



South East Queensland Land Types Booklet – Bremer Catchment



Delivering an **environment**
for **future generations to thrive**

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Table of contents

Page

South East Queensland Land Types	1
Booklet - Bremer Catchment	1
Introduction	1
General Principles of Sustainable Land Management	2
Map of Land Resource Areas	3
Blue gum on alluvial plains	4
Brigalow softwood scrub	6
Grass-sedge wetlands	8
Gum-topped box and blue gum on mixed alluvium	10
Ironbarks and bloodwoods on non-cracking clays.....	12
Ironbarks and blue gum onclays.....	14
Ironbarks and spotted gum ridges	16
Mixed open forests on duplexes and loams.....	18
Rainforest (closed forest) on basalts	19
Riparian forests	21
Softwood vine scrub	24
Tall open forests on basalts	26
Tall open forests on steep hills and mountains.....	28
Glossary	30
Regional Ecosystems in the Bremer Catchment.....	35
More Information.....	36
References.....	37

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We acknowledge the significant contribution by the Queensland Government to this publication. We have customised content in their Grazing Land Types Information sheets to provide more locally relevant information for each major sub-catchment in South East Queensland and to provide valuable supporting information for property management planning.

Disclaimer

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Acknowledgement of Country

We acknowledge that the place we now live in has been nurtured by Australia's First Peoples for tens of thousands of years. We believe the spiritual, cultural and physical consciousness gained through this custodianship is vital to maintaining the future of our region.

Contact details

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Introduction

The *South East Queensland Land Types Booklet – Bremer Catchment* provides land managers in this region with a description of the land types that may be present on their property. Land type provides a detailed description of the land and its suitability for a range of management activities. The booklet outlines the individual characteristics associated with each land type present in the Bremer catchment. Landholders can use this information to understand their land capability, identify the natural resources on their property, and plan for the appropriate use and management of their land.

The booklet provides an overview of general principles for sustainable management for all land types. This is followed by a detailed description of each land type in the Bremer catchment and of the specific land uses and management practices appropriate to each land type, including:

- **Native trees & shrubs.** Outlines the main or dominant tree species found within the broad vegetation communities that occur on each land type.
- **Pasture composition.** Classifies common grasses into desirable, intermediate and undesirable species, with their composition a valuable indicator of pasture condition.
- **Suitable sown pastures.** A range of best-bet grasses and legumes for different land types. Sown pastures are not suitable on all land types and situations and should be carefully considered. It is important to note some exotic grasses and legumes pose a significant threat to the environment because of their tendency to dominate. Species known to pose threats are marked **.
- **Introduced weeds.** Lists declared and environmental weeds often associated with the land type.
- **Soil.** Describes the dominant soil groups for each land type and their key properties which ultimately determine the suitability of the land to different types of land use.
- **Stocking rates.** a broad estimate of the area in each land type required to support an adult equivalent (AE) – a 450kg non-lactating animal – over a long planning horizon.
- **Utilisation rate.** Refers to the proportion of annual forage growth that is consumed by livestock. The safe utilisation rates listed refer to a maximum rate of average annual uses consistent with maintaining good land conditions for each land type.
- **Land use and management recommendations.** Specific recommendations for the land type to be considered in conjunction with general sustainable land management principles provided on page 2.
- **Land use limitations.** Highlights typical soil and landform characteristics that limit land use and management options.
- **Regional ecosystems.** Lists vegetation communities associated with particular land zones in a bioregion. A full list of REs is provided in the Appendices.
- **Conservation features.** Highlights significant conservation values within each land type and management considerations to protect and enhance these values.

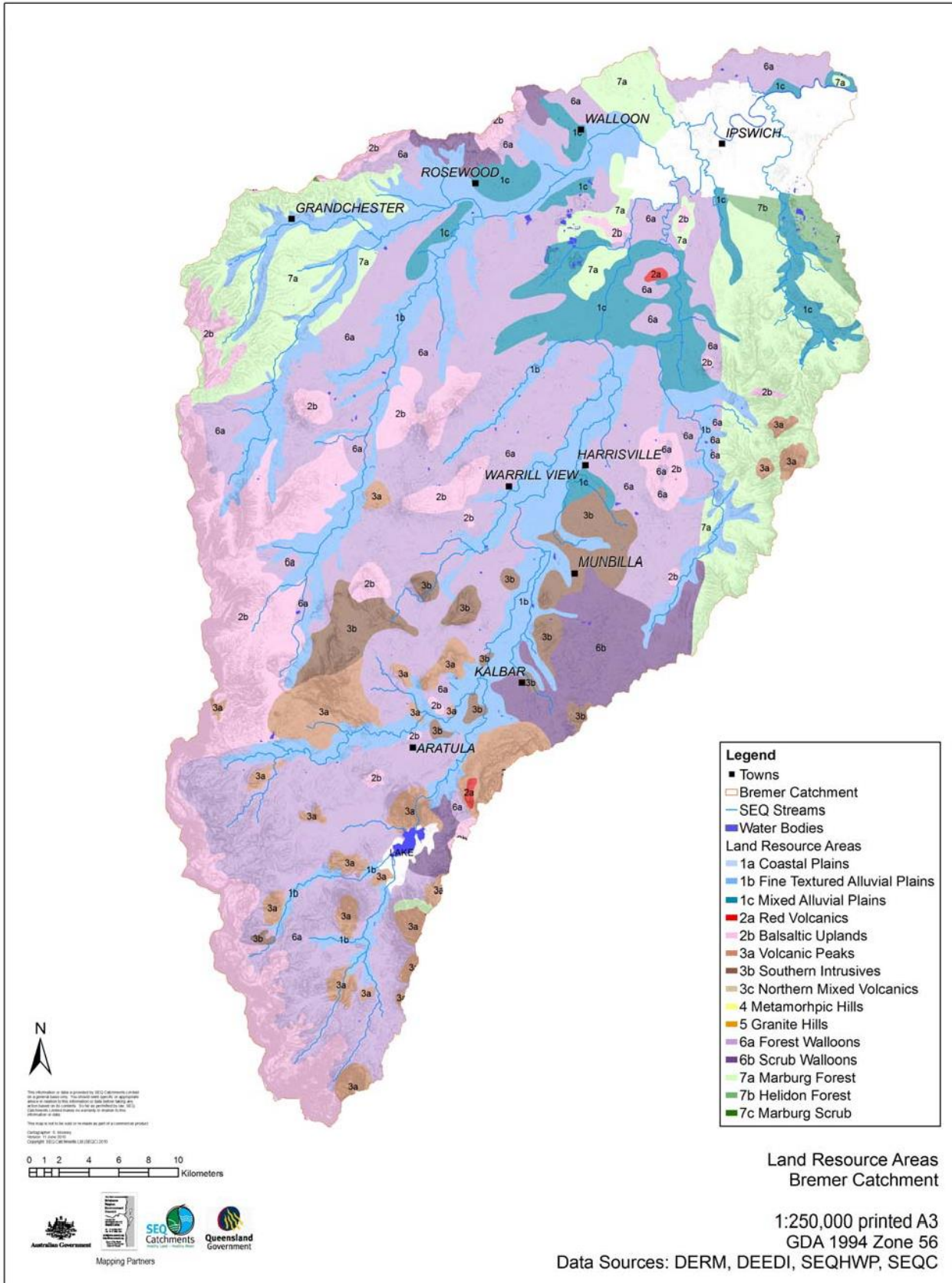
The Glossary provides an explanation of key terms within each description.

Further details on the individual characteristics are provided in the Appendices, and the section entitled 'More Information' provides a list of additional sources of information.

General Principles of Sustainable Land Management

- Manage your property according to the land use capability and limitations.
- Work cooperatively with neighbours for effective management of landscape scale issues such as fire management, weeds, animal pests and erosion.
- Ensure appropriate placement and maintenance of infrastructure (eg roads, bridges, fences, yards and water points) to minimise land degradation.
- Protect and rehabilitate areas that are degraded or at risk from erosion through fencing and re-establishment of groundcover and native vegetation.
- Control and minimise the spread of declared weeds and pests, and environmental weeds.
- Respect and protect indigenous and European cultural heritage sites.
- Minimise energy use and waste to reduce costs and environmental impacts.
- Maintain high levels of groundcover (>90 %) at all times of the year to prevent erosion and to maintain productive capacity and water quality.
- Adopt grazing management practices that maintain healthy diverse pastures dominated by 3P (Perennial, Productive, Palatable) species and that incorporate spelling at appropriate times so pastures can recover and set seed.
- Monitor and manage your pastures to match stocking rates with pasture availability.
- Adopt sustainable cropping practices (eg reduced tillage, stubble retention and use of legumes and crop rotations) to prevent soil health decline, soil acidification and erosion.
- Implement irrigation and farming practices which improve water use efficiency, minimise nutrient losses, run off and deep drainage.
- Protect and manage remnant vegetation and regrowth representing all of the original vegetation communities on your property.
- Retain large standing trees with hollows, whether alive or dead, organic litter and fallen timber, as critical habitat for a range of invertebrates, reptiles, birds and small mammals.
- Improve connectivity between patches of native vegetation through natural regeneration and strategic revegetation.
- Restore the condition of native vegetation through strategic fencing, fire management, ecological thinning and weed control.
- Ensure your fire management plan and fire regime (frequency, extent, intensity and timing) considers the ecological requirements of each vegetation type on your property.
- Maintain variability in fire frequency, intensity and the timing of burning and implement mosaic or patch burning at property and catchment scales to maximise biodiversity values.
- Protect and enhance native riparian vegetation to minimise streambank erosion, filter nutrients, provide habitat, maintain healthy aquatic functions and protect water quality.
- Manage dams as artificial wetlands by strategic fencing and establishment of alternative watering points, and providing vegetative buffers by encouraging regeneration and revegetation.
- Leave snags and large woody debris in streams to provide habitat and control erosion.

