



Land Management Planning

December 2009

Land Management Planning

Farm planning, whole farm planning, and property planning are terms used to denote a process of land use planning in which natural properties (and hazards of use) of a farm are assessed. The farm enterprises and management are then designed to match the land's potential and limitations.

Summary Structure of a Land Management Plan

I. Maps

Map Overlay 1 – Natural Features

- Natural resources
- Land / Soil Classes

Map Overlay 2 – Current Layout & Built Features

- Built structures
- Existing fencing
- Water supply
- Tracks & laneways

Map Overlay 3 – Proposed Layout

- Fences (to land class)
- Shelterbelts/Revegetation Sites
- New laneways
- Water supply and water protection
- Remnant protection

II. Work Plan

- A. Aims of the Farm Business
- B. Summary of land management issues
- C. Description of how the land management issues will be addressed
- D. Summary table of land management works

Planning Permit Requirements

Ensure the plan addresses the condition requirements on your permit.

Before the subdivision starts, a Land Management Plan must be prepared by a suitably qualified person (this can be the landholder) to the satisfaction of the Responsible Authority and for the endorsement of the Responsible Authority. The Land Management Plan must address the entire subject site and must include timelines for completion of objectives and review mechanisms, and is to include, but not be restricted to, consideration of:

1. Re-vegetation measures to increase the viability of existing vegetation planted on the site and the improvement of stormwater runoff. The Plan must show locations of all vegetation to be planted; a list of species to be planted (all species must be locally indigenous and a planting schedule must be provided), and timelines for re-planting works.
2. A Weed Management Plan;
3. Current and future farm management practices and works;
4. Erosion amelioration measures to address significant erosion issues across the site as identified;
5. Fencing off all existing and proposed areas of vegetation;
6. Building envelopes and driveways to the building envelopes. The envelopes and driveways must respond to the following:
 - the topography of the land;
 - stream beds;
 - the slope of land towards the location of streams/waterways;
 - vegetation (existing and proposed); and
 - Clause 22.08 of the Bass Coast Planning Scheme (Hilltop and Ridgeline Policy).

The driveways and building envelopes must be screened, where appropriate, to the satisfaction of the Responsible Authority.

Two copies of the Land Management Plan and Work Plan must be provided to Council. Council will endorse the plans and keep one copy on file and return the other copy for your reference.

Please note: a Landscape Plan differs from a Land Management Plan. A landscape plan considers a small zone around a house or development and includes detailed hard landscaping and drawings.

Developing the Land Management Plan

An individual can follow the process and steps outlined below to develop the Land Management Plan. Alternatively consultants are available for a fee to develop the Land Management Plan on your behalf.

A recent aerial photo, satellite image or an accurate scale farm map (such as the subdivision plan) is needed as a starting point for creating your Land Management Plan. Aerial photos can be purchased for a fee. Contact Council or the Department of Primary Industries office for information on how to source a photo of your farm.




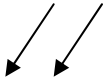


Alternatively, you can locate a satellite image of your property using the Google Earth website, or you may already have an accurate scale farm map of your property.

To develop the map layers described below, copy the original map three times, using each separate map to mark on the overlays described. Alternatively the three maps can be produced using a computer software program. Maps should be either A4 or A3 in size with a key to describe each layer. This format is necessary to allow the Land Vic Title Office to scan and copy the document.

To be endorsed by Council, the plan must be to a high quality, clear, easily understood and to the satisfaction of the Authorising Officer.

Map Overlay I






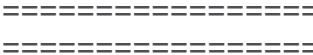

The first map overlay is used to mark on the natural features, land types and any problem areas of the property. Refer to the check list below and mark on the following if present:

| | |
|--|---|
| Remnant vegetation such as patches of bush, isolated trees and clusters of scattered trees (living or dead) in paddocks, roadsides or laneways |  |
| Waterbodies such as rivers, creeks, wetlands, streams, drains, soaks, springs |  |
| Land subject to flooding, waterlogged soils and any wet/low spots |  |
| Gullies and steep slopes |  |
| Saline discharge sites (salinity areas) and associated recharge areas | <i>sdsdsd / srsrsr</i> |
| Eroded and erosion prone areas | eeee |
| Acid soil areas / Acid sulfate soil areas | aaaa / asasas |
| Weed infestations |  |
| Pest animal habitation (burrows, dens, harbour) |  |
| Different soil types and land class boundaries | sand ∴ loam ^{ooo} clay ●●● |

Note: the key provides suggested symbols. Alternative symbols can be used.

Map Overlay 2

The second map overlay includes identifying the existing improvements, built features and infrastructure on the property such as:







| | |
|---|---|
| Shelterbelts/windbreaks/revegetation areas |  |
| Plantations or agroforestry plots |  |
| Fence lines |  |
| Farm water supply including farm dams, bores etc |  |
| Stock watering points/water troughs, pipes |  |
| Farm tracks and laneways |  |
| Houses, buildings, sheds and other built structures |  |

Map Overlay 3 - Ideal Layout - how it all fits together

The third map overlay is the proposed layout. The final step is to look at the previous map overlays to see how the existing features can work towards achieving the “ideal” farm and to mark this on a map. For example, adjustments may be able to be made to existing fencing that can help to manage soils according to their requirements such as different fertiliser rates or spelling from grazing during wet periods therefore allowing for more efficient management.

