licences. The licences will be allocated to individuals rather than properties, allowing users to purchase water from licensed users who are not extracting their full quota. All water plans will define rules for extraction during low river flows, such as when pumping is not permitted and how much water can be taken at different flow levels.

In addition to water access licences, approvals are required under the Water Management Act to undertake water supply (e.g. bores) drainage and flood works, and to remove material from land, dump material on land or undertake any other activity within 40 metres of a river that affects the quantity or flow of water.

More information on water management plans can be found in the information sheets "Overview of Macro Water Plans" and "Benefits of Macro Water Plans", which are available from DWE offices or at www.dwe.nsw.gov.au/water/macro/.

How much water do you need?

How much water is needed on a property depends on many factors, such as: the source of the water; the number of people and stock; whether it is to be used for fire fighting; and the properties' location (hotter, drier areas further from the coast lose more dam-water to evaporation). See the DWE information sheet "How much water do I need for my rural property" that will help you estimate your water requirements.

http://www.dwe.nsw.gov.au/water_trade/rights.shtml

How much water have you got?

The maximum amount of water that can be stored on a property at any time can be estimated from the dam capacity (see the information sheet "Farm dams – What size are your existing dams?") available on the DWE website, bore and river-pump flow rates and water-tank volumes. These figures can be used to seek advice about the sufficiency of your water supply from the resource access officer in DWE at Grafton, local suppliers (e.g. water-tank suppliers and local dam contractors) and neighbours.

Although the volume of water potentially available to your property may appear large, its reliability for different uses during dry periods can vary because: river water quality often deteriorates during low flows; smaller streams may completely dry up; bores and wells may become increasingly saline when water levels are drawn down too far; and rainwater capture by roofs may be insufficient to refill water-tanks except in wet periods.

How you meet the difference between what you need and what you have depends on the reliability and cost of different water sources. One of the simplest ways to conserve water for domestic use is to use water tanks to capture rainfall runoff from home and shed roofs. To get the most from your water supplies read "Farm Water", listed in the NSW Department of Primary Industries (NSW DPI) publication catalogue.



IMAGE: Coastal wetland (Julie Mousley)

Bores and wells

Accessing water from an aquifer under a property doesn't require a licence for stock and domestic use. However, the bore or well must be licensed (no charge) through the licensing unit of the DWE. Water use for other purposes also requires consent from the licensing unit. If you are considering constructing a well or bore on the floodplains, seek advice from your local shire council first, as planning permission is needed for works which may disturb acid sulfate soils.

The flow rate and quality of the water needs to be determined to assess its adequacy for different uses; many aquifers are too saline for certain uses or become increasingly saline as the water level is drawn down. There are also a range of metals, such as iron and aluminium, which affect water quality. Information about the location and depth of aquifers in your region can be obtained from the resource access officer at the DWE in Grafton. The DPI (ag) can undertake water testing for stock and irrigation purposes, but not for domestic use. Contact your resource access officer in DWE at Grafton or local council for drinking water testing laboratories. Advice about the flow rates of bore and river pumps can be obtained from the irrigation officer in the DPI (ag) at Grafton or from local suppliers of equipment (see yellow pages).

Dams

If you are intending to build a dam, seek advice from the resource access officer in the DWE at Grafton and your local council, as consents are required in a number of circumstances, including:

- if the total volume of all dams on a property will exceed the harvestable rights limit. However, if you find the dams currently on the property exceed the harvestable limit, you also need to obtain a licence from the licensing unit of the DWE
- if the dam is to be constructed on a floodplain. As it may divert flood flows, consent is also required from the licensing division
- for dams with an area of more than 0.5ha and located: in or within 40 metres of a natural waterbody, wetland or environmentally sensitive area; or in an area with high watertables, acid sulfate soils or saline soils. In this case DWE approval is needed
- if any new dam, or alterations to existing dams, affects fish passage, then consent may be needed from the DPI (fisheries).
- farm dams that are part of your harvestable rights can be located on hillsides, gullies and minor watercourses. The definition of a minor watercourse and how to work out the stream order is explained in the information sheet "Farm



dams – where can they be built without a licence?” on the DWE website www.dwe.nsw.gov.au/water/farmdams/factsheets.shtml or by contacting their resource access officer. If you wish to build the dam on a permanent river or creek you will need to obtain permission from the DWE first.

You will need to calculate whether your maximum harvestable rights dam capacity (MHRDC) is, or will be, exceeded if you want to: irrigate from dams; build a new dam; or sell part of your property (subdivision of a property can mean one part may then exceed its MHRDC as this is based on the area of each new property). In all cases, if the MHRDC is exceeded, a licence will be required. How to calculate your MHRDC is described in the information sheet “farm dams – what size can you build without a licence?” on the DWE website or by contacting the resource access officer in DWE at Grafton.

Depending on how they are constructed, dams can either be rather sterile places or a haven for wildlife. Dams provide for wildlife if they have: a range of water depths near the edge; reeds, rushes and other water plants; surrounding and overhanging woody native vegetation; and refuge areas (e.g. fallen logs, dense shrubs or central mound). It is also beneficial to restrict the access of stock, so the entire dam bank isn't trampled.

One of the benefits of building a dam that considers biodiversity conservation is that it also provides better quality drinking water as: vegetation above a dam filters sediments out of the water, reducing eutrophication and algae growth; overhanging vegetation cools the water; and exclusion of stock from much of a dam's edge reduces faeces and urine entering the water. Water quality can also be protected by maintaining a (approximately) 20m spray and fertiliser buffer around a dam, combined with high ground cover.

For a fuller discussion of how to create a dam for stock and/or wildlife, read;

- **“Farm Dams. Planning, Construction and Maintenance”** by B. Lewis (2002), which is available from the DPI bookshop
- **“Planting Wetlands and Dams by N Romanowski”** (1998), UNSW Press - available from most bookshops.

Further information is available on the DWE website <http://www.dwe.nsw.gov.au/about/search.shtml>

- *What are rural landholders' basic rights to water?*
- *Water for my rural property - do I require a licence?*
- *How much water do I need for my rural property?*
- *Farm dams - do you need a licence?*
- *Farm dams - where can they be built without a licence?*
- *Farm dams - what size dam can you build without a licence?*
- *Multiplier factor from maps*

Locate your property on the map that shows the Maximum Harvestable Right Dam Capacity multiplier. It is easy to do this is on-line http://www.farmdamscalculator.dnr.nsw.gov.au/cgi-bin/ws_postcode.epl

Further information on dam construction can also be obtained from the DPI website at www.agric.nsw.gov.au/reader/dams-storage.

Before starting the construction of a dam or earthworks, it is advisable to consult with Soil Officers in your local catchment management authority as they have responsibility for soil conservation in NSW.

Always check with neighbours for a reliable dam builder, as a good knowledge of local soils and landscapes is needed to build a successful dam.

Rivers

You do not need a licence to pump water if your property fronts a river or lake and you want to use the water for stock or domestic purpose: However, you will need one for commercial activities. Applications for licences can be made to the licensing division of the DWE in Grafton, but may not be approved – check before applying. The water can be pumped directly to your home or stock trough or into a dam for storage.

Local councils regularly monitor the quality of some streams and it is worthwhile checking with them as to what problems may exist and how best to treat the water.

While stock can obtain water directly from streams, their urine and faeces reduces the quality of water for downstream users. At the same time, they can erode streambanks and degrade riparian vegetation through trampling and grazing.

Healthy riparian vegetation is vital for:

- reducing streambank erosion (by stabilising the soil and reducing the velocity of stream flows)
- providing wildlife corridors
- decreasing pest insects (by providing habitat for insect-eating native animals)
- preventing nutrient loss (by acting as a filter)
- increasing fish stocks (by shading and cooling stream water and providing log habitats and food)
- decreasing algal growth

To provide these benefits, wherever practical, a vegetation buffer of at least 10m wide should be maintained along streams. This should be fenced (plain wires, as barbed-wire is more likely to catch vegetation during floods and wash away the fence) and off-stream water supplies provided. This does not mean that stock can't graze the fenced-off area, but only that their access is controlled. Stock are useful to reduce grass and weed growth at appropriate times. The Northern Rivers Catchment Management Authority (NRCMA) and other organisations provides funding opportunities to landholders for riparian management (fencing, off-stream water supplies, replanting, etc) and should be the first port of call to find out what is available. Your local Landcare or Community Support Officer can also put you in touch with others who have practical knowledge with riparian management, as well as inform you of current training and funding opportunities.

Riparian land doesn't just cover the immediate streamside, it also includes gullies that sometimes run with water, areas surrounding lakes and wetland and river floodplains that feed into rivers during floods.

To find out more about the benefits of riparian land and how to manage waterways read:

Australian Government Land and Water - River Landscapes publications and information sheets at http://www.rivers.gov.au/River_Management_Issues/index.html and CD may also still be available. The Land and Water website has a wealth of information about managing riparian lands and waterways with free publications that can be ordered online.

“Managing Waterways on Farms” by D Brower (1997). See irrigation and water section in the NSW DPI publications catalogue. www.dpi.nsw.gov.au/aboutus/resources



IMAGE: *Lomandra hysterix* (J.Mousley)

Water Licensing

Controlled activities near rivers, lakes or estuaries

A controlled activity approval is required for certain types of developments and activities that are carried out in or near a river, lake or estuary.

The controlled activity approval provisions commenced on 4 February 2008.

Under the Water Management Act 2000, a controlled activity means:

- The erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or
- The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or
- The deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or
- The carrying out of any other activity that affects the quantity or flow of water in a water source.

For more general information about the controlled activity provisions, read the 'frequently asked questions' fact sheet on the DWE website.

Before you undertake a controlled activity you must submit an application form to the Department of Water and Energy.

Irrigation

Irrigation, whether from a river, bore, well or dam requires a licence from the DWE. However, new irrigation licences are not being made available, so if your property doesn't have a licence, you will need to purchase one from a current licence holder if you wish to irrigate.

The licences are currently based on a set area (e.g. 10 hectare irrigation licence), so you will also need to find a landholder with an appropriately sized licence. However, meters are progressively being added to pumps and all licences will be based on volume (e.g. 10 mega litres per year) under the new water management plans.

The supply of water for irrigation is not completely secure. During low stream flows, pumping can be halted by the DWE (advertised in local papers) on the recommendation of local water user associations (landholder groups). To find out more, talk to the resource access officer in the DWE at Grafton.

NSW DPI (agriculture) also provides information on many aspects of irrigation at <http://www.dpi.nsw.gov.au/agriculture/resources/water> For advice, design and installation of irrigation systems contact private irrigation specialists (see irrigation &/or reticulation systems in the yellow pages).

Water quality – is it usable?

The coast's high rainfall and tidal rivers may give the appearance that copious amounts of water are available for all users. However, farm water comes from different sources and so its quality varies. Water may be unsuitable for domestic, stock, irrigation or other farm uses. Problems may be chemical (e.g. salinity) or physical (e.g. algae) and on the coast can involve acidity, iron and other metals, salts, hardness, algae and bacteria. For example:

- within the tidal range of streams (e.g. to Copmanhurst on the Clarence River, salt levels are often too high for human, stock or irrigation purposes).
- above the tidal range of streams, algal levels (e.g. blue-green algae) can increase to toxic levels during periods of low flows. Dams can also have toxic algal blooms due to nutrient runoff from paddocks
- on the floodplains, aluminium, iron, manganese and sulfur can be high due to the presence of acid sulfate soils or salt layers within the soil.



For more information on drinking water quality issues, visit;

- the Department of Health's website at (www.health.nsw.gov.au/public-health/ehb/water/drinkwater.html.)

For more information about farm water quality, visit the DPI's website www.agric.nsw.gov.au/reader/water-irrig

Or specifically for blue-green algae visit;

- The Cooperative Research Centre (CRC) for Water Quality and Treatment website; <http://www.waterquality.crc.org.au/dwfacts>
- www.murraybluegreenalgae.com/graziers.htm.

If you have doubts about the quality of your stock and irrigation water supply, water testing can be conducted by;

- DPI (agriculture), with water sampling kits available from some local offices

Strategies rural landholders can use to maintain water quality on their property and across the catchment include;

- maintaining high levels of ground cover throughout the year
- maintaining a broad healthy riparian vegetation strip
- retaining native vegetation on steep slopes
- controlling stock access to dams and streams
- using off-stream watering (e.g. troughs and tanks)
- not applying fertilisers or sprays just prior to heavy rainfall events, especially if the soil is already saturated.
- using split applications of fertilisers rather than a single heavy application
- only applying fertilisers when pastures are actively growing
- maintaining fertiliser and spray buffers around dams and streams.