Map of Land Resource Areas



Blue gum on alluvial plains



Land Resource Area	Fine textured alluvial plains (1b).
Landform	Blue gum woodland to open forest on alluvial plains.
Broad vegetation description	Remnants of Queensland blue gum woodland with a grassy understorey. Also swamp mahogany, Moreton Bay ash and gum topped box.
Native trees and shrubs	Queensland blue gum (<i>Eucalyptus tereticornis</i>) (T), Gum topped box (<i>E. moluccana</i>) (T), Moreton Bay ash (<i>Corymbia tessellaris</i>), Swamp box (<i>Lophostemon suaveolens</i>), Brisbane wattle (<i>Acacia fimbriata</i>), Maiden's wattle (<i>A. maidenii</i>), Hickory wattle (<i>A. disparrima</i>), Black tea-tree (<i>Melaleuca bracteata</i>), Broad-leaved apple (<i>Angophora subvelutina</i>). (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes & creeping blue grass, scented top, paspalum, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wire grass, blady grass, swamp foxtail, native rat's tail.
Suitable sown pastures	Rhodes (Callide), creeping blue, Floren blue, pangola, paspalum, kikuyu, setaria, panic Lucerne, siratro, burgundy bean, clovers, medics, lotononis (coastal).
Introduced weeds	Chinese celtis, lantana, green cestrum, annual ragweed, blue heliotrope, lippia, fireweed.

Soil	
Description	Queensland blue, forest blue, kangaroo, black spear, Rhodes & creeping blue grass, scented top, paspalum, native legumes.
Key properties	Plant available water capacity: Medium to high. Fertility: Medium to high. pH: Surface – Variable (6 to 8). More alkaline in subsoil. Salinity: Very low. Sodicity: Non-sodic. Cracking clays occasionally sodic at depths > 60 cm. Effective rooting depth >1.2 m for loams and >1.5 m for cracking clays.
Stocking rates	Cleared native pastures: 1 AE / 3 ha. Improved pastures: 1 AE / 1 ha.
Utilisation	Conservative pasture utilisation: 35% by weight.
Enterprise	Predominantly cropping; fattening on native and improved pastures.
Land use and management recommendations	Extensively developed for agriculture, including wide range of dryland and irrigated crops and pastures. Soils are suitable for most grain, fodder and small crops. Coordinated drainage strategy of subsurface drains, diversion banks and crop layout design is required in intensively developed areas. Adopt practices such as minimum tillage, stubble mulching, include green cover crops in crop rotations and retain crop residues to maintain soil structure and reduce erosion. Maintain adequate surface cover at all times in areas used for grazing. Spell pastures when flowering and seeding. Control declared and environmental weeds. Burn with a low intensity fire in summer to late autumn every 3 to 6 years. Aim to burn 30 to 60% of any given area. Spot ignition in cooler or moister periods encourages mosaics.
Land use limitations	Slow drainage, particularly black earths with high clay content, may cause waterlogging and restrict growth of some crops. Alluvial loams become cloddy after cultivation and may become hard setting if compacted by continual cropping. Local frosts and flooding may occur. Erosive flooding may be a high risk in some locations. Surface runoff may be high, particularly following irrigation. Overland flow may cause rill and sheet erosion on unprotected surfaces. Stream banks are susceptible to erosion. Soil structural problems and plough pans may develop if cropped continuously.
Regional ecosystems	12.3.3 (major); 12.3.7 (minor)
Conservation features	While blue gum is common, blue gum communities have been extensively cleared and fragmented. As an endangered regional ecosystem, intact remnants and regrowth areas have high conservation significance. Freshwater wetlands which are important for biodiversity & ecosystem function are associated with this land type. Large, mature blue gums containing hollows are important nesting sites and habitat for a variety of birds and marsupials. Regrowth regenerates rapidly in the absence of grazing and frequent fire.

Brigalow softwood scrub



Land Resource Area	Scrub Walloons (6b).
Landform	Undulating low hills and steep hills (3-10% slopes).
Broad vegetation description	Brigalow open forest on sedimentary rocks with vine forest understorey.
Native trees and shrubs	Brigalow (<i>Acacia harpophylla</i>), Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) (T), Red kamala (<i>Mallotus philippensis</i>), Shiny-leaved canthium (<i>Psychrax oderata</i> forma <i>oderata</i>), Leopard ash (<i>Flindersia collina</i>), Foambark (<i>Jagera pseudorhus</i>), Bitter bark (<i>Alstonia constricta</i>), Chain fruit (<i>Alyxia ruscifolia</i>), Scrub boonaree (<i>Alectryon diversifolius</i>), Silver croton (<i>Croton insularis</i>). (T) = Suitable timber species
Pasture composition	Minimal grassy understorey.
Desirable pasture species	Queensland blue, kangaroo, Rhodes grass, green panic.
Intermediate pasture species	Pitted blue, Barbed wire grass, hooky grass, couch.
Undesirable pasture species	Wire grass, blady grass, slender chloris, slender bamboo.
Suitable sown pastures	Callide Rhodes, green panic, creeping blue grass, Siratro, shrubby stylo, caatinga stylo, medics.
Introduced weeds	African boxthorn, lantana, Bathurst burr, thistles, fireweed.

Soil	
Description	Grey and brown cracking clays with self mulching surfaces (grey and brown clays). Brown clays often shallower than grey clays. Variable gilgai development often present. Sometimes mottling of grey clay subsoils. Varying amounts of soft and concretionary lime below 30 cm, and occasional weathered rock fragments and iron/manganese.
Key properties	Plant available water capacity: High. Fertility: Medium to high. pH: Surface slightly acid to neutral (6.3 to 7). Subsoils variable (6.4 to 8.5). Salinity: Low to very low at surface; medium to high at depths below 0.5 m. Sodicity: Non-sodic at surface. Subsoils sodic (<0.3 m) to strongly sodic (0.5 m). Effective rooting depth: <0.8 m (grey clays) to >1 m (brown clays).
Stocking rates	Cleared native pastures: 1 AE / 3 ha. Improved pastures (dryland): 1 AE / 2 ha.
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Cattle fattening.
Land use and management recommendations	Suitable for grazing of native and improved pastures, dryland (brown clays) and irrigation (grey clays) cropping. Adopt practices such as minimum tillage, stubble mulching, and weed control to maintain soil structure and reduce erosion. Include cover crops in crop rotations and retain crop residues. Use of broad based contour banks to reduce effect of cracking. Do not cultivate on slopes greater than 8%. Maintain adequate surface cover at all times. Spell pastures when flowering and seeding. Control declared and environmental weeds and regrowth. Burn at intervals of 6 to 10 years. Use a fire of light to moderate intensity avoiding the hottest time of the year. Burn less than 10% in any year.
Land use limitations	Sodicity, salinity, poor drainage, depth to bedrock can limit effective rooting depth. High salinity in subsoils (particularly grey clay) can reduce plant available water capacity. Saline outbreaks may occur on lower slopes. Mitigate through maintaining >30% tree cover and deep rooted perennial grasses. Slow drainage may cause waterlogging. Phosphorus availability may be limiting in brown clay soils. Soils may become hard setting with cultivation. Highly erodible if bare or cultivated on slopes >2%. Workability difficult immediately after rain, irrigation or when soil is dry.
Regional ecosystems	12.9-10.6, 12.8.23
Conservation features	Extensively cleared for pasture and cropping. Only very small areas remain and these are used by migratory birds such as yellow robins, grey fantails, varied trillers and rufous fantails. These scrubs are important habitat for bush turkeys and black-striped wallabies and a highly diverse reptile community that utilises fallen timber, dead trees and exfoliating bark, particularly gecko species, dragons and skinks. A number of resident woodland bird species (such as the bush stone-curlew, squatter pigeon, brown tree creeper and grey-crowned babbler) live in these scrubs. Remnants are threatened by fire on their margins and by weed invasion, e.g. asparagus, exotic grasses and tree pear. The use of fire breaks and cool season burns reduce this risk. Ideally, for conservation, these unique areas would be fenced off from grazing.

Grass-sedge wetlands



Land Resource Area	Principally coastal plains (1a), fine textured alluvial plains (1b) and mixed alluvial plains (1c).
Landform	Depressions in marine or alluvial plains, especially backplains.
Broad vegetation description	Freshwater wetlands seasonally dominated by grasses and sedges.
Native trees and shrubs	Queensland blue gum (<i>Eucalyptus tereticornis</i>) (T) around edges. (T) = Suitable timber species
Other associated native species	Sedges (<i>Cyperus</i> spp.), Clubrushes (<i>Schoenoplectus</i> spp.), <i>Eleocharis</i> spp., Common reed (<i>Phragmites australis</i>), Cumbungi (<i>Typha</i> spp.), Water snowflakes (<i>Nymphoides indica</i>), Smartweeds and knotweeds (<i>Persicaria</i> spp.), Nardoo (<i>Marsilea mutica</i>), Water ribbons (<i>Triglochin procerum</i>).
Native and naturalized grasses	Water couch (<i>Paspalum distichum</i>), Swamp ricegrass (<i>Leersia hexandra</i>), <i>Ischaemum</i> spp. and <i>Chloris</i> spp.
Suitable sown pastures	It is not recommended that any pasture species be sown in these wetlands
Introduced weeds	Condamine couch/lippia, water primrose, para grass, water hyacinth.