The principles of best practice to follow when creating map overlay 3 are detailed in Appendix A.

The third layer should show:

| | |
|---|--|
| Locations of all vegetation to be planted. |  |
| Fencing of all existing and proposed areas of vegetation. |  |
| Locations of pest plants and animals to be managed. |  |
| Erosion amelioration measures to address significant erosion issues across the farm as identified. |  |
| Salinity amelioration measures to address salting issues across the farm as identified. |  |
| Fencing off or protecting all water resources. |  |
| As appropriate include current and future farm management practices and works i.e. proposed re-fencing to land class, proposed farm tracks and dams, watering points, paddocks in need of pasture renovation etc. | |
| Include a key to identify symbols or colours used. This could be colour coded and/or numbered shading, symbols or notations that make it clear to the reader /Responsible Authority. | |

Note: As you implement your plan, works completed from the 'ideal' or third layer should be transferred to the second layer, as this depicts the 'current' layout of your farm. You may find some Land Management planners create the ideal layout as the second layer and the current existing improvements layer as the third layer. The order in which you complete the second and third overlay is not critical. You should complete them in the order that makes sense to you.

Works Program

Developing a prioritised works program to address the issues identified towards the development of the ideal farm is another important step. The process of developing the Land Management Plan has enabled you to identify issues, set priorities and plan how to address them on the farm. The issues and the activities to address them need to be developed into an action plan that includes timelines and must be submitted with your Land Management Plan to Council. Prioritise your works according to need, expected cost and effort.

To assist you in developing the Works Program, a template has been provided in **Appendix B**. Complete the relevant sections.

The Works Program must detail the following activities:

| | |
|--|---|
| | Revegetation projects with a list of species to be planted. All species must be locally indigenous and a species list must be provided. The species list should be presented as a table with the following headings: Plant Type (large trees, shrubs, herbs/lilies etc), Quantity, Common Name, and Botanical Name. |
| | Fencing off and protecting all existing remnant vegetation and proposed areas of revegetation. |
| | Weed control. A Weed Control Summary should be presented in a table with the following headings: Weed Name, Control Measure, Month (Jan-Dec). |
| | Pest animal control. |
| | Erosion amelioration measures to address significant erosion issues across the farm as identified. |
| | Salinity amelioration measures to address salting issues across the farm as identified. |
| | Fencing off or protecting all water resources. |
| | Current and future farm management practices and works i.e. proposed re-fencing to land class, proposed farm tracks and dams, watering points, paddocks in need of pasture renovation etc. |

Final Step:

Submit your Land Management Plan and Works Program to Council:

Bass Coast Shire Council
 76 McBride Avenue
 (PO Box 118)
 Wonthaggi Vic 3995

Appendix A

Overlay 3 - Principles of Best Practice

The third overlay is used to create the ideal farm layout based on the principles of best practice. The principles to follow are described below.

Remnant Vegetation

Conserving remnant vegetation on-farm is important for the survival of our native plants and animals as less than 10 percent of remnant vegetation remains within Bass Coast Shire. Remnant vegetation conservation includes its protection (ensuring no further loss), enhancement (better management to improve condition and quality), and restoration (re-establishment or replanting of local indigenous species).

- Exclude stock access from the remnant area through protective fencing.
- Reintroduce species through planting or direct seeding if the remnant has been highly altered.
- Maintain habitat by keeping rocks, fallen logs and branches, dead trees and trees with hollows to provide homes for wildlife.
- Encourage natural regeneration through patch burning or soil disturbance.
- Link the remnant into other areas of vegetation through habitat corridors.
- Protect threatened, rare or endangered species in co-operation with relevant regulatory bodies.
- Control pest plants and animals within remnant vegetation areas.
- Maintain a buffer around the remnant vegetation area to prevent nutrients, fertilisers and spray drift from impacting on the remnant.

Ask yourself the following questions:

- *What areas of bush or scattered trees need to be fenced on the farm to prevent stock access and to enhance their survival?*
- *How can existing bush on the property be integrated and connect with that in the surrounding landscape? Are there natural linkages along watercourses, gullies or roadsides?*
- *How healthy is my bush, would it benefit from patch burning or revegetation to enhance the species diversity?*

Revegetation

Vegetation can help hold soil together and prevent erosion, draw up water to prevent salinity, provide shelter and shade for stock and pasture and provide habitat for wildlife. Local indigenous species should be used in any new plantings because they are suited to local conditions, they encourage native animals and insects and are generally easier to establish than exotic species.

Ask Council for a copy of the *Bass Coast Shire Indigenous Plants Brochure* to find suitable species for your property or seek advice from Landcare, Department of Sustainability and Environment, Greening Australia, or your local Catchment Management Authority.

