Natural Resources and Water
Managing Queensland's natural resources
... for today and tomorrow

# Land Manager's Monitoring Guide

## Native vegetation area indicator

Queensland the Smart State

Queensland Government
Natural Resources and Water

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This document is a dated extract from an online publication. Please check for the latest version at:
**<www.nrw.qld.gov.au/monitoring_guide>**



# *Contents*

# What is it?

Native vegetation area (sometimes referred to as vegetation extent) refers to the extent of native vegetation covering an identified area on your property. According to the National Land and Water Resources Audit (AG 2001), 18 percent (30.4 million hectares) of Queensland's native vegetation has been cleared, mainly in the coastal lowlands and floodplains from Cairns south to the New South Wales border and in the inland Brigalow Belt. Retaining, maintaining and restoring an adequate proportion of native vegetation on properties and across catchments and regions are a national natural resource management priority.

Monitoring native vegetation area involves mapping the boundaries and location and calculating the current area of each site of native vegetation on your property. The boundaries between different types of native vegetation and pastures are often indistinct and may change subtly each time you monitor. It is important to decide where the boundaries are located and map them accurately, as they are used to calculate the area of native vegetation. An area of native vegetation may have two or three different groups of dominant plant species or vegetation communities. You may need to map these as different vegetation map units.

The size of an area of native vegetation determines the impact of edge effects. The term 'edge effects' refers to things that affect vegetation and wildlife that occur at the boundary between two vegetation types, for example where pasture meets a forested area. Edge effects can include changes in species composition, gradients of moisture, sunlight, soil and air temperature and wind speed. The edge of native vegetation areas may be more susceptible to weed and pest animal invasion. The smaller the area of native vegetation area the more susceptible it is to edge effects.

## *Other factors and related indicators*

Monitoring native vegetation area will give you information on location and area changes only. An interpretation of results from monitoring native vegetation area can be enhanced by monitoring other vegetation-related indicators including: 'Recruitment of woody plants', 'Tree canopy cover and health', 'Shrub cover', 'Large trees', 'Organic litter', 'Fallen woody material', 'Native plant richness' and 'Weed species'.

You may consider using photopoints as an additional technique to support monitoring native vegetation area. Permanent markers positioned near the current boundaries of native vegetation areas can provide points for regularly taking photographs from. These photographs can provide a clear and valuable visual record of any change in the area but do not provide an actual measurement of area.

You may also be interested in assessing historical change in native vegetation area on your property. You can do this by comparing any available aerial photographs or satellite images of your property that were taken over a series of years.

# Why monitor this indicator?

Monitoring the long-term change in the native vegetation area on your property will give you an indication of whether the area of native vegetation is increasing, decreasing or remaining static. It will also give you an indication of the impacts of your management actions. After mapping your native vegetation and collecting data on change in native vegetation area over a few years you will be able to obtain:

- Initial (baseline) information on the location, boundaries and area of native vegetation on your property, including grassland, shrubland and remnant vegetation
- Trend data relating to changes in the area of native vegetation over time
- Information on how you are progressing towards any vegetation area targets
- A series of Geographic Information System (GIS) layers or plastic map overlays that can show your progress against targets
- Information to develop management strategies that maintain a target area of the vegetation on your property.

## *Is the State Government monitoring native vegetation?*

In Queensland, the Queensland Herbarium and the Queensland Department of Natural Resources and Water are regularly monitoring the vegetation cover at a broad scale. New regional ecosystem and remnant vegetation maps are published regularly by the Queensland Herbarium as satellite-based assessments are completed. You may also find these maps useful when monitoring vegetation area on your property. However, not all areas of vegetation may be recorded by these mapping programs. Availability will depend on the size and shape of native vegetation on your property and its classification (remnant or non-remnant and regional ecosystem status). Maps produced by these programs can show broad changes on your property but are unlikely to provide you with enough detail about the subtler changes in vegetation area at the property level as a result of your management actions.

# Planning to monitor this indicator

The 'Developing your monitoring plan' part of the 'Monitoring overview' section of the Land Manager's Monitoring Guide discusses seven key questions that help to define the why, what, who and how of monitoring:

1. What are your monitoring objectives?
2. How will your data be used?
3. What will you monitor?
4. Where will you monitor?
5. When and how often will you monitor?
6. Who will be involved and how?
7. How will your data be managed?

These seven questions should be considered for every indicator that you plan to monitor. In addition to the concepts discussed in the 'Monitoring overview' you should also considered the following issues that are specific to this indicator when planning your monitoring.

## *What are your monitoring objectives?*

If you have identified that you want to sustainably manage native vegetation for non-production or production related purposes, you need to know how much vegetation you have and what area you may gain or lose over time as a result of your management actions. You may have set some objective or target for native vegetation management as part of your management plan such as:

- Increasing the area of native vegetation with planned regrowth
- Expanding grazing or farming areas
- Improving wildlife movement with high quality native vegetation corridors
- Establishing shelter belts
- Increasing the proportion of deep-rooted perennial plants for salinity management in your district.

## *How will your data be used?*

Clearing of native vegetation is a major degradation issue in many parts of Australia. Native vegetation area is one of the indicators listed in the National Framework for Natural Resource Management Standards and Targets (AG, 2004) as it plays an important role in landscape processes such as water quality, dryland salinity and biodiversity in Australia and it is of strong interest to the community. The regional natural resource management body <www.regionalnrm.qld.gov.au> in your area is required to report on native vegetation against the following three nationally agreed indicators:

- The extent of present native vegetation
- The extent of each priority native vegetation type (as identified by the regional body)
- The proportion of each vegetation type as a percentage of its estimated extent pre-1750.

Regional natural resource management bodies may be interested in your data. You are in the best position to provide the most accurate assessment of the area of vegetation on your property. If you are interested in participating in the monitoring programs of regional natural resource management bodies, you should contact your local regional body directly <www.regionalnrm.qld.gov.au>.

## *What will you monitor?*

### Existing monitoring in your area

Before you start monitoring any indicator it is strongly recommended that you explore who else is monitoring in your area, what they are monitoring and how they are monitoring it. Doing this will not only make sharing your data easier if you chose to do so but will also help you become more familiar with:

- Any area specific issues that may influence your monitoring
- What strategies and/or methods have proven successful within your area

Other land managers, landcare or catchment groups, your regional natural resource management body or the Environmental Protection Agency (EPA) may be monitoring native vegetation in your area.