Fire

What impact does fire have on the environment?

Fire is a natural part of the Australian landscape, but its incorrect management (both bushfires and deliberate burning) can have many undesirable consequences such as:

- Death and injury to people
- Loss of homes and other assets
- Loss of vegetation communities (e.g. rainforests and wetlands)
- Changes in the structure and composition of communities (e.g. loss of shrubby understoreys that act as habitat and food sources for a wide range of lizards, birds and mammals)
- Loss of wildlife because animals couldn't escape the flames, or later, due to the destruction of habitat and food sources.
- Changes in the composition of animal species (e.g. animals that prefer dense shrubby understoreys are displaced by other species that are adapted to more open understoreys as fire frequency increases)
- Degradation of soils from the loss of ground cover, organic matter and nutrients
- Contamination of water sources from increased soil erosion brought on by the loss of ground cover.

The degree of impact that fire has on the environment depends on its frequency (how often fires occur), intensity (how hot the fire is), extent (the area burnt by the fire) and season (what time of year the fire occurs).

Most Australian plants and animals are resilient enough to tolerate a single fire, as long as it is not too great in extent or too intense. However, plants that rely solely on seeds to regenerate require sufficient time between fires to grow to maturity and set seed, otherwise they will fail to recolonise after fires. Equally, if fire is suppressed for too long, larger longer-lived species may out compete smaller species for space and light.

Generally, when fire is excluded, long-lived species such as trees and bushes come to dominate and as fire frequencies increase the vegetation becomes more open and grassy.

The desirable fire frequency is very dependent on the type of vegetation communities and its species composition. It is highly recommended to seek advice before embarking on any fire ecology regimes for your property including the correct classification of the vegetation types. The following examples of fire frequency recommendations are based on what scientists currently know about fire ecology, and will continue to be refined as more information comes to hand.

- **Coastal Heathland** A fire frequency of 7-30 years is recommended (with most fires around 8-12 years) to maintain overall biodiversity. For heathland in drier, rocky inland areas, fire intervals between 15 and 50 years are suggested.
- **Dry Sclerophyll Shrub Forest** - includes low forest and woodland dominated by eucalypts, with a hard-leaved shrubby understorey. Variable fire intervals mostly in the 7 to 30 year range are recommended to maintain diversity.
- **Dry Sclerophyll Shrub/Grass Forest** consists of open eucalypt forest with a sparse hard-leaved shrub layer and continuous grassy groundcover. Intervals in the 5 to 25 year range, with occasional intervals up to 50 years in some areas, have been recommended. The grass component is likely to be best maintained by short intervals (e.g. 5 – 7 years).
- **Wet Sclerophyll Forest (grassy subformation)** is dominated by straight-trunked eucalypts, with a grassy understorey and sparse shrubs, which may have hard or soft leaves. The present state-wide recommendation is for fires every 10-50 years.
- **Wet Sclerophyll forests (shrubby subformation)** are tall eucalypt forests with a dense understorey of broad soft-leaved shrubs, ferns and herbs. Currently, variable fire intervals in the range 25-60 years are suggested for these forest types.
- **Forested wetlands** typically feature hard-leaved trees (eucalypts, casuarinas and paperbarks), scattered shrubs and a continuous ground-cover of water-loving sedges and herbs. Scientists have not yet studied the role of fire in this vegetation type in any detail however variable intervals between 7 and 20 years, with some intervals up to 35 years have been suggested for this vegetation type.



- **Freshwater wetlands;** fire frequency between 6 and 35 years have been suggested for this vegetation type which is vulnerable to peat fires when the substrate is dry. Planned fires are therefore best conducted when the substrate is wet. Freshwater wetlands are areas of environmental sensitivity and need to be treated with care. Most coastal wetlands are covered by protective legislation, such as SEPP 14, Threatened Species Conservation Act (as endangered ecological communities), or Development Control Plans.
- **Rainforest** is very sensitive to burning and fire should be excluded.
- **Riverine vegetation;** fire should be excluded from river and creek vegetation and other vegetation surrounding water bodies (e.g. dams). These communities act as biological filters that reduce the movement of soils and nutrients and hence minimise the contamination of water sources.

Variability in the frequencies of fires is important, as even within one community type there will be species that benefit from more frequent fires and others that benefit from longer intervals between fires. Hence, varying the fire interval tends to produce greater species richness.

As the intensity of a fire increases, so does its destructive ability. Intense fires may kill the dominant overstorey (e.g. trees), damage plant regeneration sites (e.g. buds) and destroy soil seed banks; thereby, reducing the ability of plants and community types to regenerate.

Intense fires can also degrade the soil by reducing the organic matter content (soil glue and nutrient store) and biological life, resulting in poorer water infiltration and greater erosion. This in turn increases water pollution, as soils and nutrients are washed into dams, rivers and wetlands.

Extensive fires that burn out large areas reduce the ability of plants and animals to recover. Patch burning provides animals with refuge and forage and creates a seed source for plants to more quickly recolonise burnt areas. Patch burning also reduces fuel loads, potentially slowing the spread of wild fires.

While the protection of life and property come first, if landholders use a zoning approach to fire management then the risk to farm and assets can be minimised while other areas can be managed for biodiversity.

What impact has fire had on the North Coast?

There have been many vegetation changes associated with the inappropriate use of fire, including: a reduction in the extent of rainforest; degradation of wetlands (at times forming scalds that cover many hectares and which takes decades to reclaim); loss of shrubby understoreys in forests; invasion of pastures by less desirable species; loss of wildlife habitat; weed incursion; and soil erosion.

Just two examples of inappropriate fire use are included here;

- Until recently, regular burning of pastures in late winter and early spring was a widespread practice on the north coast. While regular burning is still practiced today, it is far less common. One of the most common reasons for burning was to stimulate early spring pasture growth (especially of the native species blady grass), at a time when most pastures were dormant and of poor quality. However, the high frequency of burning gave blady grass a competitive advantage over other pasture species, so that blady grass now dominates large areas and often occurs as a monoculture. Unfortunately, blady grass only provides good quality feed for about 4-6 weeks after burning and then becomes rank and unpalatable to stock. One of the most common practices to remove the rank growth and stimulate new growth in the following year was to re-burn the pastures, further exacerbating the spread of blady grass, loss of species and shortening of the pasture growth period.

Regular pasture burning has also led to the loss of soil organic matter and soil nutrients. As a consequence, the soils tend to: form crusts that limit water infiltration; be more prone to erosion, thereby reducing the depth of topsoil; and provide a less nutritious medium for crop and pasture growth.

- Hazard reduction burns in forests have also had negative impacts. Frequent burning tends to open up many forest types, removing shrubs and increasing the grassiness of the vegetation. The most common species to benefit are fire-loving grasses, such as blady grass and kangaroo grass, that grow rapidly and produce a large bulk of highly combustible material. The increased rate, at which combustible material is produced, increases the need for more regular burns. These fires also burn hotter, increasing its affect on the forest structure. Hence there is a downward spiral, where fire opens the forest structure; this increases the abundance of grasses, more bulk is then produced more quickly and then even more frequent fires are needed to reduce the bushfire hazard.

Fire. What are your rights and responsibilities?

The Rural fires Act 1997 (and Regulations) and Worker Compensation Act 1987 are the current legislation affecting bushfires. The Rural Fires Act established the Rural Fires Service, which is responsible for the management of fires in rural areas of NSW. Under the Rural Fires Act, a bushfire danger period has been established, from the 1st October to the 31st March each year. The dates can be varied for different local government areas depending on local conditions. The approach of the bushfire danger period and any variations to the dates is extensively advertised in local papers and over local radio stations. However, landholders can also obtain the information from the NSW Rural Fire Service's web site at www.rfs.nsw.gov.au. During the bushfire danger period, you can only light fires under permit from the Rural Fire Service. These can be obtained by contacting your local Rural Fire Service control centre.

The Rural Fire Service can also declare a total fire ban at any time. During this period, you are not permitted to light any fires, even if you have a permit from the Rural fire Service that is still current. If you do become aware of an unauthorised fire on any land during the bushfire danger period (or total fire ban period), you must take all possible steps to extinguish it. Where you can't do this, you need to inform the Rural fire Service (on their emergency number) as soon as possible.



IMAGE: Hazard reduction burn, Cowarra State forest. (Jeremy Bradley).

If you are responsible for lighting an unauthorised fire on your property during the fire danger period or total fire ban period, you will be liable to a penalty of up to \$5,500 or 12 months prison. Where the fire escapes to someone else's property (or you set light to the property), the penalty may be up to \$11,000 or 5 years prison.

You may complain to the Rural Fire Service, if you believe a fire hazard exists on an adjacent property. The Service will then discuss control measures with the owner. Where recommendations are ignored, the Rural Fire Service will issue a fire hazard reduction notice, which obliges a landholder to undertake the hazard reduction at their own expense. If they don't comply, the Service can employ someone else to do the work and charge the landowner for it.

If you clear away all combustible material within 6 metres of a dividing fence, then unless your neighbour does the same, they will be responsible for all fire damage to the fence.

How can you learn to manage fires?

The Rural Fire Service is responsible for managing fires across 90% of NSW. To do this, it largely depends on volunteers to fight the fires. Becoming a volunteer not only provides a community service, but is the best way to learn how to prepare for, manage and fight fires. All volunteers are trained in fire fighting and there is a range of courses offered for different specialities. To find out more contact your local Rural Fire Service control centre or go to (www.bushfire.nsw.gov.au - Joining the RFS.)

A number of government organisations are available to provide advice to landholders on fire management on private properties. These include:

- Rural Fire Service – contact fire control centres for all aspects of fire management;
- NSW DPI (agriculture) – contact agronomists for pasture management
- Shire councils – contact their environment officers
- National Parks division of the Department of Environment and Climate Change.



What help is available after a fire?

The Department of Community Services is responsible for welfare and recovery services. They can coordinate food, accommodation, clothing, advice and financial and personal support. Contact the State Recovery Centre.

The Department of Primary Industries (agriculture) coordinates the provision of animal relief services to primary producers, such as coordinating the supply and distribution of fodder, managing the care of pet animals. Contact should be made through your local RFS control centres.

Visit the Department of Primary Industries (agriculture) website www.agric.nsw.gov.au/bushfire for information on assessing burns on stock, humane destruction and disposal, pasture recovery and caring for native animals.

The Rural Assistance Authority provides natural disasters loan scheme that charges nominal interest for primary producers within an area declared a natural disaster.

Where wildlife is injured or orphaned by fire, contact WIRES (groups that specialises in wildlife recovery)

Where can you get further information?

To find out more about preparing your property for fire using protection zoning, go to the NSW Rural fire Service's web site at www.rfs.nsw.gov.au.

- **"The Complete Bushfire Safety Book"** by J. Webster (2000). ISBN 1 74051 0348. Published by Random House. Available from most bookshops.
- Fire and its management for biodiversity at Nature Conservation Council NSW - Hot Spots Fire Project http://nccnsw.org.au/index.php?option=com_content&task=blogcategory&id=317&Itemid=642 for the following publications;
- Hot Spots Fire Project **"Managing Fire on Your Property"**: A Booklet for Landholders in the Northern Rivers region
- Northern Rivers Hot Spots Fire Project Fact Sheets; Burning Approval Fact Sheet, Dry Sclerophyll Forest, Heath-leaved Banksia, Glossy Black Cockatoo, Landholder Fire Plan
- Fire and Grazing in the Northern Rivers Region (Draft 1)
- Fire Frequency Guidelines and the Vegetation of the Northern Rivers Region (Draft 2)
- Bushfire preparedness, restrictions, permits and management at www.bushfire.nsw.gov.au

Resources

Abbreviations used in this document are:

DECC – Department of environment and Climate Change
 DWE – Department of Water and energy
 NRCMA – Northern Rivers Catchment Management Authority NSW
 DPI – NSW Department of Primary Industries (agriculture)
 DPI – Department of Primary Industries and Fisheries
 LHPA – Livestock Health and Pest Authority (formerly RLPB)
 NRM – Natural Resource Management
 PVP – Property Vegetation Plan
 LALC – Local Aboriginal Land Councils

Introduction to rural life

The most comprehensive introduction to rural living is available in the recommended reading and web sites listed below.

After you have read some of these, seek local advice on specific areas from the contacts listed under each topic heading.