Soil	
Description	Brown to black medium to heavy clays,
Key properties	Plant available water capacity: High Fertility: Medium. Salinity: Non-saline (except in marine areas) Sodicity: Non-sodic
Enterprise	Seasonal grazing by livestock.
Land use and management recommendations	Livestock should be excluded from these wetlands during wet periods and native species flowering and seed set. Native pasture species should not be supplemented with introduced species. Exclude fire.
Land use limitations	These wetlands become waterlogged after rain and are seasonally inundated.
Regional ecosystems	12.3.8
Conservation features	<p>Many areas of this wetland type have not been mapped due to their small size. Changes to water flows, particularly the construction of levee-banks and damming of water courses, have caused significant changes to these wetlands including the loss of native species and their replacement by weed species.</p> <p>Grazing management to exclude stock access during strategic stages, e.g. when soils are susceptible to pugging or wetland plants have not completed seeding, may enable long-term productive use whilst maintaining biodiversity values and ecological function.</p> <p>These wetlands provide habitat for numerous wetland plants and animals, including snipe, bitterns, waterfowl, and frogs and are particularly important as refugia during dry conditions. Frogbit (<i>Hydrocharis dubia</i>) is a threatened plant that occurs in these wetlands.</p> <p>Pigs may be a management issue.</p>

Gum-topped box and blue gum on mixed alluvium



Land Resource Area	Mixed alluvial plains (1c)
Landform	Alluvial plains, gently undulating levees and terraces, high river terraces and narrow drainage flats (0-6% slopes).
Broad vegetation description	Gum-topped box dry woodland to open woodland on sedimentary rocks and mixed alluviums.
Native trees and shrubs	Queensland blue gum (<i>Eucalyptus tereticornis</i>) (T), Gum-topped box (<i>E. moluccana</i>) (T), Moreton Bay ash (<i>Corymbia tessellaris</i>), Swamp box (<i>Lophostemon suaveolens</i>), Brisbane wattle (<i>Acacia fimbriata</i>), Maiden's wattle (<i>A. maidenii</i>), Hickory wattle (<i>A. disparima</i>). Sometimes associated with the endangered Swamp tea-tree (<i>Melaleuca irbyana</i>) as an understory and softwood scrub species e.g. Red kamala (<i>Mallotus philippensis</i>), Shiny-leaved canthium (<i>Psydrax oderata</i> forma <i>oderata</i>), Leopard ash (<i>Flindersia collina</i>), Foambark (<i>Jagera pseudorhus</i>), Bitter bark (<i>Alstonia constricta</i>), Chain fruit (<i>Alyxia ruscifolia</i>), Scrub boonaree (<i>Alectryon diversifolius</i>). (T) = Suitable timber specie.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, creeping bluegrass, scented top, paspalum, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wiregrasses, blady grass, swamp foxtail, native rat's tail.
Suitable sown pastures	Rhodes (Callide), creeping blue, Floren blue, pangola, paspalum, kikuyu, setaria, panic Lucerne, siratro, burgundy bean, clovers, medics, lotononis (coastal).
Introduced weeds	Chinese celtis, lantana, green cestrum, annual ragweed, blue heliotrope, lippia

Soil	
Description	Deep dark brown to dark grey cracking clays (coarse structured clays), or loamy sand to clay loam (prairie soils) texture contrast soils (soloths). Usually gilgai development is present, and a thick bleached zone occurs above the hard clays in duplex soils.
Limitations	Surface may be hard setting. Highly saline and strongly sodic subsoils. If strongly acid, chemical toxicities (Al, Mg) may be a problem and indicate an increased dispersion tendency.
Key properties	Plant available water capacity: Coarse clays and loams - high. Soloths - very low. Fertility: Coarse clays and loams – high. Soloths – low. pH: Both surface and subsoil – variable. Surface - 4.5 to 7.7. Subsoil - 4.2 to 8.5. Salinity: Very low to low at surface; medium to high salinity at depths >50 cm. Sodicity: Non-sodic; strongly sodic at depths > 50 cm. Effective rooting depth <0.6 m to >1.2 m on alluvial loams.
Stocking rates	Native pastures: Uncleared 1 AE / 8 ha; Cleared: 1 AE / 4-5 ha Improved pastures: 1 AE / 2-3 ha.
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Breeding
Land use and management recommendations	Suitable for grazing of native and improved pastures, timber reserves and plantations. Maintain adequate surface cover at all times. Duplex soils are not suitable for agricultural development. In better drained areas, short-term forage crops may be grown. Adopt practices such as minimum tillage, stubble mulching, and weed control to maintain soil structure and reduce erosion. Include cover crops in crop rotations and retain crop residues. Burn every 6 to 25 years in summer to winter with a low to moderate fire to control thick regrowth (wattles, red ash, gum-topped box) if restricting grass cover. Aim for a 25% to 50% mosaic burn. Burn with soil moisture and with spot ignition strategy so that a patchwork of burnt/unburnt is achieved.
Land use limitations	Poor to very poor drainage causes waterlogging after rain, particularly in soils with high clay content, with some areas seasonally inundated. Effective rooting depth reduced by poor drainage, high subsoil salinity and sodicity. Moderate to high risk of sheet and gully erosion on cracking clays on sloping sites. Texture contrast soils are very susceptible to sheet, tunnel, and gully erosion. Plant growth limited by very tough, poorly structured subsoil and hard setting surfaces of duplex soils. Saline seeps may occur in lower slope positions.
Regional ecosystems	Dominant: 12.9-10.3, 12.9-10.11. Others: 12.3.3
Conservation features	Remnant woodlands are important habitat for gliders, possums, koalas, tree creepers, speckled warblers, powerful owls and ground foraging birds. These woodlands provide important corridors through the landscape for both resident and dispersing fauna. Frequent fires reduce the shrubby understorey, but variable fire regimes encourage mosaics. Heavy grazing reduces fuel loads and exposes the soil surface to erosion.

Ironbarks and bloodwoods on non-cracking clays



Land Resource Area	Principally Basaltic uplands (2b), Forest Walloons (6a). Also Northern mixed volcanics (3c).
Landform	Predominantly mid to upper slopes (slopes up to 40%) in hilly country.
Broad vegetation description	Dry to moist woodlands and open forests, mainly on undulating to hilly terrain of mainly metamorphic and acid volcanic rocks. Often on coarse, shallow, sandy soils.
Native trees and shrubs	Silver-leaved ironbark (<i>Eucalyptus melanophloia</i>), Narrow-leaved ironbark (<i>E. crebra</i>) (T), Bloodwoods (<i>Corymbia intermedia</i> , <i>C. trachyphloia</i>) (T), Queensland blue gum (<i>Eucalyptus tereticornis</i>) (T), Spotted gum (<i>Corymbia citriodora</i> ssp. <i>variegata</i>) (T), Moreton Bay ash (<i>C. tessellaris</i>), Broad-leaved apple (<i>Angophora subvelutina</i>). (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, creeping bluegrass, scented top, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch, native panic, couch.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail, native lovegrass.
Suitable sown pastures	Rhodes grass, creeping bluegrass, shrubby, fine stem, and caatinga stylo, siratro.
Introduced weeds	Lantana.

Soil	
Description	Shallow, texture contrast soils with loamy surfaces overlying reddish brown, well structured clays (non-calcic brown soils).
Limitations	Thin, hard setting surface soils.
Key properties	Plant available water capacity: Low. Fertility: Low. pH: Surface – 6 to 7. Subsoil – 6.7 to 7.2. Salinity: Very low Sodicity: Non-sodic Effective rooting depth <0.6 m.
Stocking rates	Uncleared native pastures: 1 AE / 8 ha. Cleared native pastures: 1 AE / 3-4 ha. Improved pastures: 1 AE / 3 ha.
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Cattle breeding and fattening.
Land use and management recommendations	Not suitable for cropping. Suitable for grazing of native and, on better slopes, improved pastures. Maintain adequate grass cover at all times, and timber cover on steeper slopes and ridges, to reduce risk of erosion. Control dense regrowth (ironbarks, wattles, corkwood) by burning with a low intensity fire in summer to late autumn every 2-3 years. Aim to burn 30-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics.
Land use limitations	Effective rooting depth limited by depth to bedrock. Low plant available water capacity due to shallow soil depths. Hard setting reduces infiltration rate. Often occurs on very steep slopes. Risk of erosion on steep slopes if surface is disturbed.
Regional ecosystems	Dominant: 12.11.3. Others represented: 12.8.16, 12.8.17.
Conservation features	This woodland is an important wildlife habitat. Mature stands with numerous tree hollows are home to possums, koalas and gliders. The rough fissured bark of the ironbarks is ideal habitat for skinks and geckoes. The grassy understorey provides habitat for ground fauna such as small marsupials (bettongs), reptiles (frilled-neck lizards) and birds (quail) and is an important food source for the large macropods (whip-tailed wallabies, eastern grey kangaroos). While large areas of this land type have been thinned for grazing, reasonably sized remnants remain. The health of the landscape can be enhanced through appropriate fire regimes, grazing management and allowing regrowth to develop into effective wildlife corridors.