- Revegetate with appropriate local indigenous plant species.
- Aim to have all the natural vegetation structures present in your revegetation planting i.e. ground covers (40 percent), mid storey shrubs (40 percent) and over storey trees (20 percent).
- Link revegetation and habitat corridors/shelterbelts into adjoining remnant vegetation areas.
- Consider prevailing wind directions and connectivity as well as provision of shade in your design of shelterbelts.
- Winter shading of laneways reduces the prospect of the laneway surface drying. For tracks and laneways consider planting on the eastern side where possible.
- Exclude stock access from the revegetation area through protective fencing.
- Control pest plants and animals within revegetated areas.
- Use revegetation as a method to stabilise and prevent soil erosion and salinity.
- Use revegetation as a method to provide shelter for stock and pasture.

Ask yourself the following questions:

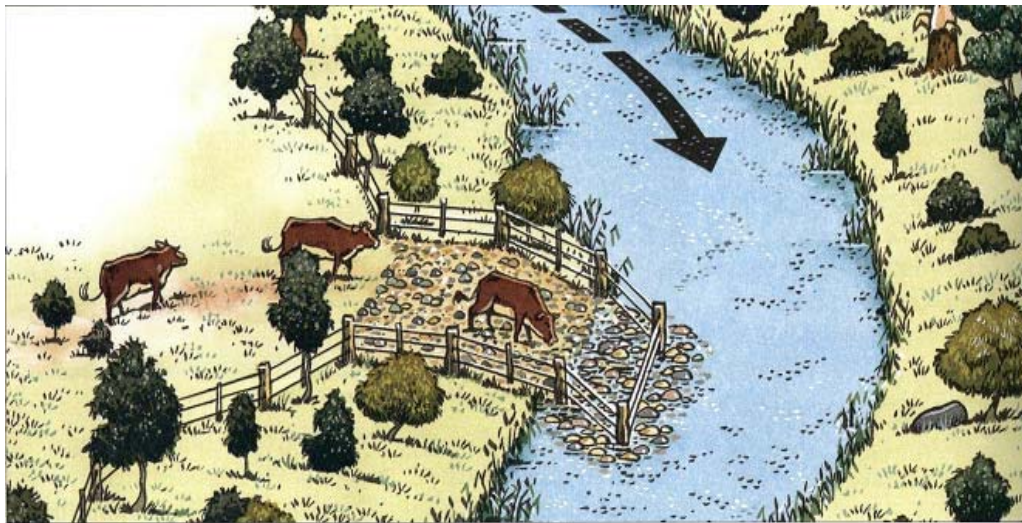
- *Which paddocks and laneways would benefit from shelterbelts?*
- *Do I have sheltered areas for stock during severe weather and extreme heat? Which direction are dominant winds during winter?*
- *How can existing bush, scattered trees or windbreaks on the property be integrated and connect with that in the surrounding landscape? Are there natural linkages along watercourses, gullies or roadsides?*
- *What other areas would benefit from extra trees? Waterways, eroded sites, saline areas?*

Water

Water resources include rivers, creeks, streams, swamps, groundwater, wetlands, drains, soaks, springs and dams. Restricting direct stock access to water resources and reticulating your stock water supply will minimise erosion and contamination of the water source, leading to improved stock and waterway health.

- Drains, wetlands, waterlogged areas and water bodies should be identified on the farm plan and managed separately.
- Exclude stock access from water resources through protective fencing.
- Maintain a vegetated buffer around water resources and waterways to prevent nutrients, fertilisers and effluent from entering the waterway when application is made to pastures or crops.

- A suitable distance from waterways or drainage lines should be determined based on slope, soil type and vegetation type to help prevent contamination. Within a paddock, a grassy buffer-strip of at least 5-10 metres each side of a drainage line should be left to trap nutrients and should not be cultivated or fertilised.
- In the case of seasonal wetlands and waterlogged areas, remove stock during wet periods to prevent pugging then return them during the summer when these paddocks offer valuable summer feed.
- Stabilise and rehabilitate eroded sites, waterways, gully areas etc. Aim to re-establish a variety of indigenous plant species including grasses, sedges, shrubs and trees so that maximum ground cover and protection is achieved.
- Reticulate water to troughs for stock watering points. Alternatively, gravel, rock or concrete ramps into a portion of a dam can be constructed. Fence across the middle of the dam and around the perimeter and establish native grasses and small shrubs. A fact sheet on how to do this is available from Council or Landcare.
- A stable fenced watering point in-stream can minimise erosion if it is not possible to reticulate this water source.
- Locate crossings in a straight section of the waterway. Culverts and crossings in named waterways require a permit from the Catchment Management Authority.
- Stage the removal of willows and revegetate using indigenous plants to stabilise treated areas. Expert advice and permits should be sought from the Catchment Management Authority.



Water access point. Illustration Paul Lennon. Adapted from *Water Note 7*, Water and Rivers Commission (Western Australia), p. 2.

(Department of Primary Industries (DPI), (2006), Environmental Best Management Practice on Farms, DPI Catchment and Agricultural Services, Warrnambool, Vic).