Reading:

"Rural Living" section in this kit

"Living and Working in Rural Areas" A handbook for managing land use conflict on the NSW North Coast, (2007) produced by the Centre for Coastal Agricultural Landscapes and NRCMA. Published by and available from NSW DPI Wollongbar.

"Rural Life. Is It for you?" by C. Benjamin (2002). ISBN 0 7345 0202 8. Available from NSW DPI (agriculture) bookshop in Orange. A CD that helps you examine what you want and need from the land, and what will be your responsibilities and legal obligations;

"Farming in a Small Way". ISBN 0 7347 1500 5. Available from NSW DPI (agriculture) bookshop. Provides information on finding the farm you want, choosing the right enterprise, and avoiding the perils and pitfalls of rural life;

"Town and Country Farmer" magazine is a quarterly publication available from newsagents;

"Small Farms" is a monthly magazine available from newsagents; they also have a bookshop (02) 4861 7778

Web Sites

- 'Farm Ready' - Two grants are available through the FarmReady program which assists landholders to access training opportunities and grants eg; FarmReady Reimbursement Grants and FarmReady Industry Grants. More information can be found at <http://www.daff.gov.au/climatechange/australias-farming-future/farmready>
- Small farms magazine and bookshop at www.smallfarms.net
- Regional Services www.regionalaustralia.gov.au is the Commonwealth government's site outlining services available to regional Australia. For questions call the Australian Government Regional Information Service 1800 026 222.

Natural resources

Soils

Contacts

- **General information about local soils**
 - Agronomists, NSW DPI (agriculture)
- **Location of acid sulfate soils and planning controls**
 - Local Shire Councils

- **Suitability and management for pastures and cropping**
 - Agronomists, NSW DPI (agriculture) at Grafton and Kempsey
- **Suitability and management for horticulture**
 - Horticulture officer, NSW DPI (agriculture) at Coffs Harbour
- **Management of acid sulfate soils**
 - National Acid Sulfate Soil Information Officer, NSW DPI
 - Wollongbar Agricultural Institute.
 - Environmental officers at Shire Councils
- **Soil erosion control measures**
 - NRCMA at Coffs Harbour
 - Landcare and Community Support Officers at various locations across the northern rivers – see contacts list in folder.
 - NSW DPI (agriculture)
 - Soil Conservation Services in the Department of Lands at Coffs Harbour and Grafton for advice and works
- **Soil erosion control funding**
 - NRCMA at Coffs Harbour
 - Landcare Offices
- **Earthworks**
 - Shire Councils for planning controls
 - Soil Conservation Services in the Department of Lands at Coffs Harbour and Grafton
 - Local contractors (see "excavating &/or earth moving contractors" in the yellow pages)
- **Soil chemical testing**
 - NSW DPI (agriculture) offices for advice and list of testing laboratories
 - Soil Conservation Services in the Department of Lands
 - Produce stores (see yellow pages)

Training Courses

Soil health field days are provided by various organisations and agencies including NSW DPI (agriculture). Contact your Community Support Officer or nearest Landcare office for news of any field days or courses in your local area.

Reading

"Soils" section in this kit

"Soil Sense – Soil Management for NSW North Coast Farmers (2nd edition)" edited by R Lines-Kelly (2000). ISBN 0 7347 1210 3. Available from NSW DPI (agriculture) bookshop. Describes the main soils on the north coast; the soil management techniques needed for each of the region's main agricultural enterprises and provides a farmer's A-Z of soil terms.

"Saving Soils- A landholders guide to preventing and repairing soil erosion" hard copies available from NRCMA

and NSW DPI. A .pdf of the manual can be downloaded at - <http://www.dpi.nsw.gov.au/agriculture/resources/soils/erosion/saving-soil>

"Soil Landscapes" - Technical manuals and maps that describe the soil landscapes, and their potential and limitations, of much of the eastern section of the region. Best referred to with an advisor, most of who will have copies.

Web Sites

- Management of soil structure, nutrients and biology for agriculture at www.agric.nsw.gov.au/reader/soil-health-fertility
- Many aspects of soils in NSW at www.naturalresources.nsw.gov.au/care/soil/
- Agricultural portal to a range of soil information at local, state and federal level at www.agriculture.gov.au
- Maps and data of natural resources information held by the NSW Government (www.nratlas.nsw.gov.au)
- The National Coastal Acid Sulfate Soils web site www.environment.gov.au/coasts/cass/index.html
- SoilCare is an association of primary producers and others on the North Coast of NSW with special interests in soil processes. www.soilcare.org.au/index.htm

Water

Contacts

- **Dam regulations and licensing**
 - Licensing unit of DWE at Grafton
- **Advice on dam construction and earthworks**
 - Soil Conservation Services in the Department of Lands
 - NRCMA
 - Local shire councils
- **River health: management and funding**
 - NRCMA
 - Landcare and Community Support Officers
 - Some shire councils
- **Dam construction**
 - Soil Conservation Services in the Department of Lands
 - Private dam builders (see “earth moving/ excavating contractors” in the yellow pages)
- **Bore and river pumping regulations and licensing**
 - Licensing unit of DWE at Grafton
- **Aquifer locations, depths and possible yields**
 - Natural Resources Officer in DWE at Grafton
- **Bore construction**
 - Private contractors (see “boring &/or drilling contractors” in the yellow pages)
- **River quality/height monitoring**
 - Local shire councils
- **Pump performance and irrigation design**
 - Private irrigation consultants (see “irrigation &/or reticulation systems” in the yellow pages)
- **Stock and irrigation water quality testing**
 - NSW DPI (agriculture)
 - Soil Conservation Services in the Department of Lands
- **Domestic tank water quality testing**
 - Local shire councils

Reading

“Water” section in this kit

“Overview of Macro Water Plans” and “Benefits of Macro Water Plans” information sheets outline the new water management

plans that will affect all rural water users. Available from all DWE offices and online at http://www.dwe.nsw.gov.au/water/plans_macro.shtml

“*Managing Waterways on Farms*”. Describes how to manage creeks and streams to prevent erosion and improve water quality. Available from NSW DPI bookshop, see website www.dpi.nsw.gov.au/aboutus/resources/bookshop, search by location “Tocal (Paterson)”, publications listed alphabetically by title.

“*Planting Wetlands and Dams*” by N Romanowski (1998). ISBN 0868406082. Available from most bookshops.

Web Sites

- Water rights, dams, legislation and licencing at www.dwe.nsw.gov.au/water_trade/rights.shtml
- Dam construction at www.dpi.nsw.gov.au/agriculture/resources/water/storage
- Irrigation management at www.dpi.nsw.gov.au/agriculture/resources/water and www.dpi.nsw.gov.au/aboutus/resources/factsheets
- River and riparian management at www.rivers.gov.au
- Drinking water quality issues at www.health.nsw.gov.au/public-health/ehb/water/drinkwater.html

Native vegetation

Contacts

- **Vegetation identification**
 - Coffs Harbour Botanic Gardens Herbarium – all plants
 - Botanical Information Service, Sydney Botanic Gardens
 - DECC, Sydney – all plants
 - Agronomist, NSW DPI (agriculture) at Grafton or Kempsey pastures, weeds and poisonous plants
 - Rangers, National Parks and Wildlife division of the DECC Coffs Harbour or Dorrigo
 - Private consultants (see “natural resource” or “environmental &/or pollution” consultants in yellow pages)
- **Vegetation assessment**
 - Landcare Officers
 - NRCMA – Property Vegetation Plans
 - Private consultants (see “natural resource” or “Environmental &/or pollution” consultants in yellow pages)
- **Native pasture management**
 - Agronomists, NSW DPI (agriculture) at Grafton or Kempsey
 - Agronomists at local produce stores
 - Private consultants (see “farm & agricultural advisory services” in the yellow pages)
- **Wetland management**
 - Agronomists, NSW DPI (agriculture) at Grafton or Kempsey
 - NRCMA (aquatic ecosystems officer)
 - Wetland Care Australia
 - Environmental officers at Shire Councils
- **Forest management for conservation (also see “forestry” in the “plant industries” section)**
 - National Parks and Wildlife division, DECC

- Mid North Coast Farm Foresters
- Private consultants (see “natural resource” or “environmental &/or pollution” consultants in yellow pages)
- **Native vegetation clearing**
 - NRCMA for advice and approvals
 - Shire councils for development approvals
 - Agronomists, NSW DPI (agriculture) at Grafton or Kempsey for advice on the economics of clearing for agriculture
- **Conservation agreements and funding opportunities**
 - National Parks and Wildlife division, DECC – Coffs Harbour or Dorrigo

Training Courses

“*Native and Naturalised Grasses*”. Grass identification and management. Contact the agronomist in NSW DPI (agriculture) at Kempsey.

“*Native Vegetation Recognition*” field days. Other identification and management workshops are often run. Contact your local Landcare and Community Support Officer for more information.

“*Bush Regeneration*” and “*Conservation and Land Management*”. Contact your local TAFE College for more information.

Reading

“Native Vegetation” in this kit

Reading part one - Identification

“*Eucalypts and Angophoras of the North Coast of New South Wales*” by CL Bale (2003). ISBN 9781 863 890 007. A key to, and description of, all eucalypts and angophoras found on the north coast. Available from the United Campus Bookshop, University of New England (UNE) Armidale.

“*Field Guide to Eucalypts. Vol. 1. South-eastern Australia*” by MIH Brooker and DA Kleinig (1990). ISBN 9781 876 334 369.

“*Eucalypts of the Bellinger Valley*” and “*Eucalypts of the Dorrigo Plateau – A guide to their recognition*” by Ross Macleay and Jan Parkin (200?). Available from Bellinger Landcare Inc.

“*Rainforests Tree and Shrubs - A Field Guide to Their Identification*” by JB Williams et al. (1984). ISBN 9780 977 555 307. An easy to use pictorial key to rainforest trees and shrubs. Available from the United Campus Bookshop, UNE Armidale.

“*Rainforest Climbing Plants*” by JB Williams and GJ Harden (1984). ISBN 9780 977 555 314. An easy to use pictorial key to rainforest climbing plants. Available from the United Campus Bookshop, UNE Armidale

“*Wildflowers of the North Coast of New South Wales*” by B Kemp (2004). ISBN 1 877069 05 1. Available from most bookshops.

“*Waterplants of New South Wales*” by GR Sainty and SWL Jacobs (1981). The definitive photographic guide to waterplants of the region. Out of print, but available in many libraries.

“*Wetland Plants of Queensland. A field Guide*” by KM Stephens and RM Dowling (2002). ISBN 0643066748

Reading part two -Assessment and Management

“*Vegetation Survey and Assessment – a Practical Guide for the Management of Native Vegetation*” (2004). Available from Tocal Agricultural College, NSW DPI (ag) at Paterson

“*Bushland Resources Kit*” and “*Where Land Meets Water*” Although designed for the Hunter Valley, the principles are relevant to the north coast. Covers vegetation assessment and revegetation. Available from the Hunter-Central Rivers Catchment Management Authority, Phone (02) 4930 1030.

“*Plan for Trees – a Guide to Farm Revegetation*” (1998). Available from NSW DPI bookshop, see website www.dpi.nsw.gov.au/aboutus/resources/bookshop, search by location - “Tocal (Paterson)”, publications listed alphabetically by title.

“*Revegetating Streams in the Bellinger, Coffs Harbour, and Clarence Catchments. A Guide to Species, Planting, Locations and Planting Methods*” Available from NRCMA and Landcare Offices.

Web Sites

- Rules on vegetation clearing and many other issues at http://northern.cma.nsw.gov.au/programmes_native_vegetation.php
- Biodiversity information and conservation management at www.environment.nsw.gov.au/natureconservation.htm
- Wetland management at www.wetlandcare.com.au and www.dnr.nsw.gov.au/water/wetlands.shtml
- Riverine vegetation management at www.rivers.gov.au
- Links to local, state and federal information at www.environment.gov.au

Pastures

Contacts

- **Identification**
 - Agronomists in NSW DPI (agriculture) at Grafton and Kempsey
 - Coffs Harbour Botanic Gardens Herbarium
 - Botanical Information Service, DECC Sydney
 - private consultants (see “natural resource” or “environmental &/or pollution” consultants in yellow pages)
- **Management**
 - Agronomists in NSW DPI (agriculture) at Grafton and Kempsey
 - Private consultants (see “natural resource” or “environmental &/or pollution” consultants in yellow pages)
 - agronomists in produce stores (see yellow pages)

Training Courses

“*Prograze*”. Workshop series designed to develop participants’ pasture and animal assessment skills and show how to use these skills to improve on-farm grazing decisions on beef and sheep farms. Contact NSW DPI (agriculture) at Grafton and Kempsey.