Ironbarks and blue gum on clays



Land Resource Area	Principally Basaltic uplands (2b). Also Forest Walloons (6a).
Landform	Ridge crests, and mid to upper slopes in undulating rises to rolling low hills.
Broad vegetation description	Queensland blue gum, silvered-leaved and narrow-leaved ironbark dry woodlands to open woodlands on rolling volcanic hills and rises and sandplains or depositional plains.
Native trees and shrubs	Silver-leaved ironbark (<i>Eucalyptus melanophloia</i>), Narrow-leaved ironbark (<i>E. crebra</i>)(T), Queensland blue gum (<i>E. tereticornis</i>) (T). (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, creeping blue grass, scented top, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail, native lovegrass.
Suitable sown pastures	Callide Rhodes, creeping blue grass, Siratro, caatinga stylo, clover, medics.
Introduced weeds	Lantana, fireweed.

Soil	
Description	Very shallow (lithosols) to shallow, dark clay loams and clays (rendzinas) over weathering rock. Surface - loose to self-mulching, occasionally hard setting.
Limitations	Shallow effective rooting depth.
Key properties	Plant available water capacity: Low to very low. Fertility: Variable pH: Surface – Lithosols 6 to 6.6, rendzinas 6.6 to 7.5 Subsoil – Lithosols 4.8, rendzinas 8.0 Salinity: Very low Sodicity: Non-sodic Effective rooting depth <0.3 m (lithosols) and <0.8 m (rendzinas).
Stocking rates	Cleared native pastures: 1 AE / 4 ha. Improved pastures: 1 AE / 3 ha.
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Cattle breeding and fattening.
Land use and management recommendations	Suitable for grazing of non-irrigated improved pastures. Grain, fodder and small crops may be grown on areas with suitable depth soils (>0.5 m) and low slopes (<10%). Very shallow soils are not suited for development, and support generally poor quality native pastures. Maintain maximum surface cover to maintain soil structure and reduce erosion. Implement contour banks, safe disposal areas for runoff and crop management strategies to control erosion. Very shallow soils should be left as undisturbed as possible with maximum surface cover maintained at all times to minimise erosion risk and reduce accessions to the watertable. Timber and other woody vegetation should be retained on ridges and steep slopes. Burn every 3-6 years in summer to late autumn with a low intensity fire to help control weeds and regrowth (silver-leaved ironbark, wattles, corkwood). Aim to burn 30-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics.
Land use limitations	Effective rooting depth limited by depth to bedrock. Low plant available water capacity due to shallow soil depths. Hard setting with large amounts of gravel and stone (lithosols). Often occur on very steep slopes. Highly erodible on steep slopes with poorly structured soils. Basalts may be subject to land slip.
Regional ecosystems	Dominant: 12.8.6, 12.8.17
Conservation features	These basalt ridges are associated with several significant eucalypts and these communities have outstanding fauna value, especially for arboreal hollow dwellers. Uplands areas are important in a bio-geographic sense with many species limited to these areas.

Ironbarks and spotted gum ridges



Land Resource Area	Marburg forest (7a), Helidon forest (7b).
Landform	Undulating hills and rises; steep hills and mountains.
Broad vegetation description	Dry woodlands to open woodlands on undulating to low hilly terrain dominated by Spotted gum.
Native trees and shrubs	Spotted gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>)(T), Narrow-leaved ironbark (<i>Eucalyptus crebra</i>)(T), Grey ironbark (<i>E. siderophloia</i>)(T), White mahogany (<i>E. acmenoides</i>)(T), Broad-leaved ironbark (<i>E. fibrosa</i> ssp. <i>fibrosa</i>)(T), Bloodwoods (<i>C. intermedia</i> , <i>C. trachyphloia</i>)(T), Moreton Bay ash (<i>C. tessellaris</i>), Smooth-barked apple (<i>Angophora leiocarpa</i>), Early black wattle (<i>Acacia leocalyx</i>), Brisbane wattle (<i>A. fimbriata</i>) (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, Callide Rhodes, creeping blue, forest blue, black spear grass, native legumes.
Intermediate pasture species	Tambookie, angleton, pitted blue, barbed wire, couch, hooky grass.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail, native lovegrass.
Suitable sown pastures	Sown grass species generally not recommended. Legumes: Siratro, wynn cassia, shrubby stylo, fine stem stylo.
Introduced weeds	Creeping lantana, lantana.

Soil	
Description	Texture contrast soils of brown to dark grey loamy sands overlaying red, brown or yellow clay. Surface - sandy or loamy, hard setting. Usually a prominent bleached zone above hard clay subsoil.
Limitations	Effective rooting depth <40 cm. Dispersible subsoils
Key properties	Plant available water capacity: Very low. Fertility: Variable, but commonly low. pH: Surface – 4.5 to 6.6. Subsoil – Highly variable (5 to 9). Salinity: Low at surface; medium to high at depth below 50 cm. Sodicity: Non-sodic at surface; sodic to strongly sodic at depth.
Stocking rates	Native pastures: Uncleared 1 AE / 10 ha; Cleared 1 AE / 6-7 ha.
Utilisation	Conservative pasture utilisation: 25% by weight.
Enterprise	Beef breeding and growing stores, native and plantation hardwood forestry.
Land use and management recommendations	Suitable for grazing of native and improved pastures. Timber reserves. Maintain maximum surface cover at all times. Over-sowing of legumes should be done with minimal soil disturbance (e.g. strip cultivation). Maintain timber, especially on steeper slopes and ridges. Burn every 6 to 25 years in summer to winter with a low to moderate fire to control thick regrowth if restricting grass cover. Aim for a 25% to 50% mosaic burn. Burn with soil moisture and with spot ignition strategy so that a patchwork of burnt/unburnt is achieved.
Land use limitations	Plant growth limited by tough clay subsoil and hard setting surfaces. Rooting depth limited by hard, and saline or acid, subsoils. Hard clay subsoils impede drainage and are prone to waterlogging in wet periods. Very susceptible to sheet, tunnel and gully erosion. Generally very low nutrient status, particularly nitrogen and phosphorus.
Regional ecosystems	Major: 12.9-10.2, 12.9-10.5, 12.9-10.17, 12.11.5, 12.11.6, 12.12.3, 12.12.5.
Conservation features	Habitat for rare flora (<i>Personia</i> spp. and cycads) and provides valuable resources for forest dependent fauna such as possums, gliders, forest owls, micro-bats, insectivorous birds and arboreal and ground dwelling reptiles. In areas with moderate to low slopes, these land types have generally been cleared or thinned for grazing. Areas that have been extensively managed for timber have been modified through selective thinning and frequent fire resulting in even aged stands with minimal habitat trees and poor stand succession. Retaining adequate numbers of habitat trees is important for forest health and biodiversity. The careful use of fire (especially following disturbance such as thinning or harvesting) allows forest regeneration and can be used pro-actively to promote biodiversity values within the land type and across the landscape.

Mixed open forests on duplexes and loams



Land Resource Area	Forest Walloons (6a); Helidon forest (7b); Marburg forest (7a).
Landform	Undulating to steep hills.
Broad vegetation description	Dry woodlands to open woodlands, mostly on shallow soils in hilly terrain. Most extensive on sandstone and weathered rocks.
Native trees and shrubs	Spotted gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>) (T), Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) (T), Grey ironbark (<i>E. siderophloia</i>) (T), Moreton Bay ash (<i>C. tessellaris</i>), Bloodwoods (<i>C. intermedia</i> , <i>C. trachyphloia</i>) (T). (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, creeping blue grass, scented top, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail, native lovegrass.
Suitable sown pastures	Rhodes grass, creeping blue grass, Wynn cassia, shrubby stylo, fine stem stylo.
Introduced weeds	African lovegrass, lantana, creeping lantana, giant rat's tail grass.

Soil	
Description	Texture contrast soils of brown to dark grey loamy sands overlaying red, brown or yellow clay. Surface - sandy or loamy, loose to hard setting surface soil.
Limitations	Effective rooting depth <0.4 m (solodics) to <1.5 m (podzolics). Dispersible subsoils
Key properties	Plant available water capacity: Low. Fertility: Variable, but commonly low. pH: Surface - acid to neutral (4.5 to 6.5). Subsoil: Soloths and podzolics – acid (5.0 to 6.0). Solodics – alkaline (8.0 to 9.0). Salinity: Very low at surface; high at depth. Sodicity: Non-sodic at surface; strongly sodic at depth (solodics).
Stocking rates	Native pastures: Uncleared 1 AE / 8 ha; Cleared 1 AE / 5-6 ha; Sown dryland: 1 AE / 4-5 ha.
Utilisation	Conservative pasture utilisation: 25% by weight.
Enterprise	Cattle breeding.
Land use and management recommendations	Suitable for grazing of native and improved pastures. Timber reserves. Maintain maximum surface cover at all times. Over-sowing of legumes should be done with minimal soil disturbance (e.g. strip cultivation). Maintain as much timber cover as possible, especially on steeper slopes and ridges. Burn every 6 to 25 years in summer to winter with a low to moderate fire to control thick regrowth if restricting grass cover. Aim for a 25% to 50% mosaic burn. Burn with soil moisture and with spot ignition strategy so that a patchwork of burnt/unburnt is achieved.
Land use limitations	Plant growth limited by tough clay subsoil and hard setting surfaces. Rooting depth limited by hard, and saline or acid, subsoils. Hard clay subsoils impede drainage and are prone to waterlogging in wet periods. Very susceptible to sheet, tunnel and gully erosion. Generally very low nutrient status, particularly nitrogen and phosphorus.
Regional ecosystems	Dominant: 12.9-10.3, 12.9-10.7, 12.9-10.17, 12.11.18. Others represented: 12.3.11, 12.5.1, 12.9-10.4, 12.9-10.12, 12.9-10.19.
Conservation features	This woodland is an important wildlife habitat with a surprisingly wide range of fauna. Larger marsupials such as wallabies often use this habitat. Numerous tree hollows are home to possums and gliders. The rough fissured bark provides good reptile habitat, for skinks and geckoes. A good grass cover protects slopes and hillsides from erosion and provides habitat for ground fauna such as button-quail. Mosaic burning for regeneration and retention of microhabitats is critical for maintaining species richness. Selective overgrazing in the burnt areas needs to be managed. Retention of mature trees is necessary, as only long-lived trees will form hollows. Conservation management should aim to retain remnant patches especially where these offer connectivity values.