## *Where will you monitor?*

When selecting your monitoring sites you should try and include sites that represent:

- All types of native vegetation on your property, for example forest, open woodland, shrublands, native grasslands, wetlands, riparian zones/creek lines and desert areas
- All uses of native vegetation on your property, for example harvested and non-harvested native forest, unused areas, native pastures, grazing land, regrowth, revegetation/restoration sites and unused road reserves and access tracks
- Areas of proposed changes, for example connectivity of habitat corridors and/or expansion of grazing/farming areas.

## *When and how often will you monitor?*

You probably have a good idea of how quickly the vegetation area is changing on your property and this should determine how frequently you monitor. As a guide, native vegetation area should ideally be monitored annually about the same time of the year and before and after any major changes on the property.
The frequency of monitoring will be influenced by:

- Property activities, for example revegetation, clearing and/or fencing
- The size of the property and the size and complexity of the vegetation areas
- The time and resources available to conduct the activity
- The influences of climate, for example vegetation dieback, rainfall and wildfire intensity
- The availability of remote sensing data, including aerial photographs and satellite imagery.

## *What legal or regulatory requirements will affect your monitoring?*

Native vegetation area is indirectly linked to legislation such as the Vegetation Management Act 1999 and the State Policy for Vegetation Management 2004 < http://www.nrw.qld.gov.au/vegetation/legislation.html >. Key principles of this policy are the regulation of native vegetation clearing to prevent loss of biodiversity and to maintain remnant endangered and remnant of concern regional ecosystems (see ‘Glossary’). Further, the Vegetation Management Act 1999 requires that the area of all regional ecosystems be monitored to ensure that no regional ecosystem changes status, for example from ‘of concern’ to ‘endangered’. The Queensland Department of Natural Resources and Water vegetation management database denotes areas permitted to clear. When threshold levels are reached the very next application to clear is not permitted.

In Queensland, significant emphasis is placed upon the distinction between areas of remnant and non-remnant vegetation (see ‘Glossary’). The Queensland Herbarium is continually updating vegetation information and holds the most current vegetation mapping for Queensland. In addition, the management implications and legal obligations for remnant and non-remnant vegetation differ greatly.

For more information on legislation relating to vegetation, its clearing and conservation, see the Queensland Department of Natural Resources and Water vegetation management website <www.nrw.qld.gov.au/vegetation>.

# How do you measure it?

Monitoring native vegetation area is a whole-of-property activity that can be done as a tabletop or computer mapping exercise with field checking to compare what has been recorded with what really exists on your property. Vegetation location is identified by recording on property maps, as accurately as possible, where the boundary of each vegetation type lies.

Before you can measure changes in native vegetation area you will need to establish baseline information on the location and area of native vegetation. In this situation 'baseline data' refers to the native vegetation area at the start of your monitoring program or the earliest available record you have against which subsequent monitoring can be compared. Baseline data may come from aerial photographs, satellite images or hand-drawn boundaries that have been field checked. Satellite imagery, although more expensive, is available for the whole state and likely to be the most up-to-date; it is recorded every few weeks.

This guide provides two levels of monitoring for native vegetation area. These two levels of monitoring differ in how the area of native vegetation is recorded during field checking. Field checking for level 1 monitoring will require basic field survey mapping skills to accurately work out area and record the information on hand drawn maps. Level 2 monitoring allows you to better share your data with others by using GPS to record the location of vegetation. So level 2 monitoring requires appropriate equipment, software and skills.

When mapping native vegetation area it is not crucial to include topographic information, existing cropping/cultivated areas, exotic pastures, home gardens, orchards, built infrastructure, roads, tracks, railway lines, fence lines, watercourses, wetlands, dams, and drainage lines. However, you may want to record this information on layers or overlays as part of a property plan.

# How do you measure it? - Level 1 monitoring

**Key aspects of level 1 monitoring**

- Trace vegetation area from aerial photographs and satellite images onto a hand-drawn map
- Ground-truth hand-drawn maps
- Monitor periodically.

## *Skills needed*

### Tracing and map drawing

- Interpreting aerial photographs or satellite images
- Basic field survey techniques for mapping an area
- Basic maths for calculating areas from survey data

## *Equipment and costs*

**Aerial photography**

Aerial photography as normal, enlargement or mosaic for recent and historical images are available from the Queensland Department of Natural Resources and Water <www.nrw.qld.gov.au/property/mapping/aerial_photography.html>. However, availability varies across the state. The cost for single contact prints is $37.00, while 1 200mm x 900mm laser copy enlargements are about $78.20 (price as at 1/7/2007 – please check for any change).

**Or**

**Printed satellite images**

Printed satellite images of recent and/or historical images are available from:

- Queensland Department of Natural Resources and Water <www.nrw.qld.gov.au/property/mapping>
- Geoimage Pty Ltd <www.geoimage.com.au>
- TerraneanMapping Technologies < http://www.terranean.com.au/ >
- Information Queensland <www.information.qld.gov.au>

- SLATS (Statewide Landcover and Trees Study) printed and processed Landsat images from the Queensland Department of Natural Resources and Water show vegetation, property boundaries and place names. These cost $196.00 for medium-scale prints—1:50 000 and 1:100 000—(price as at 1/7/2007 – please check for any change).

**Or**

**Printed topographic maps**

Printed large-scale (1:25 000) topographic maps are available from your local Queensland Department of Natural Resources and Water office <www.nrw.qld.gov.au/about/contactus/service_centres.html> for a cost of about $10 each. It is recommended that you purchase folded maps for easy storage.

**Minor items**

- Plastic overlay sheets
- A range of fine-tipped coloured permanent marker pens or Chinagraph pencils
- Plastic eraser and cleaning alcohol
- Removable adhesive tape (e.g. masking tape) or some means of securing overlay sheets
- Writing paper
- Dot-grid sheets for measuring areas from property maps (see 'Queensland Department of Natural Resources and Water fact sheet (L74) – Property mapping: Measuring distance and area' <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>).
- Field/survey tape measure and vehicle trip meter for large areas
- Compass

# *Time taken*

The time taken to hand-draw and field check maps may vary depending on:

- The size of the property – larger properties are more time-consuming
- The complexity of the landscape – highly variable landscapes can be harder to interpret from aerial photographs or satellite images and take more time to check on the ground
- The frequency of monitoring
- The level of detail that can be drawn from the photographs and images and how recent they are – recent clear photos may require less field checking.

# *Monitoring procedure*

## Preparing a vegetation overlay

**1.** Place a clear plastic overlay over the photograph or satellite image and secure with removable tape.

**2.** Mark on the plastic overlay some clear reference points against features on the photograph or image so that you can realign the overlay sheet with the aerial photograph if it slips.