“*Native and Naturalised Grasses*” and “*Paddock Plants*” field days that cover pasture identification and management. Contact the agronomist in NSW DPI (agriculture) at Kempsey.

“*Topfodder Silage*”. Workshops that demonstrate how to improve the feed value of silage made on farm and minimise losses from harvest to feed out. Contact NSW DPI (agriculture) at Grafton or Kempsey for dates and locations. FarmReady eligible course

Reading

“Pastures” section in this kit

“Fertilisers for Pastures” by E Havilah et al (2005) is a free booklet designed to help landholders make better fertiliser decisions. Available from NSW DPI (agriculture) offices or download from <http://www.dpi.nsw.gov.au/agriculture/resources/soils/improvement/pastures>

“Best Management Practices for Temperate Perennial Pastures in NSW”. Describes best management practices for sustainable dryland grazing. Although designed for the tablelands, the principles are the same for the coast. Available to download at http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0020/161417/bmp-full.pdf.

“Grasses of the North Coast” is a booklet that describes the most common paddock grasses of the North Coast.

“Pasture Plants of the North Coast: Non grasses”

By Harry C. Rose. Both of these booklets are available from NSW DPI (agriculture) and local Landcare offices.

Web Sites

- All aspects of pasture selection and management in NSW at www.dpi.nsw.gov.au/agriculture/field/pastures
- A more tropical emphasis on pasture management at www.dpi.qld.gov.au/pastures/

Impacts on natural resources**Climate****Contacts**

- **How climate affects pastures and cropping**
 - Agronomists in NSW DPI (agriculture) at Grafton or Kempsey
- **How climate affects horticultural crops**
 - Horticulture officer in NSW DPI (agriculture) at Coffs Harbour

Training Courses

“Farming in a Changing Climate” - Contact Greg Reid at DPI NSW Wollongbar (02) 6626121. FarmReady eligible course.

Reading

“Climate” section in this kit

“Weather and Climate in Farming – Managing Risk for Profit” describes how to manage climatic risks on farm. Available from NSW DPI bookshop, see website www.dpi.nsw.gov.au/aboutus/resources/bookshop, search by location “Tocal (Paterson)”, publications listed alphabetically by title.

Web Sites

- Local weather forecasts, current weather and climate averages at www.bom.gov.au/weather/nsw/
- Understanding climate and weather at www.dpi.nsw.gov.au/agriculture/resources/climate-and-weather
- Summary of climate change impacts for the north coast region at <http://www.environment.nsw.gov.au/resources/climatechange/08501NorthCoast.pdf>

Drought**Contacts**

- **How to manage pastures and crops**
 - Agronomists in NSW DPI (agriculture) at Grafton or Kempsey

- **How to manage horticultural crops**
 - Horticulture officer in NSW DPI (agriculture) at Coffs Harbour
- **How to manage livestock**
 - Beef cattle officer in NSW DPI (agriculture) at Casino
- **Drought support subsidies for primary producers**
 - Rural Assistance Authority
- **Processing of drought subsidies and providing support information**
 - Rural Financial Counselling Service at Armidale or Macksville
 - LHPA at Grafton
- **Disaster welfare assistance**
 - Department of Community Services at Coffs Harbour
- **Financial advice**
 - Rural financial Counselling Service at Armidale or Macksville
- **River pumping restrictions**
 - Natural Resources officer in DWE at Grafton
- **Livestock starvation/cruelty**
 - Royal Society for the Prevention of Cruelty to Animals
- **Injured and orphaned wildlife WIRES**

Reading

“Drought” section in this kit

“Managing Drought”. A free book for NSW farmers covering most aspects of drought, including planning, feeding, farm management and assistance. Available at most NSW DPI (Agriculture) offices.

“The Drought Recovery Guide 2005”. A free book for NSW farmers that helps producers develop drought recovery strategies and make other important management decisions. Available at most NSW DPI (Agriculture) offices.

Web Sites

- Drought planning, management and financial assistance at www.dpi.nsw.gov.au/agriculture/emergency/drought
- Weed strategies following drought at www.dpi.nsw.gov.au/agriculture/emergency/flood/publications/weed-strategies
- LHPA drought assistance www.lhpa.org.au/drought-assistance
- Rural Financial Counselling Service drought assistance www.daff.gov.au/agriculture-food/drought/rfcs/counsellors/nsw
- Rural Assistance Authority www.raa.nsw.gov.au

Flood**Contacts**

- **Flood and storm warnings**
 - listen to local radio stations for updates and advice
 - State Emergency Service
- **Emergency help for people and animals**
 - State Emergency Service
- **To determine if you are in a flood-prone area**
 - Local councils
- **Local flooding knowledge**
 - Local State Emergency Service
 - neighbours

- **Local flood plans**
 - Council Offices
 - State Emergency Service
- **Develop a household flood-action plan**
 - State Emergency Services
- **Develop a livestock flood-action plan**
 - LHPA in Grafton
 - Livestock officers in NSW DPI (agriculture)
- **How to manage livestock during and after flood**
 - Dairy officer in NSW DPI (agriculture) at Kempsey
 - Beef cattle officer in NSW DPI (agriculture) at Casino or Taree
- **Financial advice**
 - Rural Financial Counselling Service at Armidale or Macksville
- **Disaster relief**
 - Rural Assistance Authority
 - Department of Community Services
- **Livestock starvation/cruelty**
 - Royal Society for the Prevention of Cruelty to Animals
- **Injured and orphaned wildlife**
 - WIRES

Reading

“Flood” section in this kit.

Web Sites

- Flood management of livestock at www.dpi.nsw.gov.au/agriculture/emergency/flood

Fire**Contacts**

- **All fire management information, fire danger periods, burn-off permits and training**
 - Rural Fire Service control centres
- **Advice on fire management on private properties**
 - Rural Fire Service control centres
 - Agronomists in NSW DPI (agriculture)
 - Environment officers in local councils
 - National Parks division of the DECC Coffs Harbour and Dorrigo
- **Disaster relief**
 - Department of Community Services
 - Rural Assistance Authority
- **Injured and orphaned wildlife**
 - WIRES

Training Courses

A range of fire fighting courses is offered to volunteers in the Rural Fire Service. To find out more contact your local Rural Fire Service control centre or visit www.bushfire.nsw.gov.au/dsp_content.cfm?CAT_ID=291

“Hotspots: Fire Ecology” workshops. Demonstrates how to manage fire on rural properties. Contact your local Landcare office for more information.

Reading

“Fire” section in this kit “Where you can get further information”

“The Complete Bushfire Safety Book” by J Webster (2000). ISBN 1 740510348. Published by Random House. Available from most bookshops.

Web Sites

- “Fire” section in this kit
- Fire affects on stock and pastures at www.dpi.nsw.gov.au/agriculture/emergency/bushfire
- Bushfire preparedness, restrictions, permits and management at www.bushfire.nsw.gov.au/
- Fire and its management for biodiversity at www.griffith.edu.au/environment-planning-architecture/southeast-queensland-fire-biodiversity-consortium
- Nature Conservation Council NSW - Hot Spots Fire Project http://nccnsw.org.au/index.php?option=com_content&task=blogcategory&id=317&Itemid=642

Weeds**Contacts**

- **Identification of weeds**
 - Coffs Harbour Botanic Gardens Herbarium
 - Botanical Information Service, DECC, Sydney
- **Identification and management**
 - Agronomists in NSW DPI (agriculture) at Grafton and Kempsey for pasture and crop weeds;
 - Horticulture officer in NSW DPI (agriculture) at Coffs Harbour for horticultural weeds;
 - Noxious weeds officers at local councils.
 - Far North Coast Weeds Authority for noxious weeds
 - Landcare Offices
 - NRCMA
 - Agronomists at local agricultural produce stores for agricultural weeds
 - Private consultants (see “environmental and/or pollution consultants” and “natural resource consultants” in the yellow pages for all weeds and for commercial Bush Regeneration contractors.
- **Approvals may be needed in a number of circumstances (see “Weeds” section in this kit)**

Training Courses

“Weed Identification and Management” field days. Contact your local Landcare office or NSW DPI (agriculture) office.

Tocal College at Paterson runs various weed management workshops (see www.tocal.nsw.edu.au)

Envite (NSW) weed management training and information see website at www.envite.org.au - Lismore office: (02) 6621 9588

Reading

“Weeds” section in this kit

“Weeds: An Illustrated Botanical Guide to the Weeds of Australia” by B.A. Auld and R.W. Medd. (1987)

“Noxious Weeds of Australia” by W.T. Parsons and E.G. Cuthbertson. (1992)

“Poisonous Plants: Handbook for Farmers and Graziers”

by E.J. McBarron (1983)

“Bush Invaders of South-East Australia: a Guide to the Identification and Control of Environmental Weeds found in South-east Australia” by A. Muyt (2001)

“Noxious weeds of Australia” (2001) ISBN 0 643 16514 8. Available NSW DPI online bookshop www.dpi.nsw.gov.au/aboutus/resources/bookshop

“Weed Control in Lucerne and Pastures” by JJ Dellow et al (2004).

Available from NSW DPI bookshop, or download from the website <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/publications>

Web Sites

Weed identification and management at

- www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds
- www.northcoastweeds.org.au
- www.weeds.org.au
- www.envite.org.au

Vertebrate Pests

Declared pest animals in the region include wild dogs, European rabbit and feral pigs. Landholders have an obligation to eradicate pest animals on their property and notify the LHPA of their presence. However, there are many other vertebrate pests that cause both environmental problems and agricultural losses (e.g. cane toads, Indian Mynas and deer).

Contacts

- **Advice and assistance in eradicating declared pest species and other nuisance animals**
 - LHPA
- **Advice and assistance in controlling environmental pests**
 - Landcare offices
- **Licence to keep pest animals**
 - LHPA
- **Registration of domestic dingoes (obligatory)**
 - Local shire councils
- **Licence to control native pest animals on private property**
 - National Parks division in the DECC

Reading

“**Vertebrate pest control manual**” (2008). ISBN (Manual) 0 73471641 9. Available NSW DPI online bookshop www.dpi.nsw.gov.au/aboutus/resources/bookshop

Web Sites

- Pest animal control and the LHPA's role at www.lhpa.org.au/pest-control
- Australian agricultural portal to local, state and commonwealth information on pest animals at www.agriculture.gov.au/browse/health/pests
- Native pest animals and pests affects on native environments at www.environment.nsw.gov.au/pestsweeds/index.htm

Primary producer status

Eligibility for primary producer status means that expenses incurred in running the enterprise are tax deductible, tax liabilities can be spread over time and fuel rebates are available. To determine your status

Contact

- **Local taxation specialists (see Taxation Consultants in the yellow pages)**
- **Australian Tax Office (Phone: 13 28 66)**

Reading

“The Bush Law Handbook” by T. Smith (2005). ISBN 0 947205 86 1. University of NSW Press. Available from most bookshops

Web Sites

- Australian Taxation Office. Go www.ato.gov.au > Your industry type > Business > Primary Production

Legislation

Rural land and agricultural enterprises are affected by many pieces of what is often complex legislation. Included here is the link to all legislation and two books that make it all easy to understand.

Reading

“**The Bush Law Handbook**” by T Smith (2005). ISBN 0 947205 86 1. University of NSW Press. Available from most bookshops

“**Rural Landholders Guide to Environmental Law in NSW**” (2008). Available from the Environmental Defenders Office (EDO), EDO website.

Web Sites

- NSW at www.legislation.nsw.gov.au
- NSW Environment law www.edo.org.au
- Commonwealth at www.scaleplus.law.gov.au

**Animal enterprises
Beef cattle**

Property identification codes and identification tags must be obtained from the LHPA before buying or selling cattle. Find out about the National Livestock Identification Scheme.

Contacts

- **National Livestock Identification Scheme**
 - LHPA at Grafton for information on its operation and to obtain Property Identification Codes and livestock identification tags
 - Beef Officer in NSW DPI (agriculture) at Casino for information on its operation
- **Identification and transport**
 - LHPA at Grafton
- **Management (e.g. grazing management, supplementary feeding, animal assessment, etc)**
 - Beef Officer in NSW DPI (agriculture) at Casino or Taree
- **Buying and selling stock**
 - Stock and station agents (see yellow pages)
- **Stock disease**
 - Vet in LHPA at Grafton for herd disease or a history of recurring disease only
 - Private vets (see yellow pages)
- **Development consent for feedlots**
 - Local councils

Training Courses

“**Prograze**”. Workshop series designed to develop participants’ pasture and animal assessment skills, and show how to use these skills to improve on-farm grazing decisions on beef and sheep farms. Contact NSW DPI (agriculture) at Grafton or Kempsey.