Rainforest (closed forest) on basalts



Land Resource Area	Principally Red volcanics (2a). Also Basaltic uplands (2b).
Landform	Undulating rises to rolling low hills and plateaux (slopes 3-40%).
Broad vegetation description	Upland and Lowland Complex notophyll vine forest and Araucarian notophyll vine forest on basic volcanics.
Native trees and shrubs	Figs (<i>Ficus</i> spp.), Booyongs (<i>Argyrodendron</i> spp.), Yellow carabeen (<i>Slonea woolsii</i>), Rosewood (<i>Dysoxylum fraserianum</i>), Lilly pillies (<i>Syzygium</i> spp.), Sassafras (<i>Doryphora sassafras</i>), Rose marara (<i>Pseudoweinmannia lachnocarpa</i>), Corkwood (<i>Ackama paniculosa</i>), Bolly gum (<i>Litsea reticulata</i>), Hoop pine (<i>Araucaria cunninghamii</i>)(T), Flame tree (<i>Brachychiton acerifolius</i>), Lace bark (<i>Brachychiton discolor</i>), Brush box (<i>Lophostemon confertus</i>)(T), Bangalow palm (<i>Archontophoenix cunninghamiana</i>), Walking stick palm (<i>Linospadix monostachya</i>), Acronychias (<i>Acronychia</i> spp.), Native tamarind (<i>Diploglottis australis</i>), Giant stinging tree (<i>Dendrocnide excelsa</i>), Celery wood (<i>Polyscias elegans</i>), Scentless rosewood (<i>Synoum glandulosum</i>), Poison peach (<i>Trema tomentosa</i>), White cedar (<i>Melia azedarach</i>)(T), Red cedar (<i>Toona ciliata</i>)(T). (T) = Suitable timber species.
Pasture composition	No native pastures in uncleared rainforest. Some naturalised paspalum and mat grass and minimal grassy understorey after clearing.
Desirable pasture species	Queensland blue, forest blue, kangaroo, Rhodes, kikuyu, paspalum, green panic..
Intermediate pasture species	Pitted blue, barbed wire, couch grass
Undesirable pasture species	Wiregrasses, blady grass, slender chloris.
Suitable sown pastures	Rhodes, prairie grass, kikuyu, paspalum, green panic, setaria. White clover, glycine, siratro.
Introduced weeds	African boxthorn, privet, lantana, bracken fern, blady grass, wild tobacco, Crofton weed, fireweed.

Soil	
Description	Deep, (often >5 m) red, strongly structured clays that are friable and highly permeable. Occurs also on shallow, dark friable clay loams and clays over weathered parent rock. Shallower soils have bedrock at 30 to 80 cm.
Key properties	Plant available water capacity: High. Low in shallow soils. Fertility: Medium to high. pH: Krasnozems: Surface – acid (5.5 to 6.5). Subsoil – more acid (4.8 to 6.0) Prairie soils: Surface – slightly acid (6.5). Subsoil – strongly alkaline (8.5) Salinity: Low to very low. Sodicity: Non-sodic. Effective rooting depth <0.8 m (prairie) to >1.5 m (krasnozems).
Stocking rates	Cleared native pastures: 1 AE / 3-4 ha. Improved pastures: 1 AE / 2 ha,
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Cattle breeding and fattening; dairying; hoop pine plantations.
Land use and management recommendations	Suitable for grazing of improved pastures, dryland and irrigated cropping. Maintain maximum surface cover to maintain soil structure and reduce erosion. Avoid trafficking and cultivation when wet to reduce soil compaction. Rotate intensively cultivated crops with broadacre field crops and legumes to improve soil structure and fertility. Periods under pasture rotation are recommended to enhance long-term soil stability and soil organic matter content. Regular additions of fertiliser are required to maintain productivity. Lime application required on average every 3-5 years. Do not cultivate on slopes greater than 10-15%. Adopt practices such as minimum tillage, stubble mulching, and weed control to maintain soil structure and reduce erosion on sloping lands. Do not burn deliberately. May need active protection from wildfire in extreme conditions or after prolonged drought. Planned burns should be conducted at the ecotone of dry rainforest, burning away from the dry rainforest areas. Ensuring conditions of good soil moisture and moisture of litter in surrounding communities will limit fire intensity.
Land use limitations	Surface structure becomes cloddy and hard setting under cultivation; plough pans may develop. Effective rooting depth limited by very strongly acid subsoils. Fertility is variable and declines rapidly under development. Highly erodible on cultivated slopes >3% (krasnozems). Prairie soils are moderate to high erosion risk, particularly on steeper slopes. Shallow soils often stony and <0.5 m above weathered bedrock. Landslip risk in some areas (Mt Tamborine, Beechmont, Running Creek)
Regional ecosystems	12.8.3, 12.8.4, 12.8.5
Conservation features	Habitat for endemic and rare and threatened flora and fauna. These rainforests on the fertile elevated plateaux have been extensively cleared and established with kikuyu. The remnants tend to be small and are threatened at the margins by weed invasion. Outside of national parks and reserves, the lack of connectivity in the landscape threatens the genetic vigour of species that make up and inhabit these rainforests.

Riparian forests



Land Resource Area	Fine textured alluvial plains (1b). Also mixed alluvial plains (1c) and coastal plains (1a).
Landform	Narrow strips along creeks or rivers where enough moisture is available.
Broad vegetation description	Narrow fringing strips of eucalypt dominated open-forest and woodlands to gallery rainforest (notophyll vine forest) on alluvial plains and riverine systems.
Native trees and shrubs	Red bottlebrush (<i>Melaleuca viminalis</i>), Black tea-tree (<i>M. bracteata</i>), River she-oak (<i>Casuarina cunninghamiana</i>), Queensland blue gum (<i>Eucalyptus tereticornis</i>) (T), Flooded gum (<i>E. grandis</i>) (T), Brush cherry (<i>Syzigium australe</i>), Weeping lilly pilly (<i>Waterhousia floribunda</i>), Water gum (<i>Tristaniopsis laurina</i>), Native elm (<i>Aphananthe philippinensis</i>), Black bean (<i>Castanospermum australe</i>) (T), White cedar (<i>Melia azedarach</i>) (T), Sandpaper fig (<i>Ficus coronata</i>), Silky oak (<i>Grevillia robusta</i>) (T), Native frangipani (<i>Hymenosporum flavum</i>), Quandong (<i>Elaeocarpus grandis</i>) (T), <i>E. obovatus</i>), Red cedar (<i>Toona ciliata</i>) (T), Brisbane wattle (<i>Acacia fimbriata</i>), Maiden's wattle, (<i>A. maidenii</i>). (T) = Suitable timber species.
Other associated native species	Mat rush (<i>Lomandra longifolia</i> , <i>L. hystrix</i>), Blueberry lily (<i>Dianella caerulea</i>).
Pasture composition	
Desirable pasture species	Kangaroo grass, paspalum, kikuyu, barbed wire grass.
Intermediate pasture species	Pitted blue, couch grass.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail.
Suitable sown pastures	Not recommended.
Introduced weeds	Chinese celtis, cats claw creeper, Madeira vine, balloon vine, climbing asparagus, camphor laurel, mulberry, lantana
Soil	

Description	Alluvial deposits adjacent to streams of sandy loams through to clay.
Key properties	Plant available water capacity: Medium to high. Fertility: Medium to high. Salinity: Very low Sodicity: Non-sodic Effective rooting depth: >1 m
Stocking rates	Cattle should be grazed only intermittently. (See Land use and management recommendations below.)
Enterprise	Riparian forests should be protected and conserved.
Land use and management recommendations	Riparian forests should be fenced and grazing restricted to managing grasses and weeds. Maintain groundcover cover and minimise erosion. Where Chinese celtis is a problem, adopt short periods of high intensity grazing in combination with other weed control methods. Access to streams by livestock should be avoided or carefully managed. Avoid intentionally burning this fringe vegetation. Burn surrounding ecosystems in conditions that minimise fire incursion.
Land use limitations	Soils are often highly erodible.
Regional ecosystems	Dominant: 12.3.1, 12.3.2, 12.3.7. Others represented: 12.3.3.
Conservation features	Riparian forests occur along streams forming an intricate network extending from upland areas through to coastal lowlands. They provide corridors and habitat for a unique and variable group of communities in which regeneration is closely linked with disturbance caused by variations in stream flows. River she-oak often dominates riparian forests; however in well protected upland and fertile lowland reaches, communities of gallery rainforests are supported. Riparian forests and associated geomorphic habitats of rounded basalt boulders and gorges through to sandstones and coastal estuaries support a plethora of essential habitat for many species including stream frogs, platypus, fish nurseries and macro- invertebrates, many of which are rare or threatened. Catchment management activities are aimed at conserving and restoring riparian forests to enable functioning corridors and the maintenance of essential habitat and water quality. Feral pigs can cause extensive damage