Ask yourself the following questions:

- *What gully and waterway areas need to be fenced and revegetated to enhance water quality and farm safety?*
- *Do I need to fence and revegetate along creeks and waterways to stabilise banks and provide a nutrient buffer?*
- *What drainage areas should I avoid when working paddocks? Is a grass buffer strip maintained?*
- *What low spots and seasonally wet areas need to be fenced and managed separately?*
- *What farm dams need to be fenced?*
- *Is water reticulated to troughs and are troughs placed in appropriate locations?*
- *Is stock access to creeks and waterways managed?*

Erosion

Water erosion is caused by soil exposure and/or excess water moving through and over soils. Slopes greater than 10 degrees, areas stock have made bare, heavy soils with poor drainage, drains and waterways are all susceptible to erosion. Wind erosion is the removal of exposed topsoil by high winds and effects land with poor vegetation cover. If vegetation is removed so that only about one third of the soil remains covered then wind will start blowing soil particles away. The land will then be predisposed to water erosion problems when the rain returns. Types of erosion include: land slips, tunnel, gully, sheet, rill and stream bank.

- Erosion areas should be identified on the farm plan and managed separately.
- Keep groundcover as close as possible to 100 percent. Maintain groundcover through good grazing management, retaining stubble and converting to low till or no till practices.
- If the area needs to be retired from production revegetate the eroded site with local indigenous plants.
- Plant deep-rooted perennial pastures, trees or an appropriate mixture of both to increase water usage.
- Consider water diversion and engineering solutions to slow or retard water flow.
- Maintain and improve vegetation along drainage lines and waterways.
- Rehabilitate and protect vulnerable sites such as active gullies to prevent future erosion.
- Minimise soil disturbance by fencing out wet areas to address pugging damage and avoid drainage lines, seeps and springs when working in paddocks or moving stock.

Ask yourself the following questions:

- *What gully and waterway areas need to be fenced and revegetated to enhance water quality and farm safety?*
- *What areas are vulnerable to erosion and need to be set aside for protection?*
- *What low lying or wet areas would benefit from drainage or spelling from grazing during wet periods?*
- *Where do I need to apply management practices to prevent pugging and soil compaction?*
- *Are all farm areas managed to minimise soil erosion?*
- *Are there degraded creeks, gullies, drainage lines, landslips or tunnel erosion that need to be addressed?*

Control and Reversal of Salinity

Dryland salinity is caused by clearing of native vegetation. The water normally taken up by trees and grasses infiltrates through to ground water causing the groundwater level to rise and dissolve salts in the subsoil. Irrigation salinity is caused by poor land drainage and excess water being used for irrigation. The irrigation water brings dissolved salts to the surface.

- Lower the water table to assist in the control of soil salinity.
- Use water where it lands by revegetating hills and break of slope areas (recharge sites) and low lying areas where groundwater discharges. Salt tolerant species may be required on discharge areas.
- Plant deep-rooted perennial pastures, trees or an appropriate mixture of both to increase water usage and reduce recharge of salty ground water.
- Manage existing salt-tolerant plant species by implementing managed grazing – the key being to maintain plant cover.
- Saline areas should be identified on the farm plan and managed separately.

Ask yourself the following questions:

- *Ask yourself where can I strategically place trees and deep rooted pastures in the landscape to reduce recharge?*
- *What areas are vulnerable to salinity and need to be set aside for protection?*

Noxious and Environmental Weeds

Weeds are considered a pest because they impact negatively on natural and agricultural resources. Monitor for weeds year round including non-grazed areas such as creeks, revegetation and remnant vegetation areas.

- Undertake weed control to reduce the level of infestation and control the spread of weeds.
- Target the eradication of new and emerging weeds to the region.
- Select control methods that are most successful for the identified weeds including non-chemical methods.
- Manage weeds in accordance with relevant legislation and with relevant permits or other approvals that may be required.
- Join your local Landcare Group to learn about the priority weeds and control methods for your area.

Ask yourself the following questions:

- *What areas of the farm need to be treated for weed control? Where have I seen noxious weeds, pasture weeds or environmental weeds across the farm?*

Pest Animals

Pest animals are considered a pest because they impact negatively on natural and agricultural resources. Monitor for pest animals year round including in non-grazed areas such as creeks, revegetation and remnant vegetation areas.

- For best results your control program should take an integrated approach and use a range of control options such as destroying warrens and dens, removing harbour, baiting, warren /den fumigation and shooting.
- Identify and manage pest animal prone areas.
- Ensure correct pest animal control methods are used to ensure that only targeted pests are destroyed.
- Manage pests in accordance with relevant legislation and with relevant permits or other approvals that may be required.

Ask yourself the following questions:

- *What areas need to be treated for pest animals? Where do I see rabbits, foxes, feral cats etc?*

Other Land Management Considerations

Although not a requirement, other land management considerations you might like to include are outlined in this section.

Managing to Land Class

Land varies widely in its ability to support different types of use and production. Most farms contain a range of land types. A land class is a unit of land with a relatively uniform set of characteristics (geology, soil type, slope, aspect etc) which allow it to support a distinctive type and intensity of use. A land class requires a specific set of management practices to sustain those uses without damage to the land. Managing soils according to their capacity can prevent damage to soil health from pugging, compaction, erosion and nutrient imbalances.

A simple way to identify land classes is to think about how the land needs to be managed. If it needs to be managed differently, then it is most likely a different land class e.g. waterlogged clays at the bottom of paddocks, verses well drain areas at the top, or steep sloping land verses flatter land. Different soils can require different fertiliser rates or spelling from grazing during wet periods or through summer. Paddocks containing a number of soil types should be managed to the most vulnerable type or temporary electric fencing can be used to control access.