“**Agriculture Information & Monitoring Services’ (AIMS)** Contact AIMS 02 67711273

“**Grazing the Coastal Floodplain**” contact Christina Clay at NSW DPI (agriculture) Wollongbar. (02) 66261355

Reading

“**Beef Agskills**” a basic guide to some of the skills and practices of beef production. Available NSW DPI online bookshop www.dpi.nsw.gov.au/aboutus/resources/bookshop

“**Beef Business**” booklet series. Covers animal assessment, marketing, selling, breeding, feeding, handling, yard design and many other aspects of beef cattle production. Available from NSW DPI bookshop, see website www.dpi.nsw.gov.au/aboutus/resources/bookshop, search by location “Tocal (Paterson)”, publications listed alphabetically by title.

Web Sites

- Extensive fact sheets on beef cattle at www.dpi.nsw.gov.au/agriculture/livestock/beef
- “Beef News” newsletter at www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/beefnews
- Market information, research and development and industry programs at www.mla.com.au/AudienceHierarchy/CattleProducers/default.htm

Dairying

Dairying is a specialist field that requires high levels of capital as well as extensive pasture, cropping, animal husbandry and administrative skills. It is generally not suited to new landholders. Before contemplating dairying, talk to a dairy officer.

Contacts

- **Dairy Officers in NSW DPI (agriculture) at Kempsey or Taree**
- **Other contacts for owners of a few cows are the same as for beef cattle**

Reading

“**Keeping a Cow**” by J Wilson (2005) for anyone wanting to keep one or a few head of dairy cows. Available NSW DPI online bookshop www.dpi.nsw.gov.au/aboutus/resources/bookshop

Web Sites

- NSW DPI dairying at www.dpi.nsw.gov.au/agriculture/livestock/dairy-cattle
- Dairy Australia www.dairyaustralia.com.au

Horses

The following resources are for owners of stock horses and are not meant to meet the needs of a horse enterprise.

Contacts

- **Horse owners will need to contact veterinarians, horse associations, industry bodies and local horse owners to obtain advice. Also, see the yellow pages for horse-based services**

Animal health

- Vet in LHPA at Grafton or Kempsey for multiple animals or a history of recurring disease only
- Private vets for individual animals (see yellow pages)
- **Branding and brand registration**
 - LHPA at Grafton or Kempsey

Training Courses

“**Horse Care & Handling**”. Introductory horse handling short course. Contact Tocal College, NSW DPI (agriculture).

For those wishing to enter any sector of the horse industry, both Trenayr TAFE campus (near Grafton) and Tocal College at Paterson offer diploma courses for those wishing to enter the horse industry.

Reading

“**Healthy Land Breeds Healthy Horses**”. Provides best practice guidelines in landcare, horse health and economic feeding for horses. Available from the Rural Industries Research and Development Corporation.

“**Horse Sense: The Guide to Horse Care in Australia and New Zealand**” by P Huntington et al (2004). ISBN 0643065989. Landlinks Press. Available from most bookshops.

“**Managing Horses on Small Properties**” by J Myers (2005). ISBN 0643090673. Landlinks Press. Available from most bookshops

Web Sites

- NSW Dept of Primary Industries at www.dpi.nsw.gov.au/agriculture/livestock/horses
- The Australian Horse Industry Council with extensive links to sites on health, management, horse industries and horse associations at www.horsecouncil.org.au
- Rural Industries Research and Development Council’s horse research program at www.rirdc.gov.au/RIRDC/programs/established-rural-industries/horses/
- Horse Industry Directory at www.horsedirectory.com.au/nsw/
- Horse associations at www.australianwesternhorshowcase.com.au/Association_links.htm

Pigs**Contacts**

- **All aspects of management**
 - Livestock Officer, Pigs –General Production in NSW DPI (agriculture) at Orange
- **Development consent for piggeries**
 - local shire councils
- **Producer groups**
 - Australian Pork Ltd
 - NSW Farmers Association
 - Meat and Livestock Australia

Web Sites

- NSW DPI’s pig information at www.dpi.nsw.gov.au/agriculture/livestock/pigs
- More pig industry and management information from Qld DPIF. Go www.dpi.qld.gov.au > Animals > Pigs
- Australian Pork Ltd at www.australianpork.com.au

Poultry

Contacts

- **All aspects of management**
 - Poultry Officer in the NSW DPI (agriculture) Paterson, Tocal Agricultural Centre
 - Health issues NSW DPI (agriculture) Menangle, Elizabeth Macarthur Agricultural Institute
- **Development consent for commercial production**
 - Local shire councils
- **Producer groups**
 - NSW Free Range Egg Producers Association
 - "Burrawong"- grain fed free-range poultry with certified organic processing facility. Ph 6569 0901, fax 6569 0441. www.poultryofburrawong.com.au.

Reading

"*A Guide to Keeping Poultry in Australia*" by D Reading (1990). ISBN 0 670 90273 X. Viking Publishing. Available from most bookshops

"*Backyard Poultry – Naturally*" by A Moore (1998). ISBN 09585590 1 5. Python Press. Available from most bookshops

"*Model Code of Practice for the Welfare of Animals: Domestic Poultry*". ISBN 0643068678. CSIRO Publishing. Available from most bookshops

Web Sites

- NSW DPI's poultry web site <http://www.dpi.nsw.gov.au/agriculture/livestock/poultry>
- Australian egg Corporation at <http://www.aecl.org/>
- Meat poultry issues and publications at http://www.nswfarmers.org.au/policy_committees/poultry_meat
- egg production at http://www.nswfarmers.org.au/policy_committees/eggs/middle
- Qld DPIF's poultry web site www.dpi.qld.gov.au > Animal Industries > Poultry
- University of Sydney's poultry information gateway at <http://vein.library.usyd.edu.au/links/poultry.html#general>

Bees

Contacts

- **All beekeeping advice**
 - Livestock officer, Bees in NSW DPI (agriculture) at Bathurst and Richmond
- **Registration as a beekeeper (compulsory)**
 - Regulatory officers in NSW DPI (agriculture) at Coffs Harbour.
- **Beekeeping regulations and notifiable diseases**
 - Regulatory officers in NSW DPI (agriculture) at Coffs Harbour.
- **Beekeeping associations**
 - NSW Apiarists' Association Inc.

Training Courses

"*Bee Keeping*". Designed for new entrants to the industry. Contact Tocal Agricultural College, Paterson.

"*Queen Bee Breeding*" for beekeepers with some experience. Contact Tocal Agricultural College, Paterson.

Reading

"*Australian Beekeeper*", a monthly magazine on beekeeping available from c/- Pender Bee Goods Pty Ltd, 34 Racecourse Rd, Rutherford, 2320. Phone (02) 4932 7999 or email penders@nobbys.net.au

"*Australia's Honeybee News*", a bimonthly magazine available from, PO Box 352, Leichhardt, 2040. Phone (02) 9798 6240 or email honeybee@accsoft.com.au.

Web Sites

- All aspects of beekeeping at <http://www.dpi.nsw.gov.au/agriculture/livestock/honey-bees>
- List of beekeepers associations <http://www.honeybee.com.au/beeinfo/assn.html>

Aquaculture

Contacts

- **Aquaculture advice and details on funding schemes and contacts**
 - Aquaculture Extension Officer in NSW DPI (fisheries) at Coffs Harbour and Trenayr TAFE Campus near Grafton
- **Aquaculture permits and the application process**
 - Aquaculture Administration Centre
- **Whether development consent is needed**
 - Local councils
- **Information on aquaculture markets**
 - NSW Aquaculture Association
- **Sydney Fish Market Authority**
- **Links to the regions aquaculture sector**
 - Mid North Coast Regional Development Board
- **Aquaculture producers group**
 - NSW Aquaculture Association

Training Courses

"*Intensive Recirculating Systems*" and "Introduction to Water Quality" TAFE PLUS short courses. Trenayr TAFE Campus at Grafton.

Reading

"*Australian Fish Farmer: A Practical Guide to Aquaculture*" by J. Mosig and R Fallu (2004). ISBN 0643068651. Published by Landlinks Press. Available from most bookshops

Web Sites

- NSW DPI extension services, freshwater and saltwater aquaculture fact sheets and "NSW Aquaculture Industry Directory" at <http://www.dpi.nsw.gov.au/fisheries/aquaculture>
- Qld DPIF's aquaculture web site, www.dpi.qld.gov.au > fisheries > Aquaculture
- NSW Aquaculture Association at <http://www.nswaqua.com.au/>
- "AustAsia Aquaculture", bimonthly magazine about aquaculture in Australia, see <http://www.austasiaaquaculture.com.au/>

Field crops, horticultural and forestry

Field crops

Contacts

- **Agronomists in NSW DPI (agriculture) at Grafton and Kempsey**

Reading

"*Field crop herbicide injury: the Ute Guide*" Catalogue number B666, available at NSW DPI Bookshop Orange

Web Sites

- NSW Dept of Primary Industries at <http://www.dpi.nsw.gov.au/agriculture/field>
- Qld DPIF's horticultural site, www.dpi.qld.gov.au > Plants > Field crops and pastures

General horticulture

These resources are relevant for most horticultural crops

Contacts

- **Horticulture Officers in NSW DPI (agriculture) at Coffs Harbour**

Reading

"*Good Fruit and Vegetables – Informing the Australian Horticulture Industry*" a monthly magazine, for subscriptions see https://www.ruralbookshop.com.au/book_detail.asp?product_id=2581&producttype_id=1

"*Coastal Fruitgrowers Newsletter*". Available by subscription, phone Sandra Hardy on 02 4348 1916, or on the web at <http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/coastal-fruitgrowers>

"*New Crop Industries Handbook*" information about 69 new plant crops, available from Rural Industries Research and Development Corporation website <https://rirdc.infoservices.com.au/items/04-125>

Web Sites

- Management advice for a wide range of horticulture crops, NSW DPI (agriculture) services, newsletters and related web links at <http://www.dpi.nsw.gov.au/agriculture/horticulture>
- Qld DPIF's horticultural site, www.dpi.qld.gov.au > Plants > Fruit and vegetables
- Links to horticulture at the federal, state and local level via the Department of Agriculture, fisheries and forestry's agricultural portal at www.agriculture.gov.au
- Rural Industries Research and Development Corporation <http://www.rirdc.gov.au/> see Plant Industries
- Horticulture Australia at www.horticulture.com

Avocados

In addition to General Horticulture resources.

Contacts

- **Producer body**
 - Avocados Australia Ltd

Reading

"*Talking Avocados*" is the official magazine of Avocados Australia. Contact Avocados Australia on 07 3846 6566 or subscribe online at www.avocado.org.au/industry/growers_talking.asp.

The "*Agrilink Avocado Information Kit*", the computerised management package Avoman and the avocado reference database AvolInfo are all available from Qld DPI. See www.dpi.qld.gov.au > Plants > Fruit and vegetables > Fruits & nuts – Major crops – Avocado.

"*Avocado: Botany, Production and Uses*" edited by AW Whiley et al. ISBN 0 85199 357 5. CABI Publishing, New York. Available from bookstores.

Web Sites

- Avocadosource – a free electronic library of avocado knowledge at www.avocadosource.com
- Avocados Australia Ltd at www.avocado.org.au

Bananas

In addition to General Horticulture resources.

Bananas plants infected with bunchy top, Black sigatoga and Panama disease must be destroyed immediately. Banana plant material may not be removed from any place without a permit. Growers must notify a regulatory officer within 24hrs of the presence of notifiable diseases or pests.

Contacts

- **Permits and advice about disease control measures**
 - Regulatory Officers in NSW DPI (agriculture) at Coffs Harbour
- **Advice about management**
 - Bananas NSW
- **Producer representative body**
 - Australian Banana Growers Council is the peak body of the industry

Reading

Newsletters

"*Australian Bananas*". Contact the Australian Banana Growers Council

"*Banana Bulletin*". Contact Bananas NSW

Web Sites

- Bananas NSW www.bananasnsw.org.au
- Australian Banana Growers Council www.abgc.org.au
- Industry contact list at Australian Banana Growers Council website, www.abgc.org.au/pages/IndustryContacts/IndustryContacts.asp

Citrus

In addition to general horticulture resources.