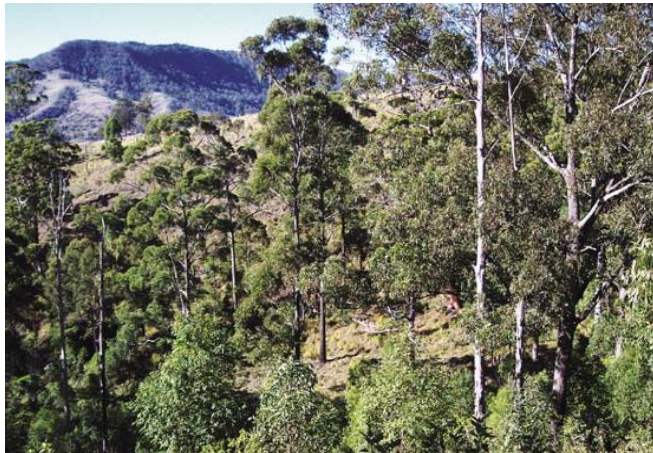
Softwood vine scrub



Land Resource Area	Principally Marburg scrub (7c). Also Marburg forest (7a) and Basaltic uplands (2b)
Landform	Mid to upper slopes of rolling hills and steep hills (3-30% slopes).
Broad vegetation description	Notophyll vine forests and Araucarian notophyll and microphyll vine forests, occasionally with Eucalypt emergents, on fine-grained sediments, metasediments and basic to intermediate (to acid) volcanics.
Native trees and shrubs	Hoop pine (<i>Araucaria cunninghamii</i>) (T), Crow's ash (<i>Flindersia australis</i>) (T), Southern silver ash (<i>F. schottiana</i>) (T), Deep yellowwood (<i>Rhodesphaera rhodantha</i>) (T), Brush whitewood (<i>Atalaya salicifolia</i>), Hoop pine (<i>Araucaria cunninghamii</i>) (T), Southern silver ash (<i>F. schottiana</i>), Deep yellowwood (<i>Rhodesphaera rhodantha</i>) (T), Brush whitewood (<i>Atalaya salicifolia</i>). (T) = Suitable timber species.
Pasture composition	Minimal Grassy understorey.
Desirable pasture species	Queensland blue, forest blue, kangaroo, Rhodes, kikuyu, paspalum, green panic.
Intermediate pasture species	Red Natal, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail.
Suitable sown pastures	Callide Rhodes, green panic, kikuyu, paspalum, creeping bluegrass. Siratro, glycine, clovers, medics, stylos (shrubby & fine stem).
Introduced weeds	African boxthorn, lantana, creeping lantana, fireweed.
Soil	

Description	Friable, well drained loamy soils that are brown, yellowish brown or reddish brown (brown earths). Some soils are shallow dark, clay loams over weathered parent rock (prairie soils).
Limitations	Bedrock 30 to 80 cm in shallow clays.
Key properties	Plant available water capacity: Low to medium. Fertility: Medium to high. pH: 6.5 to 7 at surface. Subsoils variable (6.4 to 8.5). Salinity: Very low to low. Sodicity: Non-sodic.
Stocking rates	Cleared native pastures: 1 AE / 3 ha. Improved pastures: 1 AE / 1 ha
Utilisation	Conservative pasture utilisation: 30% by weight.
Enterprise	Breeding and fattening; hoop pine and hardwood plantations.
Land use and management recommendations	Suitable for grazing of improved pastures and timber plantations. Not suitable for irrigation; duplex soils are not suitable for agricultural development. Short-term forage crops may be grown in better drained areas. Adopt practices such as minimum tillage, stubble mulching, weed control to maintain soil structure and reduce erosion. Include cover crops in crop rotations and retain crop residues. Maintain adequate surface cover at all times. Spell pastures when flowering and seeding. Control weeds and regrowth (lantana, bitterbark, wattle, scrub species).
Land use limitations	Moderate to high risk of erosion (especially tunnel erosion) on all slopes without adequate surface cover. Shallow and stony soils, low plant available water capacity. Susceptible to compaction, hard setting and rapid decline in soil fertility if cultivated. Areas may act as intake for groundwater recharge, thereby contributing to salinity problems in lower areas. Do not burn deliberately. May need active protection from wildfire in extreme conditions or after prolonged drought. Planned burns should be conducted at the ecotone of dry rainforest, burning away from the dry rainforest areas. Ensuring conditions of good soil moisture and moisture of litter in surrounding communities will limit fire behaviour/intensity.
Regional ecosystems	Major: 12.8.13, 12.9-10.15, 12.11.1, 12.11.10 Minor: 12.3.1, 12.8.5, 12.8.6, 12.8.7, 12.9-10.16
Conservation features	Very few scrub remnants remain; remnants are small and isolated. Habitat for rare and threatened flora and fauna. Remnants are threatened by weed invasion and fire on their margins. Natural regeneration should be encouraged to develop connectivity with other areas of remnant vegetation.

Tall open forests on basalts



Land Resource Area	Red volcanics (2a), basaltic uplands (2b).
Landform	Mainly on plateaus, but also occurs undulating rises to rolling low hills (slopes 3 - 40%).
Broad vegetation description	Moist to dry open forests to woodlands mainly on basalt areas.
Native trees and shrubs	Brush box (<i>Lophostemon confertus</i>) (T), Tallowwood (<i>Eucalyptus microcorys</i>) (T), Rose gum (<i>E. grandis</i>) (T), Sydney blue gum (<i>E. saligna</i>) (T), Grey ironbark (<i>E. siderophloia</i>) (T), Grey gums (<i>E. biturbinata</i> , <i>E. propinqua</i> , <i>E. major</i> , <i>E. longirostrata</i>) (T), Thin-leaved stringybark (<i>Eucalyptus eugenioides</i>) (T), Red stringybark (<i>E. resinifera</i>) (T), White mahogany (<i>E. acmenoides</i>) (T), Bat wing coral tree (<i>Erythrina vespertilio</i>). (T) = Suitable timber species.
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, scented top, kikuyu, paspalum, green panic.
Intermediate pasture species	Pitted blue, barbed wire, couch grass.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris.
Suitable sown pastures	Rhodes, kikuyu, paspalum, green panic, creeping bluegrass. White clover, glycine, siratro.
Introduced weeds	Lantana, wild tobacco tree, blady grass, privet, fireweed, giant rat's tail grass.
Soil	
Description	Deep, (often > 5m) red, strongly structured clays that are friable and highly permeable. Occurrences also on shallow, dark friable clay loams and clays over weathered parent rock. Shallower soils have bedrock at 30 to 80 cm.

Key properties	<p>Plant available water capacity: High. Low in shallow soils. Fertility: Medium to high. pH: Krasnozems: Surface – acid (5.5 to 6.5). Subsoil – more acid (4.8 to 6.0) Prairie soils: Surface – slightly acid (6.5). Subsoil – strongly alkaline (8.5) Salinity: Low to very low. Sodicity: Non sodic. Effective rooting depth <0.8 m (prairie) to >1.5 m (krasnozems).</p>
Stocking rates	<p>Cleared native pastures: 1 AE / 3 ha. Improved pastures (dryland): 1 AE / 2 ha.</p>
Utilisation	<p>Conservative pasture utilisation: 30% by weight.</p>
Enterprise	<p>Cattle growing and fattening.</p>
Land use and management recommendations	<p>Suitable for grazing of improved pastures, dryland and irrigated cropping. Maintain maximum surface cover to maintain soil structure and reduce erosion. Avoid trafficking and cultivation when wet to reduce soil compaction. Rotate intensively cultivated crops with broadacre field crops and legumes to improve soil structure and fertility. Periods under pasture rotation are recommended to enhance long-term soil stability and soil organic matter content. Regular additions of fertiliser are required to maintain productivity. Lime application required on average every 3-5 years. Adopt practices such as minimum tillage, stubble mulching, and weed control to maintain soil structure and reduce erosion on sloping lands. Do not cultivate on slopes greater than 10-15%. Burn (summer to winter) with a low to moderate intensity fire at 6-12 year intervals, with an occasional high intensity wildfire. Planned burning will assist in maintaining a diversity of understorey species. It is essential that wildfires are not the sole source of input of fire in this ecosystem. Needs disturbance to maintain RE structure (eucalypt overstorey with open understorey of predominantly non-rainforest species).</p>
Land use limitations	<p>Surface structure becomes cloddy and hard setting under cultivation; plough pans may develop. Effective rooting depth limited by very strongly acid subsoils. Fertility is variable and declines rapidly after development. Highly erodible on cultivated slopes >3% (krasnozems). Prairie soils have moderate to high erosion risk, particularly on steeper slopes. Shallow soils often stony and <0.5 m above weathered bedrock. Landslip risk in some areas.</p>
Regional ecosystems	<p>Dominant: 12.8.8, 12.8.14 Others represented: 12.3.2, 12.8.2, 12.8.9, 12.8.11</p>
Conservation features	<p>These are wet sclerophyll forests and have been important sources of timber in the past. They are associated with high rainfall on elevated and fertile sites. These forests are rich in biodiversity and provide vital corridors between the rainforest with which they are closely associated. They have outstanding fauna value, especially for arboreal hollow dwellers. Uplands areas are important in a bio-geographic sense with many species limited to these areas. There are also many associated springs that allow for a diverse variety of fauna to exist in these areas.</p>