**3.** Mark on the plastic overlay your property boundaries from the photograph or image. Use a black fine-tip pen for hand mapping so that mapped boundaries are easily visible and accurately positioned. Solid black lines of approximately 1mm thickness are often sufficient.

**4.** Add to the plastic overlay:

- A title
- A north arrow
- A legend that describes how different vegetation types will be represented on the map, e.g. different coloured areas
- A scale
- Your name
- The date
- A brief statement about the data and techniques used to produce the map.

**5.** You may want to create a plastic overlay for other features such as fence lines, dams, creeks and drainage lines and road reserves to make it easier to read and use your map (see 'Queensland Department

of Natural Resources and Water fact sheet (L73) – Property mapping: adding information' <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>).

**6.** Mark on the plastic overlay the boundaries of each area of native vegetation. You should show any areas of clumps of trees and regrowth. Use a clear system of colouring and labelling to show the different vegetation types. Number **every** vegetation area and record how these numbers relate to your vegetation types (Table 1). For example, if there are six areas of native vegetation, number them 1 to 6. Vegetation type can be recorded according to the Regional Ecosystem (RE) classification system <www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems>.

**Table 1: Example of a record of vegetation area and type**

| Vegetation area number | Vegetation type |
|---|---|
| 1 | 10.3.9 - White's ironbark open woodlands on sandy alluvial fans |
| 2 | |
| 3 | |

**7.** You may wish to use a new overlay sheet to draw in any neighbouring (off-property) areas of vegetation to show how they connect with native vegetation on your property. These areas should also be numbered and recorded as per step 6.

8. Calculate and record the individual and total areas of vegetation on your property (see 'Queensland Department of Natural Resources and Water fact sheet (L74) - Property mapping: Measuring distance and area' <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>).

9. Once you have mapped all areas of native vegetation, the next step is field checking.

## Field checking

Field checking is important as it confirms what you have marked on your overlays from the aerial photographs and/or satellite images. Remember that aerial photographs and/or satellite images do not always highlight all types of native vegetation. For instance, native grasslands and native shrublands may not show up and dense clumps of weeds can often look like shrubs.

**1.** Take your aerial photographs, satellite images, overlay map, pens, pencils, eraser, etc. out with you to each area.

**2.** Check that the boundaries of the native vegetation are mapped accurately on your overlay and redraw if necessary. Also include any other areas of native vegetation that you were not able to see on the photograph or image. The boundary of an area of vegetation may not be clear where it opens into a cleared area or merges into another type of vegetation. It is important to write down how you decide on these boundaries so that you (or someone else) use the same criteria each time an assessment is carried out (e.g. the vegetation area was mapped to the edge of any regrowth seedlings or suckers). To check the boundaries you should:

- Use your tape measure or a vehicle trip meter (by driving along the edge of the vegetation) to record the length of the boundary.
- At corners or where the vegetation changes direction, write down the compass direction to at least two visible landscape features, preferably those that are visible on your aerial photograph or satellite image (e.g. 315° NNW). This gives you coordinates to check that your areas are mapped accurately.

**3.** Record the date you did the field checking on your map so that changes can be monitored over time.

**4.** Recalculate the individual and total areas of native vegetation on your property if necessary.

## Ongoing monitoring

With your map overlays that you have checked on the ground you can now periodically monitor these areas by checking in the field and/or obtaining new aerial photographs or satellite imagery. If, after your first field checking, the vegetation boundaries are easily identified on the satellite imagery, you may be able to record most changes on your personal computer using new aerial photographs or satellite imagery with reduced field checking time.

Remember that whenever you obtain new aerial photographs, satellite imagery or check your vegetation areas in the field, you need to create and make any changes on a **new map overlay**, not the original overlay. This will allow you to keep a record of your original dataset of vegetation area and progressively develop new overlays that indicate how this changes.

## *Data quality considerations*

If you intend to use your vegetation map as part of an application for a Property Map of Assessable Vegetation under the Vegetation Management Act 1999 you will need to address the requirements described in the Application kit for a Property Map of Assessable Vegetation <www.nrw.qld.gov.au/vegetation/pmavs.html> (The application kit can be found under the 'Applying for a Property Map of Assessable Vegetation' link).

To ensure consistent assessment of the area of native vegetation on the property you should always record:

- How unclear vegetation boundaries on aerial photographs or satellite images were interpreted
- How you interpreted unclear vegetation boundaries when field checking your prepared map
- The date you prepare your layer or overlay and the date you conduct your field checking.

Important considerations for the measurement of native vegetation area include:

- The projection and scale of any aerial photographs, satellite images or maps used for comparisons must be the same.
- The map you generate must include all relevant information.
- The method of measuring native vegetation area that you use must be consistent and repeatable.

**Projection**

It is preferable that any aerial photographs or satellite images used over time have the same projection. Aerial photographs or satellite images that use a different map projection can lead to inaccuracies in mapping the native vegetation area. The Geodetic Datum of Australia (GDA94) is the standard projection to use on maps.

**Scale**

The scale of base satellite images, aerial photographs and maps should be known and stated as this sets the scale for all your subsequent overlays or layers. Any additional photographs and images used over time should also be obtained at the same scale. Aerial photographs or satellite images that are at different scales or projection can lead to inaccuracies in the mapped native vegetation area. If you enlarge or reduce the size of your aerial photographs or satellite images, the scale will change. You will need to consider this when calculating areas. It is recommended that all areas should be calculated from the original-size map to avoid confusion with scale. The size of your property and the availability of satellite imagery or aerial photographs will determine the scale at which you can map your native vegetation area. There are limits to how well an area can be recorded at various scales. Table 2 shows the minimum size of mapping units at various vegetation mapping scales used by the Queensland Herbarium.

**Table 2: Recommended mapping size for vegetation mapping based on equivalent size of features in the field at the corresponding map scale (Neldner et al. 2004, p 40)**

| | | Map scale | | | |
|---|---|---|---|---|---|
| **Feature** | **Size on map** | **1:25 000** | **1:50 000** | **1:100 000** | **1:250 000** |
| Area of the smallest mapped feature | 2 x 2 mm | 0.25 ha | 2.0 ha | 4 ha | 25 ha |
| Minimum width for linear features | 1 mm | 25 m | 50 m | 100 m | 250 m |

**Calculating native vegetation area**

It is important to use a consistent method for calculating areas of native vegetation, for example the method described in the ‘Queensland Department of Natural Resources and Water fact sheet (L74) - Property mapping: Measuring distance and area’ <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>.