Contacts

- **Producer representative body**
 - Australian Citrus Growers Inc.
- **Auscitrus (The Australian Citrus Propagation Assoc.)**

Reading

"*Auscitrus Newsletter*", subscribe by contacting Australian Citrus Growers Inc or downloading editions at www.auscitrus.com.au. > Newsletters

"*Citrus Diseases and Disorders*" A comprehensive guide for citrus growers in New South Wales. Available NSW DPI online bookshop www.dpi.nsw.gov.au/aboutus/resources/bookshop

"*Growing lemons in Australia - a production manual*". Available NSW DPI online <http://www.dpi.nsw.gov.au/agriculture/horticulture/citrus/lemon-manual>

Web Sites

- Australian Citrus Growers Inc
www.australiancitrusgrowers.com
- Auscitrus www.auscitrus.com.au.
- Citrus management resources at
www.auscitrus.org.au > Resources
- Citrus contacts in Australia at
http://www.dpi.nsw.gov.au/agriculture/horticulture/citrus

Cut flowers

In addition to General Horticulture resources

Contacts

- **Producer Groups**
 - Native Flower Growers' Association Inc.
 - Australian Native Flower Growers and Promoters Association
 - Flower and ornamental plant industry contacts – Contact the Horticulture Officer in NSW DPI (agriculture) at Coffs Harbour or www.dpi.nsw.gov.au/agriculture/horticulture/floriculture/information/contacts

Reading

“Commercial flower Growing in NSW – an Industry Snapshot”.

Provides an overview of the industry as well as recommended reading and a long list of contacts. Available from NSW DPI (agriculture) offices or http://www.dpi.nsw.gov.au/agriculture/horticulture/floriculture/industry/snapshot.

“Growing Australian Native flowers Commercially”. Available from NSW DPI (agriculture) offices or http://www.dpi.nsw.gov.au/agriculture/horticulture/floriculture/australian-south-african/growing-commercially

“NSW Flower News”. Published on the NSW DPI web site http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/nsw-flower-news and sent to members of each industry association in NSW

Web Sites

- Native Flower Growers' Association Inc. www.australiannativeflowers.com.au
- Australian Native Flower Growers and Promoters Association www.anfgpa.com
- Australian New Crops at www.newcrops.uq.edu.au

Macadamias

In addition to general horticulture resources

Contacts

- **Peak industry body**
 - Australian Macadamia Society

Reading

“Macadamia Growers Handbook” by P O'Hare et al (2004) and **“Field Guide – Macadamia Problem Solver & Bug Identifier”** by E Gallagher et al (2003), both available from the Australian Macadamia Society

“MacMan” Farm recording software. Order from the MacMan team on (07) 5453 5800 or email macman@dpi.qld.gov.au

Web Sites

- Australian Macadamia Society at www.macadamias.org

Vegetables

In addition to General Horticulture resources

Contacts

- **Horticulturalist in NSW DPI (agriculture) at Murwillumbah for general enquiries**
- **Horticulturalist in NSW DPI (agriculture) at Gosford for greenhouse and hydroponic vegetables**
- **Horticulturalists in NSW DPI (agriculture) at Yanco for larger scale field vegetables**

Reading

“Australian Vegetable Growers Handbook” for commercial growers and home gardeners. Available from the NSW DPI (agriculture) bookshop or online at www.dpi.nsw.gov.au/aboutus/resources/bookshop > search by location “Orange”, titles listed alphabetically.

Web Sites

- “Lettuce Leaf” newsletter for Australian lettuce growers. Available on the NSW DPI (agriculture) web site http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/lettuce-leaf
- “Vegiebites” newsletters discussing all issues affecting vegetable producers. Available on the NSW DPI (agriculture) web site http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/vegiebites-newsletter

Sugar cane

The New South Wales sugar industry occupies approximately 34,000 hectares of the Northern Rivers region and extends from near the Queensland border in the north to Grafton in the south. Sugar cane is a major crop in the region, being produced in the near-coastal areas of the three northern river valleys (Tweed, Richmond and Clarence). Mills are located at Condong, Broadwater and Harwood and sugar is a significant contributor to the economy of the region.

Contacts

- **Broadwater Mill: Broadwater NSW (02) 6620 8200**
- **Condong Mill: Condong NSW (02) 66701700**
- **Harwood Mill & Refinery: Harwood Island NSW (02) 66400400**

Web Sites

- For sugar Industry information go to Sunshine Sugar – NSW Sugar Milling Co – operative at http://www.nswsugar.com.au/index

Soybeans

On the North Coast of NSW, rain grown soybeans have been successfully integrated into agricultural systems for the past thirty years. These systems include the beef, sugar and cropping (maize and cereal) industries.

Reading

Desborough, P.J. (2000). Soybeans in coastal New South Wales. Pp 14-16. In Proceedings of the Eleventh Australian Soybean Conference at http://www.australianoilseeds.com

Websites

- North Coast NSW planting guide at http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0020/146180/soy-nc-06-07.pdf
- Future directions at; http://www.australianoilseeds.com

Tea tree

In addition to General Horticulture resources

Contacts

- **Advice on management**
 - Bede Clarke, Agronomist in NSW DPI (agriculture) at Casino

Producer organization

- Australian Tea Tree Industry Association

Web Sites

- Australian Tea Tree Industry Association www.teatree.org.au
- Rural Industries Research and Development Corporation research and/or publications www.rirdc.gov.au > Programs > New Rural Industries > Tea Tree Oil
- Tea Tree Group at www.tto.bcs.uwa.edu.au

Forestry**Contacts**

- **Initial contact and source of information for those interested in forestry investment**
 - Office of Private Forestry
- **Native farm forestry approvals and plantation (>30 hectares) approvals**
 - Plantation Officer in NSW DPI (agriculture) in Coffs Harbour
 - Private native forestry in DECC at Grafton
- **Farm forestry and its integration with agricultural production**
 - Forestry Officer in NSW DPI (agriculture) at Tamworth
 - Mid North Coast Farm Foresters (producer group)
- **Harvesting timber for on-farm use (routine agricultural management activities)**
 - NRCMA offices
- **Hardwood and softwood plantations joint ventures**
 - Forests NSW joint venture hotline
- **Private farm forestry**
 - Mid North Coast Farm Foresters - producer group and network on the mid north coast

Training

“Master Tree Growers” course. Contact your local Landcare office for more details.

Reading

“Private Native forestry and the Native Vegetation Act 2003” Information sheet available from NRCMA offices or online at http://northern.cma.nsw.gov.au/programmes_native_vegetation.php

“What are the exemptions for Routine Agricultural Management Activities in Coastal CMAs?”

Websites

- Agroforestry fact sheets and agroforestry contacts at http://www.dpi.nsw.gov.au/agriculture/resources/private-forestry
- Timber plantations in northern NSW at www.nio.com.au/forestry/timber_plantations_in_northern_n.htm
- Joint venture agroforestry program at www.rirdc.gov.au > Plant Industries > Farm Forestry
- Mid North Coast farm forester's producer group at www.mncff.org.au

New and emerging industries

Government departments tend to concentrate their expertise on larger established industries. Hence, there is often little research and expertise available for landholders taking up new and emerging industries. You may also need to seek out producer networks or associations for support.

Contacts

Northern Rivers Regional Development Board (NRRDB) Facilitates development of new industries, including coffee and horticulture.

- **Rural Industries Research and Development Corporation. Many publications and links to new and emerging industries**
- **Local NSW DPI (agriculture) offices**
- **Australian New Crops. University of QLD website with information on potential, new or emerging crops and who is working in the area**
- **North Coast Bushfoods Group Co-operative.**
- **Native Flower Growers Association**

Reading

“The New Rural Industries. A Handbook for Farmers & Investors” by K Hyde, 1998, available from National Library of Australia.

“The New Crop Industries Handbook” edited by S Salvin et al (2005). Available from the Rural Industries Research and Development Corporation

Web Sites

- Qld DPI's list of discussion groups for many small and new industries at http://lists.dpi.qld.gov.au
- The New Crop Industries Handbook at www.rirdc.gov.au > Publications > search under title.
- For information about Alpacas http://www.alpaca.asn.au/

Organic farming

Organic farming covers production in all areas of agriculture. If there is an advisor for the particular enterprise (see above) refer to them first. However, many organic enterprises involve small and emerging industries that do not have a specialist government advisor. In this case, you will need to contact local and state and national organizations to develop the networks and knowledge required.

Contacts

- Organic Farming Liaison Officer, NSW DPI (agriculture) at Yanco
- Coffs Regional Organic Producers Organisation Inc (CROPO)
- Biodynamic Agriculture Australia
- Organic Federation of Australia
- Organic Growers of Australia
- Australian Certified Organic & Biological Farmers of Australia
- NASAA Australian and International Organic Certifier

Reading

“Organic Farming – An Introduction”. Describes the principles and benefits of organic farming and how to convert existing farm practices.

“Organic farming – Crops, fruit and vegetables”. Looks at growing and marketing organic vegetables, fruit and grain.

“Organic farming – Livestock”. Shows how to produce livestock using organic methods, with an emphasis on sheep and wool.

All available on the NSW DPI (agriculture) web site <http://www.dpi.nsw.gov.au>

Web Sites

- NSW DPI (agriculture) “Organic News” and organic links at www.dpi.nsw.gov.au/agriculture/farm/organic
- Rural Industries Research and Development Corporation’s organic produce research program at www.rirdc.gov.au > Rural Environment > Organic Farming
- The Organic Federation of Australia and its newsletter “Organic Updates” at www.ofa.org.au

Farm basics

Pesticide usage. Certification is required to use pesticides.

Contacts

- **Pesticide usage in pastures or crops**
 - Agronomists in NSW DPI (agriculture) at Grafton and Kempsey
- **Pesticide usage in horticulture**
 - District Horticulturalist in NSW DPI (agriculture) at Coffs Harbour
- **Pesticide usage for stock**
 - Private vets (see Veterinarians in the yellow pages)
 - Livestock Officer in NSW DPI (agriculture) at Casino

Training Courses

“SmartTrain: Chemical Application (AQF Level III)”. A 2-day course that provides accreditation for those who use pesticides with powered and handheld application equipment.

“SmartTrain: Chemical Risk Management (AQF Level IV)”. A 2-day course for contractors, landholders and managers that concentrates on risk management. Contact Tocal College, Paterson, NSW 2421. Phone 1800 025 520 520, email info@tocal.com, www.tocal.com

See the Environmental Protection Authority’s web site for a list of other organizations providing pesticide training at <http://www.environment.nsw.gov.au/pesticides/trainers.htm>

Further organizations providing pesticide training can be found in the yellow pages.

Reading

See Pesticide usage in the Weeds section of this kit

“Spray drift and how to prevent it” see QLD DPI fact sheet at http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xml/4790_4909_ENA_HTML.htm

See list of NSW DPI Publications Catalogue online at <http://www.dpi.nsw.gov.au/aboutus/resources>

Web Sites

- All aspects of the requirements for pesticides use at <http://www.environment.nsw.gov.au/pesticides/>

Fencing

Adjoining owners are jointly responsible for maintaining a sufficient dividing fence between properties (Dividing fences Act 1991). The Act spells out your rights and obligations.

You are required to maintain an adequate boundary fence (fence type depends on the type of livestock) and to undertake immediate repair to avoid liability for straying stock.

Contacts

- **Advice and construction**
 - Local fencing contractors (see under “fencing contractors” in the yellow pages)
- **Funding for streamline and native vegetation fencing**
 - NRCMA
 - Landcare Community Support Officers

Training Courses

“Fencing” by NSW Dept of Primary Industries. Fencing layout, designs and types for different classes of stock and property. Contact Tocal College, Paterson, NSW 2421. Phone 1800 025 520 520, email info@tocal.com, www.tocal.com

Reading

“Cattle yards: Design, Materials and Construction” by E Powell (2006). ISBN 0724222596. Published by Qld DPIF. Available from Qld DPI or most bookstores.

“Farm Agskills”, a comprehensive guide to farm skills including rope knots, wire knots, the basics of electric and conventional fencing.