Tall open forests on steep hills and mountains



Land Resource Area	Principally Metamorphic hills (4). Also Volcanic peaks (3a).
Landform	Steep mountains and hills.
Broad vegetation description	Dry woodlands to open woodlands on undulating to low hilly terrain dominated by Spotted gum.
Native trees and shrubs	Grey gums (<i>Eucalyptus propinqua</i> , <i>E. major</i>)(T), White mahogany (<i>E. acmenoides</i>)(T), Blackbutt (<i>E. pilularis</i>)(T), Tallowwood (<i>E. microcorys</i>)(T), Spotted gum (<i>Corymbia citriodora</i> ssp. <i>variegata</i>)(T), Narrow-leaved ironbark (<i>Eucalyptus crebra</i>)(T) Broad-leaved ironbark (<i>E. fibrosa</i> ssp. <i>fibrosa</i>)(T), Smooth-barked apple (<i>Angophora leiocarpa</i>), Brown bloodwood (<i>C. trachyphloia</i>)(T). (T) = Suitable timber species
Pasture composition	
Desirable pasture species	Queensland blue, forest blue, kangaroo, black spear, Rhodes, scented top, native legumes.
Intermediate pasture species	Tambookie, pitted blue, barbed wire, couch grass, native panic.
Undesirable pasture species	Wiregrasses, blady grass, slender chloris, native rat's tail, native lovegrass.
Suitable sown pastures	Not recommended in some situations. Rhodes grass, creeping blue grass. Shrubby stylo, fine stem stylo, wynn cassia.
Introduced weeds	Lantana.
Soil	

Description	Texture contrast soils of brown loamy sands (loose to hard setting, sometimes gravelly or very shallow) overlaying red or yellow well structured clays; or very shallow soil overlying weathering rock.
Key properties	Plant available water capacity: Very low to low. Fertility: Lithosols – high. Podzolics – low. pH: Both surface and subsoils– strongly to slightly acid (5.2 to 6.8). Salinity: Very low to low. Sodicity: Non-sodic. Effective rooting depth <0.3 m (lithosols) to <1.5 m (podzolics).
Stocking rates	Native: Uncleared: 1 AE / 10 ha. Cleared: 1 AE / 5-6 ha. Improved pastures (dryland): 1 AE / 4 ha
Utilisation	Conservative pasture utilisation: 25% by weight.
Enterprise	Cattle breeding and growing.
Land use and management recommendations	Suitable for grazing of native and improved pastures. Do not clear steep slopes or areas with very shallow soils. Maintain maximum surface cover at all times. Spell pastures when flowering and seeding. Burn (summer to winter) with a low to moderate intensity fire at 6-12 year intervals, with an occasional high intensity wildfire. Planned burning will assist in maintaining a diversity of understorey species. It is essential that wildfires are not the sole source of input of fire in this ecosystem. Needs disturbance to maintain RE structure (eucalypt overstorey with open understorey of predominantly non-rainforest species).
Land use limitations	Highly erodible, with high risk of landslips on over-cleared steeper slopes. Prone to sheet erosion and wind erosion on bare, exposed slopes. Generally very low nutrient status, particularly nitrogen and phosphorus. Root development and nutrient uptake may be impeded in very shallow soils or more acid subsoils. Surface stone can be a problem. Red clays generally well drained, yellow clay subsoils poorly drained that can result in waterlogging after heavy rain.
Regional ecosystems	Dominant: 12.8.1, 12.8.20, 12.8.24, 12.8.25, 12.11.23. Others: 12.9-10.14, 12.11.9, 12.12.3, 12.12.15.
Conservation features	Habitat for rare and threatened flora including <i>Persoonia</i> spp. and cycads. When relatively uncleared, these land types provide valuable resources for forest dependent fauna such as possums, gliders, forest owls, microbats, insectivorous birds and arboreal and ground dwelling reptiles. Retaining adequate numbers of habitat trees is important in maintaining habitat for these species. Frequent fire regimes can reduce the shrubby understorey.

Glossary

Acid soil	A soil giving an acid reaction throughout most or all of the soil profile. Generally speaking, when the pH drops below 5.5, the following specific problems may occur – aluminium toxicity, manganese toxicity, calcium deficiency, and/or molybdenum deficiency. These problems adversely affect plant growth and root nodulation which may result in a decline in plant cover and an increase in erosion hazard.
Acid sulfate soil (ASS)	Acid sulfate soil is the name given to soils and sediments containing iron sulfides, the most common being pyrite. When exposed to air due to drainage or disturbance, these soils produce sulfuric acid, often releasing toxic quantities of iron, aluminium and heavy metals. This can have major environmental, health, engineering, and economic effects. The term acid sulfate soil generally includes both actual and potential acid sulfate soils, which often occur in the same soil profile. AASS usually overlie PASS. For more information, see: http://www.derm.qld.gov.au/land/ass/index.html
Adult equivalent (AE)	The feed requirement of a 450 kg non-lactating beast.
Alkaline soil	A soil giving an alkaline reaction throughout most or all of the soil profile. Many alkaline soils have a high pH indicated by the presence of calcium carbonate, and are suitable for agriculture. However, others are problem soils because of salinity or sodicity. Soils with a pH above 9.5 are generally unsuitable for agriculture.
Alluvial plain	A plain formed by the accumulation of alluvium on a floodplain over a considerable period of time.
Alluvium	Deposits of gravel, sand, silt, clay or other debris, moved by streams from higher to lower ground.
Backplain	Large alluvial flat occurring some distance from the stream channel; often characterised by a high watertable and the presence of swamps or lakes.
Clays	Soils with a uniform soil texture throughout the surface soil and subsoil. Clay soils may be 'cracking' (develop vertical cracks when dry) or 'non-cracking'.
Closed forest	A forest dominated by broad-leaved (sometimes narrow-leaved) trees with dense crowns that form a more or less continuous canopy.
Dispersion	The process whereby soils break down and separate into their constituent particles (clay, silt, sand) in water. Dispersible soils tend to be highly erodible and present problems for earth works. Dispersion is associated with sodicity levels.
Dry sclerophyll forest	A forest in which hard-leaved shrubs form a layer below the trees (usually species of eucalypts). (cf Wet sclerophyll forest)

Duplex soil	See Texture contrast soil.
Earths	Soils with a sandy to loamy (including clay loam) surface soil, gradually increasing to a loamy to light clay subsoil. Earths may be 'massive' (where the subsoil is not arranged into natural soil aggregates and appears as a coherent, or solid mass) or structured (where the subsoil is arranged into natural soil aggregates which can be clearly seen).
Effective rooting depth	The depth to which most plant feeder roots will penetrate. This is determined by the depth either to which salts have been leached and have therefore accumulated, or to an impeding layer.
Electrical conductivity (EC)	A measure of the conduction of electricity through water, or a water extract of soil. The value reflects the amount of soluble salts in an extract and therefore provides an indication of soil salinity.
Fertility	The capacity of the soil to provide adequate supplies of nutrients in proper balance for the growth of specified plants when other growth factors are favourable.
Forest	A plant community dominated by closely spaced trees with long trunks that have crowns mostly narrow and dense-foliaged and are separated from each other by an average distance equal 1 to 3 times the average crown width. (cf. Woodland)
Gilgai	Surface microrelief associated with soils containing shrink-swell clays. Characterised by the presence of mounds and depressions
Gradational	The term describes a soil with a gradual increase in texture (i.e. becomes more clayey) as the profile deepens.
Gypsum	A naturally occurring soft crystalline material which is a hydrated form of calcium sulphate. Gypsum contains approximately 23% calcium and 18% sulphur. It is used to improve soil structure and reduce crusting in hard setting clayey soils.
Hardsetting	Surface soil that becomes hard and apparently structureless on the periodic drying of the soil.
Igneous rock	Rock crystallised from molten rock material (magma). It may be extruded to the Earth's surface (volcanic) or cool at variable depths below the surface (intrusive, and plutonic).
Krasnozems	A Great Soil Group consisting of red strongly structured clay soils. They have gradational texture profiles, with an acid to neutral reaction trend.
Land Resource Areas	Broad landscape units made up of groups of different soils developed from related geological units with recurring patterns of topography and vegetation.

Lithosols	A Great Soil Group consisting of shallow, stony or gravelly soils which are usually found on steep slopes.
Metamorphic rocks	Rocks that were originally igneous or sedimentary that have been physically and/or chemically altered by high temperatures and/or pressures beneath the Earth's surface.
Mottle	Spots, blotches or streaks of subdominant colours different from the main soil colour.
Open forest	A forest dominated by trees with relatively narrow leaves forming sparsely foliated crowns (usually species of eucalypts). The forest canopy is sparse and often not continuous allowing sunlight to reach the ground within the forest. (cf Closed forest)
Pan	A hard and/or cemented soil horizon e.g. cultivation pan.
Permeability	The capacity for transmission under gravity of water through soil or sediments.
Plant available water capacity	The quantity of water held in a soil that can be extracted by plant roots. It is expressed as millimetres of plant available water within the root zone (PAWC).
pH	A measure of acidity or alkalinity. A pH of 7.0 indicates neutrality. Higher values indicate alkalinity and lower values indicate acidity. Soil pH affects the amount of different nutrients that are soluble in water and therefore the amount of nutrient available to plants.
Podzolics	A Great Soil Group consisting of texture contrast soils with distinct bleached subsurface horizons overlying subsoils which have higher clay contents and iron and manganese deposits. These soils have an acid reaction trend.
Potential acid sulfate soils (PASS)	<p>Acid sulfate soils are not always a problem. Under the anaerobic reducing conditions maintained by permanent groundwater, the iron sulfides are stable and the surrounding soil pH is often weakly acid to weakly alkaline. Such soils are called potential acid sulfate soils (PASS) as they have potential to produce sulfuric acid when disturbed or exposed to air.</p> <p>Potential acid sulfate soils:</p> <ul style="list-style-type: none"> • often have a pH close to neutral (6.5–7.5) • contain unoxidised iron sulfides • are usually soft, sticky and saturated with water • are usually gel-like muds but can include wet sands and gravels • have the potential to produce acid if exposed to oxygen.
Prairie soils	A Great Soil Group consisting of soils with thick, dark A horizons, mildly acid to mildly alkaline trend, and soil depths generally less than 1 m.