# How do you measure it? – Level 2 monitoring

**Key aspects of level 2 monitoring**

- Trace vegetation area from aerial photographs and satellite images onto a GIS-based map
- Ground-truth GIS-based maps using a GPS
- Monitor periodically.

## *Skills needed*

- Using a personal computer and GIS software
- Mapping with GIS
- Interpreting electronic aerial photographs or satellite images
- Using a GPS unit for mapping an area
- Managing GIS data

## *Equipment and costs*

**GPS receiver**

A wide range of GPS receivers are now available from camping, boating, scientific and electronics stores. Most enable you to take precise position coordinate readings and record details about each position in an attributes table that can be downloaded to your computer. Approximate cost of a GPS receiver is $250+.

**Digital aerial photography**

Aerial photography (normal, enlargement or mosaic) for recent and historical images are sold by the Queensland Department of Natural Resources and Water <www.nrw.qld.gov.au/property/mapping/aerial_photography.html> for $168.90 for a two-image digital mosaic on CD, plus $65.40 for additional images (price as at 1/7/2007 – please check for any change). The availability of these images does vary across the state. For some large properties several photos may have to be compiled into a digital mosaic. These mosaics may not be geo-referenced (to a map projection) and you should check before you purchase them.

**Or**

**Digital satellite images**

Digital satellite images of recent and/or historical images are available from:

- Queensland Department of Natural Resources and Water <www.nrw.qld.gov.au/property/mapping>
- Geoimage Pty Ltd <www.geoimage.com.au>
- Terranean Mapping Technologies < http://www.terranean.com.au/>
- Information Queensland <www.information.qld.gov.au>
- Queensland Herbarium <www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems>
- SLATS (Statewide Landcover and Trees Study) printed and processed Landsat images from the Queensland Department of Natural Resources and Water show vegetation, property boundaries and place names. These cost $196.00 for medium-scale prints (1:50 000 and 1:100 000) (price as at 1/7/2007 – please check for any change).

**GIS software**

GIS software basic functions include display of digital images and overlaying of data layers . GIS software vendors include:

- ESRI Australia <www.esriau.com.au>
- FarmMap <www.agtrix.com>
- MapInfo Australia <www.mapinfo.com.au/location/integration>
- OziExplorer <www.oziexplorer.com>.

Costs vary depending on the software purchased.

**Colour printer**

A large range of bubble jet, inkjet or laser colour printers to print maps for field use are available from computer suppliers and department stores. If you want to print maps to A3 size paper and above you may need to go to more specialist suppliers. Costs vary depending on the printer purchased.

## *Time taken*

The time taken to electronically draw and field check maps may vary depending on:

- The size of the property – larger properties are more time-consuming
- The complexity of the landscape – highly variable landscapes can be harder to interpret from aerial photographs or satellite images and take more time to check on the ground
- The frequency of monitoring
- The level of detail that can be drawn from the photographs and images and how recent they are – recent clear photos may require less field checking.

## *Monitoring procedure*

### Preparing a vegetation overlay

**1.** Start your GIS software application and load the satellite or aerial photograph image of your property.

**2.** If not already done, add a new thematic layer and trace your property boundaries.

**3.** It may be easier to read and use your map if you also create a layer for other features, such as internal fence lines, dams, creeks, drainage lines and road reserves (see Queensland Department of Natural Resources and Water fact sheet (L73) 'Property mapping: Adding information' <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>).

**4.** Add another new thematic layer and mark in the boundaries of each area of native vegetation, showing any areas where there are clumps of trees in a paddock and areas of regrowth.

**5.** You may also wish to create another thematic layer that contains any neighbouring (off-property) areas of vegetation to show how they connect with areas of native vegetation on your property.

**6.** Each new polygon that you draw will be labelled automatically by your GIS (i.e. ID number). You may want to add text to each polygon that has more meaning for you, such as 'patch on hill'. The GIS will calculate the individual polygon areas of vegetation. You will need to export these area values to a spreadsheet or table to calculate the total area.

**7.** Once you have mapped all areas of native vegetation, the next step is field checking.

**Note:** GIS software calculates perimeter lengths and areas automatically. Location coordinates are also established as part of the system as thematic layers have a 'projection'.

## *Field checking*

Field checking is important as it confirms what you have marked on your thematic layers from the aerial photographs and/or satellite images. Remember that aerial photographs and/or satellite images do not always highlight all types of native vegetation. For instance, native grasslands and native shrublands may not show up and dense clumps of weeds can often look like shrubs.

When field checking your vegetation layer, you can use at least three techniques to record information:

- Hand mapping: Using a print of the vegetation layer (with aerial photograph or satellite image) you have created and hand drawing any changes, taking field notes and updating the maps on your computer later.
- Using GPS: Using a print of the vegetation layer you have created and making any changes directly into a GPS unit (described below).
- GPS with laptop: Using a laptop computer with your vegetation layer on it and making any changes directly onto your map with the aid of a GPS unit.

A key advantage of using a GPS unit is that it allows you to accurately record the locations, boundaries and areas of native vegetation on your property. Depending on the source and scale of your digital images and other layers, there can be some metres of mismatch in the coordinates of any given point. The use of a GPS in conjunction with your photography and satellite imagery allows you to check and correct these errors.

### Field checking using GPS

**Note:** These steps may vary according to the equipment you are using.

1. Load the necessary coordinate files onto your GPS unit.

2. Take your printed vegetation layer out with you to each area.

3. Travel along the boundaries of the native vegetation to check for accuracy, recording any new GPS coordinates as you go (see the GPS manufacturer's instructions). Also include any other areas of native vegetation that you were not able to see on the image you used. The boundary of an area of vegetation may not be clear as it merges into a cleared area or another type of vegetation. It is important to write down how you decide on these boundaries so you also use the same criteria (e.g. map the edge of any regrowth seedlings or suckers).

4. Record the date you did the field checking, who did the checking and any other notes for each relevant polygon of native vegetation.

5. When field checking has been completed, load your GPS data into your GIS. You may need to work on your GIS data to get these points into polygons or edit existing polygons to the new points.

6. Record any new individual and total areas of native vegetation on your property.

7. You now have a vegetation layer in your GIS and GPS systems ready for your next monitoring occasion.

### Ongoing monitoring

With your GIS vegetation layer and GPS data that you have checked on the ground you can now periodically monitor these areas by checking in the field and/or obtaining new aerial photographs or satellite imagery. If, after your first field checking, the vegetation boundaries are easily identified on the satellite imagery, you may be able to record most changes on your personal computer using new aerial photographs or satellite imagery with reduced field checking time.