Class 1 – Good agricultural land with little risk of degradation and able to support a wide range of uses.

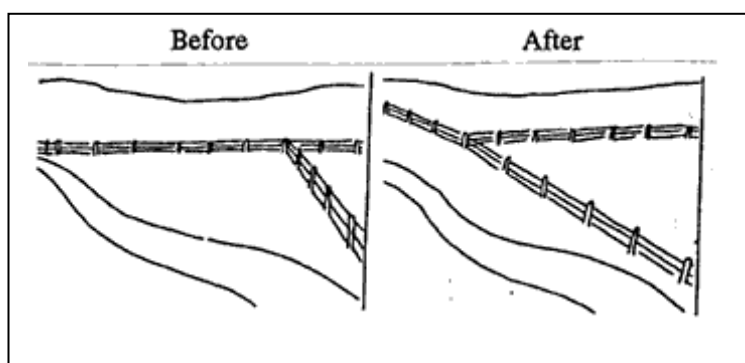
Class 2 – Land at some risk or showing signs of degradation (e.g. salting, erosion, pugging).

(Refer to the Landcare Note 'LC0100 Land Classes for Farm Planning' available on the DPI website within the Information Notes Series).

- Implementing your whole farm plan should involve progressive re-fencing to land class for ease of management, better grazing control and protection of soil, water and vegetation.

Ask yourself the following questions:

- Which paddocks have waterlogged clays that are difficult to drain mixed in with areas that are well drained?
- Which paddocks have a steep gradient and flat land incorporated together?
- How could I re-fence these paddocks in order to manage them according to their capacity?



1. Re-alignment of existing fences when they are due for replacement can offer scope to protect and revegetate areas with native vegetation.

(Platt, S. & Temby I (1999) Land for Wildlife Note LWO02, *Fencing Wildlife Habitat*, Department of Natural Resources and Environment).

Soil

Healthy soils are essential to produce quality pastures and crops. Soil must be physically, nutritionally and biologically balanced to be productive and stable. Managing soil types according to their capacity can prevent damage to soil health from pugging, compaction, erosion and nutrient imbalances.

- Identify and map soil types found on your farm (sand, loamy sand, clayey sand, sandy loam, fine sandy loam, light sandy clay, loam, loam fine sandy, silt loam, sandy clay loam, clay loam or clay). If however having grey or red soil makes no difference to its sustainable productive management, it is not necessary to delineate the colour change on the plan.
- Use a system that is meaningful to you. For example, if north facing grey soil slopes should ideally be managed differently from other sections of your farm, then they should be distinguished as a different land class.
- Monitor the fertility of your soils using standard nutrient analysis to understand their pH, nutrient levels and limitations, salinity levels and characteristics of texture and structure. This will enable appropriate management and nutrient application. Soil testing laboratories can be selected from the following website www.nata.asn.au/
- Identify erosion prone areas and where feasible, manage areas prone to erosion separately. Sometimes land retirement is the best option.
- Waterlogged soils are areas that remain wet for more than three days after rainfall or irrigation. Ideally these areas should be identified and managed separately e.g. not grazed during wet periods.
- Saline areas are usually identified by the emergence of salt tolerant plant species. Mild salting shows as patchy or stunted growth and salt tolerant species such as sea barley grass or water buttons which take the place of clovers as they die out. Saline areas should be identified on the farm plan and managed separately. Salinity risk mapping can be undertaken by Landcare for you if you become involved in the Landcare Land Management Planning Course.
- Acidity (low pH) can occur in paddocks frequently cut for hay or cropped, and pastures with high legume content as excess nitrates leach through the soil profile. Acidity shows as restricted plant growth.

Ask yourself the following questions:

- *Do I know the soil types on my farm?*
- *Am I managing soils according to their capacity?*
- *For productive efficiency, how can I create paddocks that isolate the various soil types?*
- *Do I take regular soil tests every 1-2 years to understand the soils fertility and to determine fertiliser types and application rates?*
- *What areas of the farm are salty or prone to erosion or to acidity?*

Acid Soils

Soil acidification is a natural process accelerated by some agricultural practices. When plant material is removed from the paddock, alkalinity is also removed. This increases soil acidity. Paddocks frequently cut for hay or cropped and pastures with high legume content are prone to acidification or low pH as excess nitrates leach through the soil profile. Applying higher rates of nitrogen fertiliser than the pasture can actually use will also contribute to soil acidification as un-used nitrogen leaches through the soil profile.

- Retain and sow deep-rooted perennial grasses to reduce nitrate leaching.
- Rotate hay and silage cutting (fodder conservation) around the farm.
- Avoid applying high superphosphate rates on pastures when the perennial grass component is low.
- Match timing of fertiliser application with maximum demand by plants to reduce nitrate leaching.

Apply lime according to soil test results.

- Acid soils should be identified on the farm plan and managed separately.

Ask yourself the following questions:

- *Do I undertake regular soil tests to understand the fertility and health of my soils?*
- *Which areas of the farm are prone to acidification?*
- *Do I apply fertilisers when pasture is actively growing?*

Acid Sulfate Soils

'Acid sulfate soils' is the common name given to soils containing iron sulfides, principally in the form of the mineral pyrite. Iron sulfide layers in the soil were formed thousands of years ago under tidal conditions. They are widespread around coastal landscapes and found today in low-lying areas.