Regional Ecosystem (RE)	A classification scheme which identifies vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. REs are identified by a three part code, where the first part refers to the geographic bioregion (12 = South East Queensland), the second part refers to the land zone on which the regional ecosystem occurs, and the third part refers to the vegetation type. For more information, see: www.derm.qld.gov.au/wildlife_ecosystems/biodiversity/regionalecosystems
Rendzinas	A Great Soil Group consisting of shallow to very shallow soils formed from limestone. They are dark coloured clay loams or light clays with a neutral to alkaline reaction trend.
Riparian lands	That part of the landscape adjacent to streams which exert a direct influence on streams or lake margins and on the water and aquatic ecosystems contained within them includes both the stream banks and the adjacent land.
Salinity	The presence of sufficient soluble salts to adversely affect plant growth and/or land use. The main salt involved is sodium chloride, but sulfates, carbonates and magnesium salts occur in some soils.
Sands	Soils with a uniform sand (including sandy loam) texture throughout the surface soil and subsoil.
Sedimentary rocks	Rocks formed by the accumulation of material which has been weathered and eroded from pre-existing rocks, then transported and deposited as sediment by wind or water.
Self-mulching	A condition of well-structured surface soil, notably of clays, in which the aggregates fall apart naturally as the soil dries to form a loose mulch of soil aggregates. In cultivated soils, ploughing when wet may appear to destroy the surface mulch which, however, will re-form upon drying.
Snuffy	Soils with an A horizon having a very fine granular structure and a dry consistence strength that is weak to very weak. The horizon usually has a low bulk density and may be water repellent.
Sodicity	A characteristic of soils (usually subsoils) containing exchangeable sodium to the extent of adversely affecting soil stability, plant growth and/or land use.
Soil horizon	A layer of soil material within the soil profile with distinct characteristics and properties produced by soil forming processes, and which are different from those of the layers above and or below. The three main horizons are: A (topsoil), B (subsoil), C (layer(s) below the B horizon which may be weathered parent material, not bedrock, little affected by soil- forming processes.

Soil profile	A vertical cross-sectional exposure of a soil, from the surface to the parent material.
Soil reaction trend	The general direction of the change in pH with depth.
Soil structure	The arrangement of natural soil aggregates that occur in soil; structure includes the distinctness, size and shape of these aggregates.
Soil texture	The coarseness or fineness of soil material as it affects the behaviour of a moist ball of soil when pressed between the thumb and forefinger. It is generally related to the proportion of clay, silt and sand within a soil.
Solodic soils	Soils with strong texture contrasts between A horizons and sodic B horizons which are not strongly acid.
Subsoil	Soil layers below the surface with one of the following attributes: a larger content of clay, iron, aluminium, organic material (or several of these) than the surface and subsurface soil; stronger colours than those of the surface and subsurface soil above, or the substrate below. The B horizon.
Subsurface soil	Soil layers immediately under the surface soil which usually have less organic matter, paler colours and may have less clay than the surface soil. The A2 horizon.
Surface crust	Distinct surface layer, often laminated, ranging in thickness from a few millimetres to a few tens of millimetres, which is hard and brittle when dry and cannot be readily separated from and lifted off the underlying soil material.
Surface soil	The soil layer extending from the soil surface down which has some organic matter accumulation and is darker in colour than the underlying soil layers. The A horizon.
Texture contrast soil	A soil in which there is a sharp change in soil texture between the A and B horizons (surface and subsoil) over a distance of 10 cm or less. Also known as a duplex soil.
Volcanic rocks	Igneous rocks which have cooled from magma extruded to the Earth's surface. The size of the rock crystals depends on its duration of cooling - rapid cooling forms very fine crystals or even volcanic glass.
Wet sclerophyll forest	An open forest in which soft-leaved shrubs form a layer below the trees (usually species of eucalypts). (cf. Dry sclerophyll forest)
Woodland	A plant community dominated by trees with short trunks (usually species of eucalypts) that are separated from each other by an average distance equal to 3 to several times the average crown width. There is usually a well-developed understory of either grasses and other herbs, sedges or hard-leaved shrubs. (cf. Forest)

Regional Ecosystems in the Bremer Catchment

RE Short Description

- 12.3.3 Eucalyptus tereticornis woodland to open forest on alluvial plains.
- 12.3.7 Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana fringing forest.
- 12.3.8 Swamps with Cyperus spp., Schoenoplectus spp. and Eleocharis spp.
- 12.5.1 Open forest complex with Corymbia citriodora on subcoastal remnant Tertiary surfaces. Usually deep red soils.
- 12.8.1 Eucalyptus campanulata tall open forest on Cainozoic igneous rocks.
- 12.8.3 Complex notophyll vine forest on Cainozoic igneous rocks. Altitude <600m.
- 12.8.4 Complex notophyll vine forest with Araucaria spp. on Cainozoic igneous rocks.
- 12.8.5 Complex notophyll vine forest on Cainozoic igneous rocks. Altitude usually >600m.
- 12.8.7 Simple microphyll fern thicket with Acmena smithii on Cainozoic igneous rocks.
- 12.8.9 Lophostemon confertus tall open forest on Cainozoic igneous rocks.
- 12.8.11 Eucalyptus dunnii tall open forest on Cainozoic igneous rocks.
- 12.8.12 Eucalyptus obliqua tall open forest on Cainozoic igneous rocks.
- 12.8.13 Araucarian complex microphyll vine forest on Cainozoic igneous rocks.
- 12.8.14 Eucalyptus eugenioides, E. biturbinata, E. melliodora open forest on Cainozoic igneous rocks.
- 12.8.16 Eucalyptus crebra, E. tereticornis woodland on Cainozoic igneous rocks.
- 12.8.17 Eucalyptus crebra, E. melanophloia woodland on Cainozoic igneous rocks.
- 12.8.19 Montane shrubland on Cainozoic igneous rocks.
- 12.8.20 Shrubby woodland with Eucalyptus racemosa or E. dura on Cainozoic igneous rocks.
- 12.8.21 Semi-evergreen vine thicket with Brachychiton rupestris on Cainozoic igneous rocks. Southern half of bioregion.
- 12.8.23 Acacia harpophylla open forest on Cainozoic igneous rocks.
- 12.8.24 Corymbia citriodora open forest on Cainozoic igneous rocks especially trachyte
- 12.8.25 Open forest with Eucalyptus acmenoides or E. helidonica on Cainozoic igneous rocks especially trachyte.
- 12.9-10.2 Corymbia citriodora, Eucalyptus crebra open forest on sedimentary rocks.
- 12.9-10.3 Eucalyptus moluccana on sedimentary rocks.
- 12.9-10.5 Open forest complex often with Corymbia trachyphloia, C. citriodora, Eucalyptus crebra, E. fibrosa subsp. fibrosa on quartzose sandstone.
- 12.9-10.6 Acacia harpophylla open forest on sedimentary rocks.
- 12.9-10.7 Eucalyptus crebra woodland on sedimentary rocks.
- 12.9-10.11 Melaleuca irbyana low open forest on sedimentary rocks.
- 12.9-10.15 Semi-evergreen vine thicket with Brachychiton rupestris on sedimentary rocks.
- 12.9-10.16 Araucarian microphyll to notophyll vine forest on sedimentary rocks.
- 12.9-10.17 Open forest complex often with Eucalyptus acmenoides, E. major, E. siderophloia ± Corymbia citriodora on sedimentary rocks.
- 12.9-10.19 Eucalyptus fibrosa subsp. fibrosa open forest on sedimentary rocks.

More Information

Property Management Planning

Property Management Planning (PMP) is a process for landholders to analyse their farming enterprise from a bio-physical, ecological, economic and social perspective and to formulate a well-rounded plan that takes into account factors such as vegetation management, soil conservation, nature conservation, land and water management and pest management.

Healthy Land & Water arranges a variety of workshops and field days to provide landholders with the latest information on sustainable land management practices.

Some of Healthy Land & Waters intensive workshops come with additional information such as Geographic Information Systems and satellite imagery to assist landholders to develop a holistic plan to ensure long term farm sustainability.

Key to Eucalypts of Greater Brisbane

The Queensland Herbarium has produced a user friendly guide to identifying native trees and shrubs found in the South East Queensland region, visit the Queensland Government website www.qld.gov.au

Regional Ecosystems

To search the Regional Ecosystem database or to find an explanation of land zones and the fields in RE descriptions, visit the Queensland Government website www.qld.gov.au

Websites

Healthy Land & Water www.hlw.org.au

Queensland Government www.qld.gov.au

Queensland Fire and Biodiversity Consortium www.fireandbiodiversity.org.au/

Ipswich City Council www.ipswich.qld.gov.au

Scenic Rim Regional Council www.scenicrim.qld.gov.au

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Queensland Government www.qld.gov.au

- Regional Ecosystems
- Weeds, Pest Animals and Ants
- Acid Sulfate Soils