Remember that whenever you obtain new aerial photographs, satellite imagery or check your vegetation areas with your GPS, you need to create and make any changes on a **new thematic layer**, not the original layer. This will allow you to keep a record of your original dataset of vegetation area and progressively develop new layers that indicate how this changes.

## *Data quality considerations*

If you intend to use your vegetation map as part of an application for a Property Map of Assessable Vegetation under the Vegetation Management Act 1999 you will need to address the requirements described in the Application kit for a Property Map of Assessable Vegetation <www.nrw.qld.gov.au/vegetation/pmavs.html> (The application kit can be found under the 'Applying for a Property Map of Assessable Vegetation' link).

To ensure consistent assessment of the area of native vegetation on the property you should always record:

- How unclear vegetation boundaries on aerial photographs or satellite images were interpreted
- How you interpreted unclear vegetation boundaries when field checking your prepared map
- The date you prepare your layer or overlay and the date you conduct your field checking.

Important considerations for the measurement of native vegetation area include:

- The projection and scale of any aerial photographs, satellite images or maps used for comparisons must be the same.
- The map you generate must include all relevant information.
- The method of measuring native vegetation area that you use must be consistent and repeatable.

**Projection**

It is preferable that any aerial photographs or satellite images used over time have the same projection. Aerial photographs or satellite images that use a different map projection can lead to inaccuracies in mapping the native vegetation area. The Geodetic Datum of Australia (GDA94) is the standard projection to use on maps.

**Scale**

The scale of base satellite images, aerial photographs and maps should be known and stated as this sets the scale for all your subsequent overlays or layers. Any additional photographs and images used over time should also be obtained at the same scale. Aerial photographs or satellite images that are at different scales or projection can lead to inaccuracies in the mapped native vegetation area. If you enlarge or reduce the size of your aerial photographs or satellite images, the scale will change. You will need to consider this when calculating areas. It is recommended that all areas should be calculated from the original-size map to avoid confusion with scale. The size of your property and the availability of satellite imagery or aerial photographs will determine the scale at which you can map your native vegetation area. There are limits to how well an area can be recorded at various scales. Table 3 shows the minimum size of mapping units at various vegetation mapping scales used by the Queensland Herbarium.

**Table 3: Recommended mapping size for vegetation mapping based on equivalent size of features in the field at the corresponding map scale (Neldner et al. 2004, p 40)**

| Feature | Size on map | Map scale | | | |
|---|---|---|---|---|---|
| | | 1:25 000 | 1:50 000 | 1:100 000 | 1:250 000 |
| Area of the smallest mapped feature | 2 x 2 mm | 0.25 ha | 2.0 ha | 4 ha | 25 ha |
| Minimum width for linear features | 1 mm | 25 m | 50 m | 100 m | 250 m |

**Calculating native vegetation area**

It is important to use a consistent method for calculating areas of native vegetation, for example the method described in the Queensland Department of Natural Resources and Water fact sheet (L74) 'Property mapping: Measuring distance and area' <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>.

# How to record your results

All measurements of lengths should be in kilometres (km) and area should be in hectares (ha).

The information you collect while monitoring native vegetation area is referred to as data. Data is distinct pieces of information (e.g. numbers, text or images) that can be stored electronically on paper or as samples. An organised collection of data with a common theme is called a dataset. For examples, a collection of data about a particular geographic area for a particular time period would form a dataset.

How your monitoring results are recorded will depend on what level of monitoring you are carrying out.
For level 1 monitoring you should:

- Draw on your map overlays the boundary, location and area of each site of vegetation.
- Record on your spreadsheet (Table 4) a minimum of information including:
    - Area number
    - Date checked
    - Person completing the field check
    - Checked area
    - Any comments

For level 2 monitoring you should:

- Export your polygon attributes and summary data to a spreadsheet separate from your GIS shape files. This spreadsheet should be maintained as a separate record. The attributes for each polygon should include at least the fields shown in table 5.

**Table 4: Example Level 1 monitoring data for native vegetation area**

| Native vegetation area data | | | | Additional data | | | | |
|---|---|---|---|---|---|---|---|---|
| Area | Date checked | Checked area (ha) | Comments | % Change from total baseline | Vegetation type | Type of change | Cause of change | Notes |
| 2003 | | | | | | | | |
| 1 | 23/03/04 | 34.5 | Baseline | | NOC 10.3.9 | | | M |
| 2 | 23/03/04 | 320.3 | Baseline | | END 10.3.5 | | | M |
| 3 | 23/03/04 | 30.5 | Baseline | | REG 10.3.9 | | | U |
| 4 | 23/03/04 | 151.8 | Baseline | | NOC 10.3.9 | | | E |
| 5 | 23/03/04 | 162.3 | Baseline | | NOC 10.3.9 | | | M |
| 6 | 23/03/04 | 301.2 | Baseline | | END 10.3.5 | | | M |
| 7 | 23/03/04 | 10.1 | Baseline | | NOC 10.3.9 | | | E |
| 8 | 23/03/04 | 14.2 | Baseline | | NOC 10.3.9 | | | E |
| 9 | 23/03/04 | 25.4 | Baseline | | END 10.4.6 | | | F |
| | Total area | 1050.3 ha | | | | | | |
| 2004 | | | | | | | | |
| 1 | 20/03/05 | 34.5 | Unchanged | 0 | NOC 10.3.9 | No change | | M |
| 2 | 20/03/05 | 320.3 | Unchanged | 0 | END 10.3.5 | No change | | M |
| 3 | 20/03/05 | 30.5 | Unchanged | 0 | REG 10.3.9 | No change | | F |
| 4 | 20/03/05 | 151.8 | Unchanged | 0 | NOC 10.3.9 | No change | | E |
| 5 | 20/03/05 | 162.3 | Unchanged | 0 | NOC 10.3.9 | No change | | M |
| 6 | 20/03/05 | 301.2 | Unchanged | 0 | END 10.3.5 | No change | | M |
| 7 | 20/03/05 | 5.7 | Reduction | -0.42 | NOC 10.3.9 | NV>NNV | O – Wildfire | E |
| 8 | 20/03/05 | 14.2 | Unchanged | 0 | NOC 10.3.9 | No change | | E |
| 9 | 20/03/05 | 25.4 | Declining | 0 | END 10.4.6 | No change | | F |
| 10 | 20/03/05 | 80.2 | New area | 7.64 | | NNV>NV | Revegetation | M |
| | Total | 1126.1 ha | | 7.22% | | | | |
| | Total change | 75.8 ha | | 7.22% | | | | |