“Fencing” and **“Electrical Fencing”**. All available on the NSW DPI (agriculture) web site <http://www.dpi.nsw.gov.au>

Web Sites

- Cattle yards and equipment design at www.dpi.nsw.gov.au/agriculture/livestock/beef/equip
- Goat fencing at <http://www.dpi.nsw.gov.au/agriculture/livestock/goats/mgt>

Equipment

A permit is required from the RTA to drive an unregistered vehicle (e.g. tractor) on public roads. 4WD tractors are needed to safely work much of the steeper country in the region. All tractors weighing more than 560kg are required to have Roll Over Protection Structures (ROPS)

Contacts

- **Tractor PTO guarding subsidies**
 - WorkCover

Training Courses

“Operate chainsaws.”, **“Safe use of Tractors.”** and **“Safe operation and maintenance of tractors.”** Contact Tocal College, Paterson, NSW 2421. Phone 1800 025 520 520, email info@tocal.com, www.tocal.com

“Chainsaw Operations.” Contact NSW TAFE

Reading

“Tractor Agskills: A Practical Guide to Farm Skills” Available from the NSW DPI (agriculture) book store and online at <http://www.dpi.nsw.gov.au>

Websites

Rural farm safety, training and training course providers at

- WorkCover www.workcover.nsw.gov.au/Industry/Rural/Default.htm
- FarmSafe Australia www.farmsafe.org.au

Contacts

Aboriginal Land Councils and Corporations

Refer to the list of Aboriginal Extension Project Officers and Local Aboriginal Land Councils (in the resource kit folder).

Aboriginal NRM Facilitator (NRCMA)

PO Box 1417, Coffs Harbour NSW 2450

Phone: (02) 6653 0150

Agriculture, Fisheries and Forestry, Department of (Commonwealth) - DAFF

Responsible for agriculture, fisheries and forestry at the national level. Provides an internet portal to government information at local, state and commonwealth level for agricultural natural resource management, industries, products and agribusiness

GPO Box 858, Canberra, ACT, 2601

Agriculture enquiries (02) 6272 5680

Fisheries enquiries (02) 6272 5777

Forestry enquiries (02) 6272 4679

Web sites: home page www.affa.gov.au, agricultural portal www.agriculture.gov.au

Apiarists’ Association (NSW)

Represents commercial beekeepers’ interests and produces a bi-monthly newsletter for members. Has a north coast branch in Kempsey.

Julie Lockhart (State Secretary/Treasurer)

PO Box 3018, Toongabbie east, NSW, 2146

Phone: (02) 9631 3934

Email: nswaa@bigpond.net.au

Aquaculture Association, NSW

Peak industry body that represents land-based aquaculturalists in NSW. Includes marketing, research, fact sheets

Web site: www.nswaqua.com.au

Margaret Grose (North Coast branch)

Phone: (02) 6561 5204

Australian Banana Growers Council

Peak body that represents the Australian banana industry. Includes marketing, research, fact sheets, etc

PO Box 309, Brisbane Market, Qld, 4106

Phone: (07) 3278 4786

Email: abgc@abgc.org.au

Web site: www.abgc.org.au

Australian Citrus Growers Inc.

Peak body of the Australian citrus growing industry. Includes marketing, research, fact sheets, events and seasonal updates

PO Box 5091, Mildura, Vic, 3502

Phone: (03) 5023 6333

Email: admin@australiancitrusgrowers.com

Web site: www.australiancitrusgrowers.com

Australian Macadamia Society

Peak macadamia industry body. Provides statistics, grower guides, contacts, fact sheets, etc

Suite 1, 113 Dawson St, Lismore, 2480

Phone: (02) 6622 4933

Email: admin@macadamias.org

Web site: <http://macadamias.org>

Australian Native Flower Growers and Promoters

Producer group providing news, events and promotion regarding the native flower industry

PO Box 4327, east Gosford, 2250

Phone: (02) 4365 5510

Email: olgab@netseek.com.au

Web Site: www.anfgpa.com

Australian New Crops

(University of Queensland Gatton)

Contact about information on potential, new or emerging crops and who is working in the area.

Dr Rob Fletcher, School of Agriculture and Horticulture. University of Queensland Gatton, 4343

Phone: (07) 5460 1311

Email: r.fletcher@mailbox.uq.edu.au

Web site: www.newcrops.uq.edu.au/

Australian Pork Ltd

National representative body for Australian pig producers. Includes marketing, research, fact sheets, events and seasonal updates

PO Box 148, Deakin West, ACT, 2600

Phone: 1800 789 099

Email: apl@australianpork.com.au

Web Site: www.apl.au.com

Australian Tea Tree Industry Association

Peak body of the Australian tea tree growing industry. Includes market data, research, links, etc

PO Box 20, Tweed Heads, 2485

Phone: (02) 66 742 925

Email: enquiries@attia.org.au

Web site: www.teatree.org.au

Avocados Australia

Peak industry body in Australia Includes marketing, research, fact sheets, events and seasonal updates

Po Box 663, Stones Corner, Qld, 4120

Phone: (07) 3391 2344

Email: admin@avocado.org.au

Web Site: www.avocado.org.au

Bananas NSW

A statutory body set up to aid and advise NSW banana growers. They employ an agronomist as an Industry Development Officer.

PO Box 775, Murwillumbah, 2484

Phone: (02) 66 726 633

Web Site: www.bananasnsw.org.au

Biodynamic Agriculture Australia

A not-for-profit producer-based organization that promotes the biodynamics in agriculture.

PO Box 54, Bellingen, 2454

Phone: (02) 6655 0566.

Email: bdoffice@biodynamics.net.au

Web Site www.biodynamics.net.au.

Biological Farmers of Australia and Australian Certified Organic

A representative organic body that provides assistance in market intelligence, exporting requirements, and development of contacts and networks.

Head Office, PO Box 530 – L1/766 Gympie Rd, Chermside, Qld, 4032

Phone: (07) 3350 5716

Email: info@australianorganic.com.au and info@bfa.com.au

Web Site www.bfa.com.au

Botanical Information Service, National Herbarium of NSW, Botanic Gardens Trust

Identifies plants for the public. Fee for services charged.

Urgent enquiries (e.g. poisonous plants): (02) 9231 8111

Email: botanical.is@rbgsyd.nsw.gov.au

www.rbgsyd.nsw.gov.au/information_about_plants/botanical_info

Coffs Harbour Botanic Gardens Herbarium

Provides free plant identification. Plants can be posted or left at the herbarium from 9-12am on Monday, Tuesday or Friday. Up to 5 plants are identified for free in any 3 month period.

Via Hardacre St or PO Box 648, Coffs Harbour, 2450

Phone: (02) 6648 4898

Coffs Regional Organic Producers Organisation (CROPO)

A largely small scale and backyard organics producer group

PO Box 363, Coffs Harbour, 2450

Phone: (Desnee McCosker) (02) 6651 6880

email: bes.bunyip@bigpond.com

Community Services, Department of

Lead government agency responsible for providing immediate welfare assistance to victims of disasters including drought, flood and bushfire.

Web Site: www.community.nsw.gov.au

Community Support Officers

To locate your nearest Community Support Officers refer to the list in the resource kit folder or contact the nearest NRCMA office.

Country Women's Association - CWA

A voluntary organization that works to improve conditions for country women and their families. Provides a support network and a voice to government.

There are branches in most regional areas on the North Coast

Web site: www.cwaofnsw.org.au

Environment and Climate Change (Department of) (NSW) – DECC

Level 3, Victoria St, GRAFTON

Phone: (02) 66411500

Web site: www.environment.nsw.gov.au

Coast and estuary - (02) 6561 4975

Flora and fauna protection - See NPWS

Private Native Forests - (02) 66 530103

Environment Protection Authority - EPA (DECC)

Responsible for administering the Protection of the Environment Operations Act 1997. Contact for information on the regulations regarding pesticide usage (Pesticides Act 1999) and air, water, land or noise pollution.

Sydney Office

59 Goulburn St, Sydney, 2000

Information line 131 555

Email: info@environment.nsw.gov.au

Web site: www.epa.nsw.gov.au

Coffs Harbour Office

24 Moonee St.

Phone: (02) 6651 5946

Grafton Office

49 Victoria St.

Phone: (02) 6640 2500

National Parks & Wildlife Service - NPWS

Responsible for maintaining the parks and reserve system, and conserving natural and cultural heritage in NSW. Contact for information on native plants, animals and habitats; their identification, management, regulations and licensing requirements. They also offer a number of incentive schemes for Landholders interested in nature conservation.

Information line 1300 361 967

Email: info@npws.nsw.gov.au

Web site: www.npws.nsw.gov.au

Environment and Heritage, Department of (Commonwealth) - DEH

Responsible for matters of national environmental significance. It administers the environment Protection and Biodiversity Conservation Act 1999. Provides an internet portal to government information at the local, state and commonwealth level on environmental issues covering atmosphere, biodiversity, coasts and oceans, environment protection heritage, inland waters and land.

GPO Box 787, Canberra, ACT, 2601

Phone: (02) 6274 1111

Email via enquiry page at www.deh.gov.au/erin/comments.html

Web sites: home page www.deh.gov.au, environmental portal

www.environment.gov.au

Environmental Defender's Office (NSW) - EDO

A not-for-profit community legal service specialising in public interest law, assisting individuals and community groups working to protect the natural and built environment. Provides easy to read fact sheets and other publications on environmental law.

Level 9, 89 York St, Sydney, 2000

Phone: 1800 626 239

Email: edonsw@edo.org.au

Web site: www.edo.org.au/edonsw/site/

EPA Environment Protection Authority

See DECC.

Farmers Association (NSW)

A voluntary industry body representing the farming community. Contact for information on farmer education and training, matters affecting rural industries, industrial relations, rural issues and local agricultural events

Phone: (02) 8251 1700

Email: emailus@nswfarmers.org.au

Web site: www.nswfarmers.org.au

North Coast Region

Regional Service Manager

Phone: (02) 6564 2355

Email: burtm@nswfarmers.org.au

Web site:

www.nswfarmers.org.au/about_us/regional/region_7_nc

Free Range Egg Producers Association

A producer group

Phone: (02) 4572 3315

Growsearch Australia

Growsearch is an information database of over 28,000 articles for producers of ornamental, horticultural and nursery crops. Searches are free, but photocopying of articles is charged. Articles are cheaper if you become a member.

PO Box 327, Cleveland, Qld, 4163

Phone: (07) 3821 3784

Email: growsearch@dpi.qld.gov.au

Web site: www2.dpi.qld.gov.au/growsearch

Horticulture Australia

A national research, development and marketing organization for the horticulture industry. Includes reports, news and events.

Level 1, 50 Carrington St, Sydney, 2000

Phone: (02) 8295 2300

Email on the form at

www.horticulture.com.au/contactus/contactus.asp

Web site: www.horticulture.com.au

Land & Water Australia (Commonwealth) - LWA

Provides a wide range of information about land, water and vegetation management (fact sheets, guidelines, manuals, etc)

GPO Box 2182, Canberra, ACT, 2601

Phone: (02) 6263 6000

email: public@lwa.gov.au

Web site: www.lwa.gov.au

Land Boards

Community-based tribunals that deal with local disputes, complaints, appeals and inquiries about such matters as dividing fences, road closures, crown land (permits, rents and leases) and appeals against RLPBs regarding carrying capacity decisions. for more information on their roles visit

Armidale (02) 6772 5488

Grafton (02) 6640 2046

Landcare

A nationwide program which facilitates community and volunteer activities in natural resource management. Each catchment has a Community Support Officer who can provide regular news on land management funding, workshops and field days and further contacts for your area. All Landcare and Community Support Contacts are listed in your resource kit folder.

Web: www.landcarensw.org includes some links to local Landcare and Coastcare Group web pages. To find your local Landcare networks search Northern Rivers Landcare in your area eg: Coffs Harbour, Bellingen, Clarence, Upper Clarence, Brunswick, Richmond, Tweed

Lands, Department of (NSW)

Web site: www.lands.nsw.gov.au

Crown Lands

Provides information on the Dividing fences Act 1991 and crown lands, which it administers and manages under the Crown Lands Act

Regional Office; level 1 Victoria St, Grafton

Phone: (02) 66428124

Email via the enquiry form at

www.lands.nsw.gov.au/crownlandsenq.htm

Land and Property Information

Provides land title registration, property information, valuation, surveying and mapping.

GPO Box 15, Sydney, 2001

Phone: (02) 9228 6666

Email via the enquiry form at www.lands.nsw.gov.au/LPIenquiry.htm

Map Sales

Provides aerial photographs of properties.

PO Box 143, Bathurst, 2795

Phone (02) 6332 8123

Email at www.lands.nsw.gov.au/MapsAndPhotos/mapsalesenq.htm

Legislation Online

Lists all government legislation.