When waterlogged, acid sulfate soils remain stable. When exposed to air, they react and form sulfuric acid and bring the pH to below 4. Therefore, as long as sulfide soils remain under the water table, oxidation cannot occur and these soils are quite harmless and can remain so indefinitely. However when these soils are exposed to air, they can generate large amounts of acidity, iron and aluminium.

Drainage, digging soaks and groundwater abstraction from surface aquifers can disturb acid sulfate soils. The release of acid and metal ions into the environment from these soils can have adverse effects on plant growth, cause plant toxicity and can effect the productivity and health of grazing animals. They can cause fish kills, mangrove dieback, algal blooms and many other environmental problems. Sulfuric acid can also corrode metal, steel and concrete causing damage to infrastructure.

Potential acid sulfate soils: contain iron pyrites that have not been oxidised. The iron sulfides are contained in a layer of waterlogged soil. This layer can be clay, loam or sand, and is usually dark grey and soft. The water prevents oxygen in the air reacting with the iron sulfides. This layer is commonly known as potential acid sulfate soil (PASS) because it has the potential to oxidise to sulfuric acid. Consequently, the pH is usually near neutral (approximately 7.0).

Field indicators for potential acid sulfate soil conditions include:

- If uncovered, most often the iron sulfide layer appears as a dark, grey and wet mud, however it can manifest in a number of soil types. These can include; typically waterlogged, unripe muds (soft, buttery texture, blue grey or dark greenish grey) or estuarine silty sands or sands (mid to dark grey) or bottom sediments of estuaries and tidal lakes (dark grey to black).
- Soil and sediment materials rich in iron sulfide (black ooze) tend to be very dark and soft.
- A pH of 6-8.
- Positive peroxide test.
- Offensive odour, predominantly due to 'rotten egg gas' (hydrogen sulfide).

Actual acid sulfate soils: When the iron sulfides are exposed to air and produce sulfuric acid, they are known as actual acid sulfate soils. Actual acid sulfate soils are usually exposed to the atmosphere by drainage, excavation or disturbance. The pyrite has oxidised to form sulfuric acid, decreasing the soil pH to less than 3.5. Acid sulfate soils are characterised by bright yellow or straw coloured mottles of the mineral jarosite and often contain dark reddish coloured streaks. Indicators of acid sulfate soil conditions for soil and groundwater include:

- Jarosite containing horizons (a pale yellow mineral deposit) or iron oxide mottling in auger holes or recently dug surfaces pH < 3.5.
- Jarosite present in surface encrustations or in any material dredged or excavated and left exposed.
- Corrosion of concrete and/or steel structures or severe degradation of concrete structures in contact with the soil.
- Cloudy green-blue water, excessively clear water, or iron staining in water.
- Poor pasture.
- Scalded soil.
- Yellow jarosite.
- Dominance of mangroves, reeds, rushes and other swamp-tolerant vegetation.
- Sulfurous smell after rain following a dry spell, or when the soils are oxidised or disturbed.
- Fish kills in water.

If it is recognised that your property has potential acid sulfate soils, it may be necessary to take soil core samples to find out the exact location and depth of the iron sulfide layer at a particular site. The best way to manage acid sulfate soils is to avoid disturbing or draining the iron sulfide layer (as iron sulfides are harmless while covered with water).

- If the iron sulfide layer is uncovered accidentally it can be re-covered with water immediately.
- Avoid disturbance or drainage of acid sulfate soil materials. Disturbance typically results from drainage, dewatering, excavation, filling or lowering of the watertable through drainage or drought.

- Wide, shallow drains allow surface water to drain quickly from the surface of low-lying land without exposure to the iron sulfide layer beneath. Deep, narrow drains are more likely to expose the iron sulfide layer and leak sulfuric acid into waterways.
- Sulfuric acid can be neutralised with agricultural lime, but this is costly for large areas of badly affected land.
- Re-flooding land with freshwater can slow further acidification. This method requires caution and technical advice before it is applied.
- Landowners are advised to seek expert technical advice for remediation of acid sulfate soil sites.

Ask yourself the following questions:

- *Can I detect any of the acid sulfate soil indicators on my property? Do these areas require further investigation?*
- *Are there signs of the impacts of acid sulfate soils on my property such as severely scalded ground, fish kills in water, iron staining in water, rotten egg gas smells or severe degradation of concrete structures in contact with the soil?*
- *Is soil pH 3.5 or less?*
- *Are bright yellow jarosite mottles present?*
- *Is soil pH 4 or less on aging for 8 weeks?*

Further Information

The Department of Primary Industries Information Notes Series are easy to read and cover a range of topics relating to Agriculture, Flora and Fauna, Forests, Landcare, and Land for Wildlife etc. The notes can provide information on how to address a particular land management issue on your property such as erosion control, salinity or acid soils etc. Visit www.dpi.vic.gov.au/notes to access the Information Notes Series.