Vegetation type: Biodiversity status: NOC – Not of concern, END – Endangered, REG – Regrowth. Regional ecosystem codes: 10.3.9 – White's ironbark open woodlands on sandy alluvial fans; 10.3.5 – Dawson gum open woodland on broad stream beds; 10.4.6 – Yellowwood and Queensland ebony low open woodland on Cainozoic lake beds. See 'Monitoring strategy and standards' for a discussion about regional ecosystems.
Management notes: For example, stock access may be: stock excluded (E), managed access (M) or unrestricted access (U).
Type of change: NV>NNV – Native vegetation changed to non-native vegetation; NNV>NV– Non-native vegetation to native vegetation; or No change (DEH 2004).
Cause of change: Clearing for agriculture; Conversion for agriculture; Plantation establishment; Revegetation; Land abandonment; Pest or disease invasion; Farm tree planting; Urban and/or infrastructure development; Salinity; or O – Other (DEH 2004).

**Table 5: Example Level 2 monitoring data for native vegetation area**

| Native vegetation area data | | | | | | Additional data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FID | Shape | Date checked | Checked area (ha) | Perimeter (km) | Comments | % Change from total baseline | Vegetation type | Type of change | Cause of change | Notes |
| 2003 | | | | | | | | | | |
| 1 | Polygon | 23/03/04 | 34.5 | 2.34 | Baseline | | NOC 10.3.9 | | | M |
| 2 | Polygon | 23/03/04 | 320.3 | 9.6 | Baseline | | END 10.3.5 | | | M |
| 3 | Polygon | 23/03/04 | 30.5 | 2.2 | Baseline | | REG 10.3.9 | | | U |
| 4 | Polygon | 23/03/04 | 151.8 | 9.68 | Baseline | | NOC 10.3.9 | | | E |
| 5 | Polygon | 23/03/04 | 162.3 | 5.2 | Baseline | | NOC 10.3.9 | | | M |
| 6 | Polygon | 23/03/04 | 301.2 | 9.64 | Baseline | | END 10.3.5 | | | M |
| 7 | Polygon | 23/03/04 | 10.1 | 1.0 | Baseline | | NOC 10.3.9 | | | E |
| 8 | Polygon | 23/03/04 | 14.2 | 1.5 | Baseline | | NOC 10.3.9 | | | E |
| 9 | Polygon | 23/03/04 | 25.4 | 2.9 | Baseline | | END 10.4.6 | | | F |
| | | Total area | 1050.3 ha | | | | | | | |
| 2004 | | | | | | | | | | |
| 1 | Polygon | 20/03/05 | 34.5 | 2.34 | Unchanged | 0.00 | NOC 10.3.9 | No change | | M |
| 2 | Polygon | 20/03/05 | 320.3 | 9.6 | Unchanged | 0.00 | END 10.3.5 | No change | | M |
| 3 | Polygon | 20/03/05 | 30.5 | 2.2 | Unchanged | 0.00 | REG 10.3.9 | No change | | F |
| 4 | Polygon | 20/03/05 | 151.8 | 9.68 | Unchanged | 0.00 | NOC 10.3.9 | No change | | E |
| 5 | Polygon | 20/03/05 | 162.3 | 5.2 | Unchanged | 0.00 | NOC 10.3.9 | No change | | M |
| 6 | Polygon | 20/03/05 | 301.2 | 9.64 | Unchanged | 0.00 | END 10.3.5 | No change | | M |
| 7 | Polygon | 20/03/05 | | | Replaced by FID 11 | -0.96 | NOC 10.3.9 | NV>NNV | O – Wildfire | E |
| 8 | Polygon | 20/03/05 | 14.2 | 1.5 | Unchanged | 0.00 | NOC 10.3.9 | No change | | E |
| 9 | Polygon | 20/03/05 | 25.4 | 2.9 | Declining | 0.00 | END 10.4.6 | No change | | F |
| 10 | Polygon | 20/03/05 | 80.2 | 3.6 | New area | 7.64 | | NNV>NV | Revegetation | M |
| 11 | Polygon | 20/03/05 | 5.7 | 0.50 | Replaces FID 7 | 0.54 | | | | M |
| | | Total | 1126.1 ha | | | 7.22 | | | | |
| | Total change | | 75.8 ha | | | 7.22% | | | | |

Vegetation type: Biodiversity status: NOC - Not of concern, END - Endangered, REG - Regrowth. Regional ecosystem codes: 10.3.9 – White's ironbark open woodlands on sandy alluvial fans; 10.3.5 – Dawson gum open woodland on broad stream beds; 10.4.6 – Yellowwood and Queensland ebony low open woodland on Cainozoic lake beds. See 'Monitoring strategy and standards' for a discussion about regional ecosystems.
Management notes: For example stock access may be: stock excluded (E), managed access (M) or unrestricted access (U).
Type of change: NV>NNV – Native vegetation changed to non-native vegetation; NNV>NV – Non-native vegetation to native vegetation; or No change (DEH 2004) Cause of change: Clearing for agriculture; Conversion for agriculture; Plantation establishment; Revegetation; Land abandonment; Pest or disease invasion; Farm tree planting; Urban and/or infrastructure development; Salinity; or Other (DEH 2004)

The main data and information that results from monitoring native vegetation area is a total area (and subtotals) and how that has changed over time. Additional detailed data relates to how precise boundaries and locations of the vegetation may have changed.

Figure 1 shows an example of what an unchecked first layer or overlay of vegetation area on a property may look like.

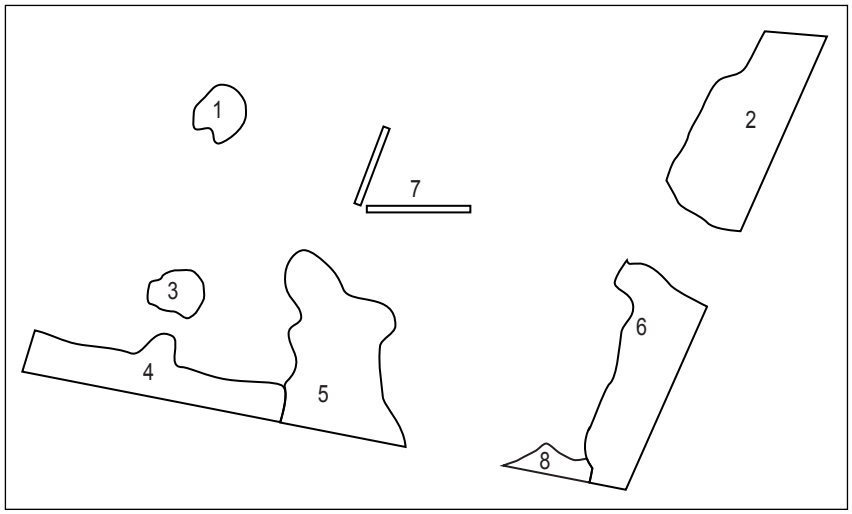


**Figure 1: Unchecked vegetation layer or overlay drawn from an aerial photograph or satellite image**

Figure 2 illustrates why field checking of the overlay or layer is essential, as the additional areas were not visible on the aerial photograph or satellite image.