NSW www.legislation.nsw.gov.au

Commonwealth scaleplus.law.gov.au

Livestock Health and Pest Authority North Coast (NSW) – formerly RLPB

Responsible for the administration and management of stock identification (NLIS), stock movement, travelling stock reserves, livestock disease control, pest animal/insect control and natural disaster relief.

Lismore: (district main office)

79 Conway Street (PO Box 16), LISMORE NSW 2480

Ph 02 6621 2317, Fax 02 6621 2928

Casino: 147 Barker Street, (PO Box 158), CASINO NSW 2470

Phone: 02 6662 3166, Fax 02 6662 6012

Grafton: 54 Victoria Street, (PO Box 21), GRAFTON NSW 2460

Phone: 02 6642 3699, Fax 02 6643 9045

Web site: <http://www.rlpb.org.au/home-page>

Meat and Livestock Australia

Producer-owned company that provides services such as marketing, research and development, market intelligence and tips and tools for a wide range of farm management issues.

Locked Bag 991, North Sydney, 2059

Phone (free call): 1800 023 100

Web site: www.mla.com.au

Mid North Coast Farm Foresters

MNCFF's are landowners operating in the mid north coast who have an interest in farm forestry. Contact for information, training, research and development in farm forestry.

PO Box 239, Bowraville, 2449

Phone: (02) 6564 7916

Email: mncff@tsn.cc

Web site: www.mncff.org.au

National Parks & Wildlife Service – See Department of Environment and Climate Change (DECC)

Services: Cultural Heritage Officers to assist with identifying whether your land harbours places of importance to Aboriginal people and how you can manage them best.

North Coast Bushfoods Group Co-Operative

Bush foods producer group

Phone: Margaret Grose (02) 6556 9656

Northern Rivers Regional Development Board (NRRDB)

Advises and supports new and emerging industries

Lismore Office: 02 6622 4011

Web site: <http://www.investnorthernrivers.com.au>

Northern Rivers Catchment Management Authority (NSW) - NRCMA

The NRCMA is the primary contact for anything to do with native vegetation, property vegetation plans and many other natural resource management issues.

Email: northern@cma.nsw.gov.au

Web site: www.northern.cma.nsw.gov.au

Northern Rivers CMA Offices are located at:

Alstonville

Phone: (02) 6627 0170

Armidale

Phone: (02) 6771 3450

Coffs Harbour

Phone: (02) 6653 0150

Grafton

Phone: (02) 6642 0622

Kempsey

Phone: (02) 65614960

Murwillumbah

Phone: (02) 6676 7390

Office of Private Forestry

Initial contact point and source of information for those interested in forestry investments in NSW.

GPO Box 39, Sydney, 2001

Phone: (02) 9228 6437

Fax: (02) 9228 6458

Email: jonathan.clark@dwe.nsw.gov.au

Web site: www.opf.nsw.gov.au/

Organic Federation of Australia

Peak body for the organic industry in Australia.

Phone: (02) 9299 8016

Email: info@ofa.org.au

Web site: www.ofa.org.au

Organic Growers of Australia

A national organic body providing certification for farmers and processors.

Phone: 6622 0100

Email: ohga@nrg.com.au

Web site: www.organicherbs.org/ohga.html

Primary Industries, Department of (NSW) – NSW DPI

Web site: www.dpi.nsw.gov.au

Agriculture division

Primary contact for information regarding agricultural production: pastures, crops, horticulture, dairying, beef cattle, soils, etc

Web: www.agric.nsw.gov.au

General enquiries: Jim Aston

Murwillumbah DPI NSW Office

Phone: (02) 66 722770

Bookshop

For purchasing of departmental publications

Orange Agricultural Institute, Orange, 2800

Phone: 1800 028 374

Email: bookshop@agric.nsw.gov.au

Online purchases:

www.bookshop.nsw.gov.au/agencydetails.jsp?agency=27

Casino Office – Agronomist

Contact for tea tree enquiries

PO Box 376, Casino, 2470.

Phone Bede Clarke on (02) 6662 1107

Coffs Harbour Office – District Horticulturalist and Regulatory Officer

Contact for horticulture and beekeeping regulations enquiries

Suite 5/Level 1, "City Square",
76 Harbour Drive, Coffs Harbour, 2450.

Phone: (02) 6650 3111

Gosford Office – Horticulturalist (vegetables)

Contact for greenhouse and hydroponic vegetables

Gosford Horticultural Institute, Research Rd, Narara, 2250

Phone: (02) 4348 1900

email: jeremy.badgery-parker@dpi.nsw.gov.au

Grafton Office - Agricultural Research & Advisory Station

Trenayr Rd, Junction Hill, 2460

Phone: (02) 6640 1600

Kempsey Office – Dairy Officer, Agronomist and Regulatory Officer

Contact for dairying, pastures, cropping, beekeeping regulations and notifiable diseases

31 Elbow St, West Kempsey, 2440

Phone: (02) 6562 6244

Email: kempsey.office@dpi.nsw.gov.au

Tamworth Office – Apiary, Forestry and Pig Officers

Contact for beekeeping, agroforestry and pig enquiries

Tamworth Agricultural Institute 4 Marsden Park Rd, Calala, 2340

Phone: (02) 6763 1100

email: john.rhodes@dpi.nsw.gov.au for beekeeping,

brendan.george@agric.nsw.gov.au for forestry and

greg.roese@dpi.nsw.gov.au for pigs

Taree Office – Agronomist, Beef Cattle Officer and Dairy Officer

Contact for dairying, beef cattle, pastures and cropping

1 Macquarie St, Taree St, West, 2430.

Phone: (02) 6552 7299

Email: taree.office@dpi.nsw.gov.au

Tocal College

Contact for agricultural training courses

Web site: www.tocal.com

'Tocal', Paterson, 2421

Phone: 1800 025520

Email: info@tocal.com

Tocal Paterson Office – Poultry Officer

Contact for poultry

'Tocal', Paterson, 2421

Phone: (02) 4939 8888

Email: tocal.office@dpi.nsw.gov.au

Yanco Office – Organic Farming Liaison Officer and Horticulturalists (Vegetables)

Yanco Agricultural Institute, Yanco, 2703

Contact for organics advice

Robyn Neeson: phone (02) 6951 2611 or email

robyn.neeson@agric.nsw.gov.au

Contact for larger scale field vegetable growing information

Tony Napier: phone (02) 6951 2796 or

email tony.napier@dpi.nsw.gov.au

Mark Hickey: phone (02) 6951 2523 or

email mark.hickey@dpi.nsw.gov.au

Fisheries Division

For all information regarding fisheries and aquaculture

Web: www.fisheries.nsw.gov.au

Location of all NSW district fisheries offices

Web: www.dpi.nsw.gov.au/aboutus/about/office

Aquaculture Administration

Information on aquaculture permits

Port Stephens Fisheries Centre

Phone: (02) 4982 1232

Grafton Aquaculture Centre, Grafton, 2460

Aquaculture Extension Officer

Contact for aquaculture information

Phone: (02) 6640 1692

Email: readp@fisheries.nsw.gov.au

Forests NSW division

Contact for joint venture forestry information.

Farm forestry information is on the agriculture web site www.agric.nsw.gov.au/reader/agroforestry

Locked Bag 23, Pennant Hills, 2120

Phone (02) 9980 4100

Hardwood Joint Venture Hotline: (02) 6643 0400

Softwood Joint Venture Hotline: (02) 6043 1007

Email: Cumberland@sf.nsw.gov.au

Web site: www.dpi.nsw.gov.au/forests

Primary Industries and Fisheries, Department of (Qld) - QDPIF

Queensland's equivalent of the Department of Primary Industries (NSW). More tropically orientated, but has a large amount of information that is relevant to the north coast

GPO Box 46, Brisbane, Qld, 4001

Phone: (07) 3404 6999

Web site: www.dpi.qld.gov.au

Specialty crops web site: www2.dpi.qld.gov.au/themaclists/1073.htm

Service include: Servicing local Aboriginal Land Councils and providing administrative support

Royal Society for the Prevention of Cruelty to Animals (RSPCA)

An animal welfare organization, which can be contacted for information on animal welfare and to report cases of animal cruelty

Web site: www.rspcansw.org.au

Web site: www.rspcansw.org.au/branches/kempsey/index.htm

Rural Assistance Authority (NSW)

Responsible for administering assistance measures to rural producers and small businesses on behalf of the Commonwealth and State Governments.

Locked Bag 23, Orange, 2800

Phone: 1800 678 593

email: rural.assist@raa.nsw.gov.au

Web site: www.raa.nsw.gov.au

Rural Financial Counselling Service

Provides free and independent financial advice for farm families, fishers and small rural businesses in financial difficulty. Includes assistance with identifying financial options and negotiating with lenders, information about government

assistance schemes and referrals to professional services.

Web site: www.ruralcounselling.org.au

Rural Fire Service (NSW)

Responsible for fire suppression and prevention in rural NSW. Contact for all information about fires - management, emergencies and training in fire fighting

Web site: www.rfs.nsw.gov.au

For public enquiries Phone: 1800 NSW RFS or 1800 679 737

For fire reporting Phone: 000

Rural Industries Research and Development Corporation

A government organization that is responsible for funding research on, and helping develop, rural industries. They supply a range of reports, newsletters and other publications on new and established rural industries.

Level 1,AMA House, 42 Macquarie St, Barton, ACT, 2600

Phone: (02) 6272 4819.

email: rirdc@rirdc.gov.au.

Web site: www.rirdc.gov.au.

Shire Councils

Contact about rates, roads, bridges, waste, community services, water and sewage services, flood mitigation, noxious weeds, tree clearing, acid sulphate soils and all development applications. Listed in local phone books.

State emergency Service (NSW) - SES

A volunteer emergency and rescue service that is the lead response agency for floods and storms across NSW. Contact when requiring assistance for storms and floods and about preparing for them

For emergencies phone: 132 500

For volunteering and safety information phone: 1800 201 000

Email via the enquiry form at www.ses.nsw.gov.au/contacts.htm

Web site: www.ses.nsw.gov.au

TAFE NSW – North Coast Institute

Provides training in computing, accounting, agriculture, aquaculture, environmental studies, horticulture, horse management.

Email: nci.courseinfo@tafensw.edu.au

Web site: www.nci.tafensw.edu.au

For course information Phone: 131 601

University of New England

Offers a range of publications on vegetation identification and natural resource management

Web site: www.une.edu.au

United Campus Bookshops

Madgwick Building, University of New England, Armidale, 2351

Phone: (02) 6772 3468

Email: armidale@ucb.net.au

Web site: www.ucb.net.au

Water and Energy, Department of (NSW) - DWE

Farm dams, licensing, irrigation, water sharing plans, river bank works – approvals.

North Coast Regional Office;

Level 2, 76 Victoria St, GRAFTON

Phone: 0266416500

Web: <http://www.dwe.nsw.gov.au>

Weeds – Far North Coast Weeds Authority

Web: <http://www.fncw.nsw.gov.au/cmst/fncw002/nova.asp>

Weeds - Far North Coast Weeds Advisory Committee

Web: <http://www.northcoastweeds.org.au/aboutus.htm>

Wetland Care Australia

Information on wetlands and their management

PO Box 114, Ballina, 2478

Phone (02) 6681 6069

Email: ballina@wetlandcare.com.au

Web site: www.wetlandcare.com.au

Wildlife Information and Rescue Service (WIRES)

For your nearest WIRES rescue service, look in the white pages of your local area telephone book under WIRES.

Workcover NSW

A statutory body, whose purpose is to achieve safe work places (including farms). Contact for information about how to manage safety risks, OH&S training and legal obligations as an employer

For enquiries phone: 131 050

Email via the enquiry form at

www.workcover.nsw.gov.au/Contactus/default.htm

Web site: www.workcover.nsw.gov.au



A Resource Kit for Rural Landholders in the Northern Rivers Region of NSW (2009).

Rewritten by Julie Mousley for the Northern Rivers Region

(based on the original version; A Resource Kit for Rural Landholders in the Nambucca, Macleay, Hastings Valleys by Harry Rose)

Production of this Resource Kit has been funded through the Australian Government Caring for Our Country Program and is supported by Landcare in the Northern Rivers Region of NSW and the Northern Rivers Catchment Management Authority.

Design by Mira Design Studio.

Visit our website at www.miradesignstudio.com.au

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NSW Government publication, prepared by CSIRO (2008),
Climate Change in the Northern Rivers Region.

Australian Bureau of Meteorology website (2009);
<http://www.bom.gov.au>

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“Saving Soils – A Landholders Guide to Preventing
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