Bass Coast Landcare Network staff can provide advice on how to address land management issues on your property. They can also assist with funding towards implementing some of the land management remediation on your farm when funding is available. Bass Coast Landcare run Land Management Planning courses where you receive assistance in developing your Whole Farm Plan. Landcare also offers training in the use of efarmer, a web based farm mapping tool which can be used to generate a computer based Whole Farm Plan.

Whole Farm Planning Courses

A great option for gaining assistance with developing your own formally recognised Land Management Plan is to do a Whole Farm Planning Course. Accredited Whole Farm Planning courses are run by the Department of Primary Industries, Landcare and TAFE and provide opportunities to access grants to implement components of your plan. The cost of the course includes key speakers, course notes and an aerial photograph of your property. The advantages of these courses are they:

- a) Give access to experts and information in particular fields (i.e. erosion, subdivisions).
- b) Encourage discussion and interchange of ideas between farmers, and

- c) Ensure that the plan is largely complete. Courses are run on weekdays, weekends and evenings.

For further details contact: DPI Leongatha Office on: 5662 9900; Bass Coast Landcare Network on: Wonthaggi: 5671 2471, Bass: 5678 2335 or Phillip Island: 5951 3318; Education Centre Gippsland (ECG) McMillan Campus Warragul on: 5622 6000 or Leongatha on 5662 6700.

Consultants available to assist you in the development of your Whole Farm Plan

| Consultant | Address | Phone |
|--|--|------------------------------|
| Bass Coast Landcare Network | See details in the table provided below | |
| Cassie Wright Nature Matters | cassiewright@alphalink.com.au | 03 5674 8242 0429 061 161 |
| Stuart Green Rural Planning | PO Box 843 Wonthaggi 3995 grebow@fastmail.com.au | 0428 125 554 |
| Education Centre Gippsland (ECG) McMillan Campus Warragul | 71 Korumburra Warragul Rd PO Box 249 Warragul 3820 | 03 5622 6000 |
| Education Centre Gippsland (ECG) McMillan Campus Leongatha | Nerrena Road Private Bay 5 Leongatha 3953 | 03 5662 6700 |

Ask Council for a copy of the *Bass Coast Shire Indigenous Plants Brochure* to find suitable species for your property or look up your 1750 (pre-European) Ecological Vegetation Class (EVC) on the DSE website www.dse.vic.gov.au and follow the links: interactive maps, biodiversity. Alternatively seek advice from Landcare, Department of Sustainability and Environment, Greening Australia, your local Catchment Management Authority or Council.

| Organisation | Address | Phone |
|---|---|--|
| Bass Coast Shire Council | 76 McBride Ave (PO Box 118), Wonthaggi 3995 www.basscoast.vic.gov.au | 1300 BCOAST (226 278) |
| Bass Coast Landcare Network | Phillip Island Landcare Office 91-96 Thompson Ave, Cowes Bass Valley Community Centre Old School Rd, Bass Wonthaggi Office 76 McBride Ave, Wonthaggi www.landcare.net.au | 03 5951 3318 03 5678 2335 03 5671 2471 |
| Department of Primary Industries / Department of Sustainability and Environment | Leongatha Office 12 Peart St Leongatha 3953 | 03 5662 9900 |
| Greening Australia | Leongatha Office PO Box 533 (Cnr Young and Bair Streets) Leongatha 3953 | 03 5662 5201 |

| Organisation | Address | Phone |
|---|--|--------------------------|
| West Gippsland Catchment Management Authority | Leongatha Office PO Box 1374 (Cnr Young and Bair Streets, Leongatha) Traralgon Head Office PO Box 1374 (16 Hotham St) Traralgon 3844 Email: westgippy@wgcma.vic.gov.au | 1300 0WGCMA (094 262) |
| Port Phillip and Westernport Catchment Management Authority Head Office | Level 1 Landmark Corporate Centre 454-472 Nepean Hwy Frankston 3199 Melways Ref 100A B7 Email: enquiries@ppwcma.vic.gov.au | 03 8781 7900 |
| Google Earth | www.earth.google.com | |

Local indigenous plants sourced from local seed are grown by the following local nurseries across the region:

| Nursery | Address | Phone |
|--------------------------------|---|--------------|
| Barb Martin Bush Bank | Phillip Island Rd, Phillip Island | 0407 330 397 |
| Melaleuca Nursery | Pearsalls Rd, Inverloch | 03 5674 1014 |
| Blackwood Forest Nursery | 50 Koetsveldt Rd, Archies Creek | 03 5678 7074 |
| Koorooman Native Flora Nursery | 390 Leongatha North Rd, Leongatha North | 03 5668 6301 |
| Tree Action Nursery | Rougheads Rd, Leongatha South | 03 5664 3259 |
| Blue Gum Forest Nursery | 285 Warragul Rd, Korumburra | 03 5655 2765 |
| Strzelecki Plant Farm | Yarragon-Mirboo North Rd, Allambee | 03 5668 7209 |

Glossary:

Remnant vegetation, indigenous vegetation and local indigenous species are plants or vegetation that naturally occur in a localised area. That is, they have existed in that area prior to and since European arrival.

Native vegetation includes any plant originally growing elsewhere in Australia.