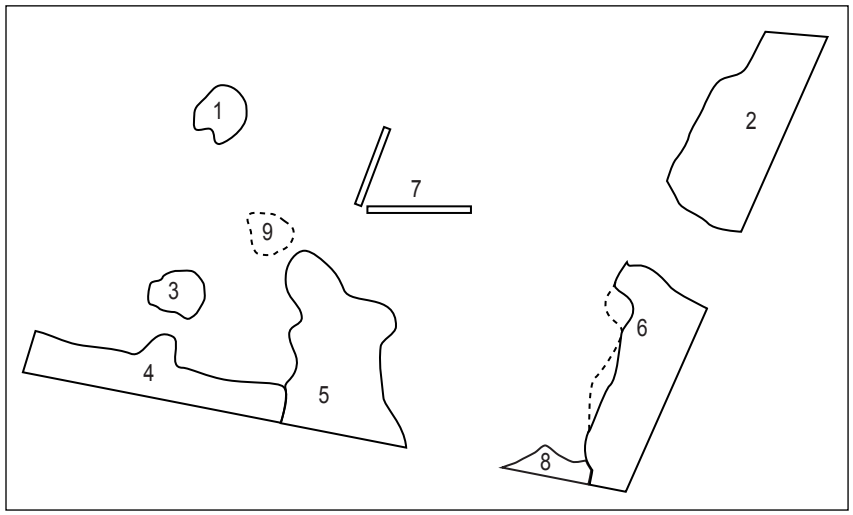


**Figure 2: The same first vegetation layer or overlay after field checking, showing additional areas (dotted)**

This checked layer or overlay and the related data provide a baseline or starting point from which further change is measured. The data for this example is shown in the top half of the recording table as shown tables 4 and 5.

The change in native vegetation area following the second monitoring activity for this example is recorded in the bottom half of tables 4 and 5 and shown in figure 3. Note that the recording sheet provides an ongoing record of each area of vegetation and each change in area while the layer or second overlay only shows the areas of change.

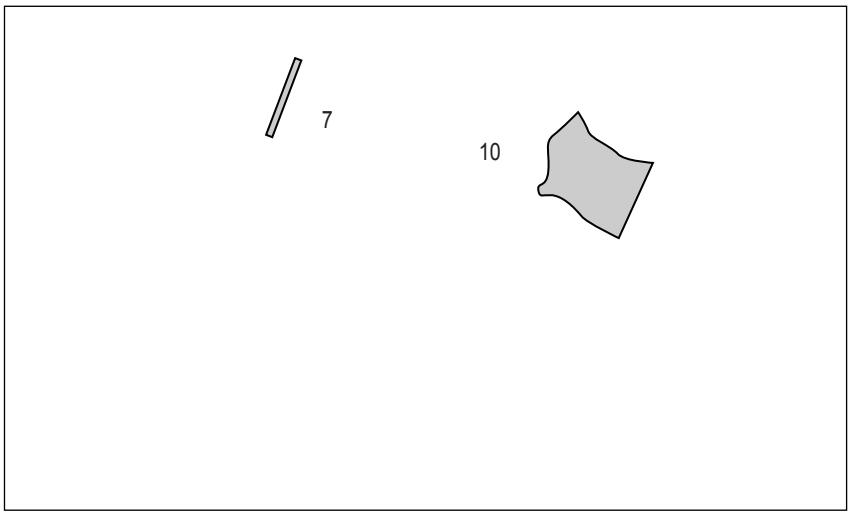


**Figure 3: Second vegetation layer showing change in area from first monitoring event**

Figure 4 shows the total and change in vegetation area when both layers or overlays are placed together.

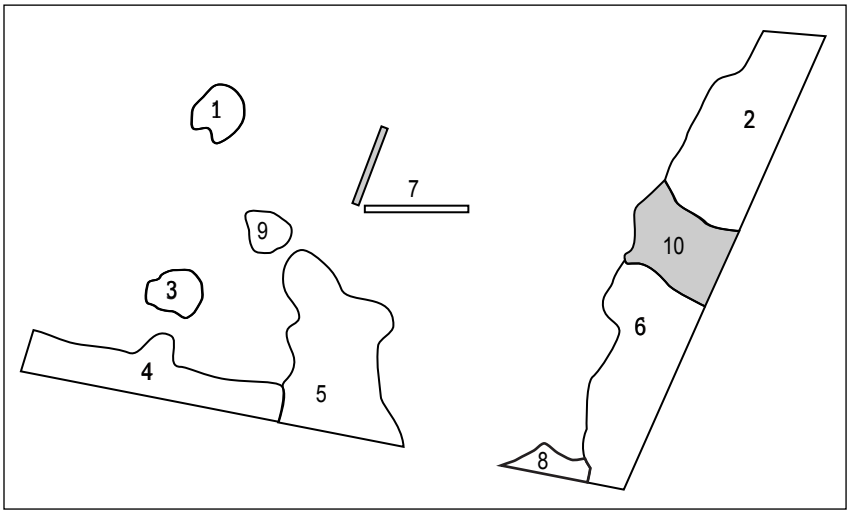


**Figure 4: Combined first and second vegetation layers showing change in area (shaded)**

The data from the tables 4 and 5 and figure 4 show that areas 1–6 and 8 have not changed in area between monitoring dates.

The inclusion of other layers of information (Figure 5) can provide a clearer understanding of what change has occurred, where it is on the property and how it relates to management activities and other events. The analysis of the data in tables 4 or 5 provides specific information on the total (in hectares) and relative (percentage) changes in areas that have occurred over the period between the monitoring events.