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- Department of Water (ND) *Acid Sulfate Soils and Acidic Drainage: Impacts on Coastal Waterways of South West Western Australia*, Department of Water, WA.
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- Victorian Resources online – Whole Farm Planning, DPI website search
www.dpi.vic.gov.au/DPI/Vro/vrosite.nsf/pages/aboutsite
- Warn L. & Hunter S. & J. (May 1996), Agriculture Note AGO392, *Pastures for Recharge Areas*, Department of Primary Industries.

Land Management Plan



works program

Appendix B

Land management - works program

Planning permit number: _____

Name: _____ Phone: _____

Property address: _____

Council property number: _____ Farm Size: _____ ha
(as per your rate notice)

Farm type

| | | | |
|--------------------------|--|--------------------------|--------------|
| <input type="checkbox"/> | Dairy | <input type="checkbox"/> | Horticulture |
| <input type="checkbox"/> | Grazing - Beef | <input type="checkbox"/> | Viticulture |
| <input type="checkbox"/> | Grazing - Sheep | <input type="checkbox"/> | Cropping |
| <input type="checkbox"/> | Grazing - Other | <input type="checkbox"/> | Hobby |
| <input type="checkbox"/> | Intensive Animal Industries - Eggs, Chicken, Meat, Poultry | <input type="checkbox"/> | Other |

a. Aim of the Farm Business

b. Summary of land management issues - erosion, salinity, pest plants and animals, wet areas, soil types, remnant vegetation, water courses

c. Description of how the land management issues will be addressed

- Layout changes
- Management practices
- Fencing
- Revegetation
- Protection of water resources and remnant vegetation

Refer to the Appendix A dot points when completing the activities and actions for each land management area. An example revegetation project and species list (based on 2,000 plants per ha) is provided below:

| Activity/Actions | Proposed timeline | Date Completed |
|---|-------------------|----------------|
| Fence and revegetate area A River Zone - 1 ha along the Powlett River using 2,000 local indigenous plants to stabilise the embankment. Refer to Area A species list attached. Spot spray 3 weeks prior to planting. Monitor and control emerging weeds as required. Monitor and control rabbits and foxes as required. Use tree guards if rabbits are a threat. | September 2009 | |
| Revegetate Area B & C Wildlife Corridor/Shelterbelt Zone - 0.35 ha using 700 local indigenous plants, to connect two areas of remnant vegetation. Refer to Area B & C species list attached. Spot spray 3 weeks prior to planting. Review revegetation planting undertaken in September 2009 and plant replacement plants for any areas that were unsuccessful. Monitor and control emerging weeds as required. Monitor and control rabbits and foxes as required. Use tree guards if rabbits are a threat. | September 2010 | |
| Revegetate Area D Soil Erosion Zone - 0.5 of a hectare using 1,000 local indigenous plants to address soil erosion. Refer to Area D species list attached. Spot spray 3 weeks prior to planting. Review revegetation planting undertaken in September 2010 and plant replacement plants for any areas that were unsuccessful. | September 2011 | |
| Review revegetation planting undertaken in September 2011 and plant replacement plants for any areas that were unsuccessful. | September 2012 | |

Example Revegetation Species List

Note: Planting density = 2,000 plants per Ha

20% overstorey, 40% midstorey, 40% ground cover species

Area A. River Zone 1 Ha

| Type | Qty | Common Name | Botanical Name |
|-----------------------|-------------|------------------------|---------------------------|
| Large Trees 10m+ | 70 | Silver Wattle | Acacia dealbata |
| | 70 | Blackwood | Acacia melanoxylon |
| | 70 | Swamp Gum | Eucalyptus ovata |
| | 70 | Narrow-Leaf Peppermint | Eucalyptus radiata |
| Medium Trees 5-10m | 60 | Swamp Paperbark | Melaleuca ericifolia |
| | 60 | Scented Paperbark | Melaleuca Squarrosa |
| Tall Shrubs 2-5m | 150 | Prickly Currant Bush | Coprosma quadrifida |
| | 150 | Prickly Tea-tree | Leptospermum continentale |
| | 150 | Woolly Tea-tree | Leptospermum lanigerum |
| Low Shrubs <2m | 150 | Hop Goodenia | Goodenia ovata |
| | 100 | Twiggy Daisy Bush | Oleria ramulosa |
| | 100 | Golden Bush-pea | Pultenaena gunni |
| Grasses/Rushes/Sedges | 150 | Common Tussock Grass | Poa labillardieri |
| | 150 | Spiny Headed Mat-Rush | Lomandra longifolia |
| | 100 | Tassel Sedge | Carex fascicularis |
| | 100 | Pale Rush | Juncus pallidus |
| Herbs/Lillies | 150 | Tasman Flax-lily | Dianella tasmanica |
| | 150 | Black-anther Flax-lily | Dianella revoluta |
| Total | 2000 | | |

Revegetation and Remnant Protection Projects

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |

Pest Animal Control

| Pest name | Control measure | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |

Erosion Amelioration Measures

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

Salinity Amelioration Measures

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

Acid Soil Amelioration Measures

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

Water – Fencing off or protecting all water resources

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

Property Management Planning – Proposed Farm Improvements

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

Other:

| Activity/Actions | Proposed timeline | Date Completed |
|------------------|-------------------|----------------|
| | | |
| | | |
| | | |
| | | |