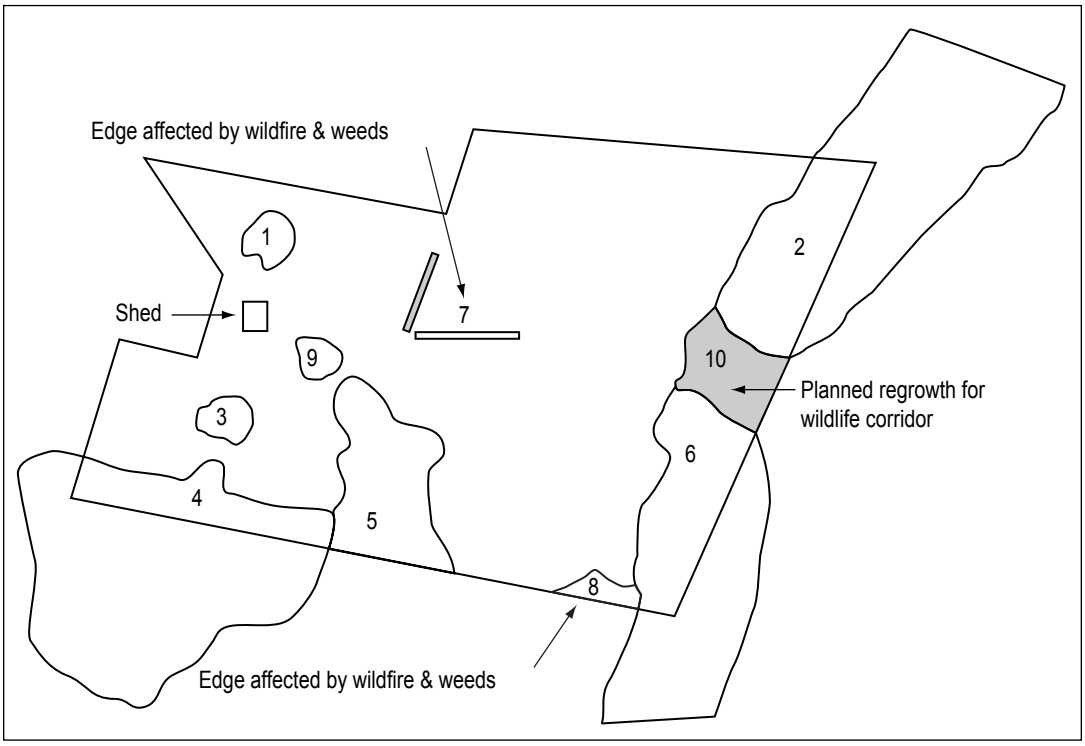


**Figure 5: Combined first and second vegetation layers also showing notes, property boundary, infrastructure and neighbouring vegetation layers**

Figure 5 represents at least three layers or overlays of information. They are:

- Property boundaries and other features
- Baseline areas of native vegetation identified at one date
- Areas of change in native vegetation area identified at a later date.

## *Metadata*

There are two aspects to recording monitoring information: the data you collect each time you monitor and the metadata associated with your monitoring data. Metadata is data that describes data or is "data about data". It describes the: who, what, when, where, why and how about a data set. Metadata is critical to preserving the usefulness of data over time. Metadata includes information about the set up, condition and maintenance of your monitoring bore/s and descriptive information about your dataset.

Descriptive information (Table 6) about your dataset should include:

- Short description of the contents of the dataset
- Name of the land manager or business responsible for the dataset
- Brief assessment of reliability of the information in the dataset
- Brief history of the source and processing steps used to produce the dataset
- Maintenance and update frequency of the dataset
- What location or area the data relates to

**Table 6: Typical data sheet for recording metadata that describes the data set**

| Key element | Metadata |
|---|---|
| Short description of the contents of the dataset | |
| Name of the land manager or business responsible for the dataset | |
| Brief assessment of reliability of the information in the dataset | |
| Brief history of the source and processing steps used to produce the dataset | |
| Maintenance and update frequency of the dataset | |
| Location or area does the data relates to | |

# What does your data mean?

How useful your monitoring data is will depend on factors such as:

- Why you have decided to monitor
- How it can inform your management decisions
- Your objectives for the management of natural resources on your property
- The value you place on your natural resources as part of your overall farm system
- The interest others may have in particular natural resources on your property.

The example shows ten sites of native vegetation. Sites 1–9 are those identified in preparing and field checking the first (or baseline) map of native vegetation area on the property. Important additional information about vegetation area is also shown adjacent to sites 2, 4 and 6 where vegetation occurs on neighbouring properties. Site 10 is a change in vegetation area that was identified from monitoring for change. In this scenario the change at site 10 was a result of planned revegetation by fencing to manage stock access between the two previously separate sites 2 and 6. Sites 7 and 8 have been noted to be badly affected by edge effects, may be in serious decline and may need to be recorded as a loss in native vegetation area on a subsequent monitoring occasion.

Large changes in vegetation area may mean that:

- Land use or management activities have affected vegetation
- Dieback has occurred
- Vegetation condition has been altered through property activities or climatic variables
- Regrowth is occurring
- Revegetation projects have added to the total property vegetation area.

Vegetation responds to climate variability. Many short-lived (ephemeral) plants will only be visible during certain phases of the drought/wet (El Niño/La Niña) cycle and many perennial plants may die during an extreme drought while others will thrive during wet phases. When interpreting any native vegetation area data, you should consider the influence of climate variability. Monitoring local rainfall and accessing long-term rainfall data (see 'Longpaddock' website <www.longpaddock.qld.gov.au>) will enable you assess this.

Comparing the native vegetation area with pasture, crop or other production records may provide an indication of how your management actions may have influenced any change in area. Other changes in the vegetation at a site may not affect the perimeter. However, there may be substantial changes within the vegetation boundaries that may be identified by monitoring other vegetation-related indicators. Monitoring these indicators, together with native vegetation area, will provide a thorough understanding of the vegetation on your property.

# What are some management options?

Monitoring native vegetation area will tell you whether you are achieving your target amount, type and layout of vegetation on your property. It provides a good visual and statistical indicator of how you are progressing. Some examples of how this information may be used are shown below.

From your knowledge of your district and with the aid of your baseline and subsequent monitoring data and overlays or layers you may plan to complete a habitat corridor as shown between sites 2 and 6 on the example property in figure 5. Monitoring native vegetation area will show how your activities such as fencing may have allowed natural regeneration and an increase in habitat. You can identify the existing area of vegetation and work out what is required to join the adjoining sites of vegetation. You will have an accurate assessment of the current boundaries and area as well as the location between the two adjoining patches of vegetation.

You may wish to remove other areas of vegetation showing signs of severe decline from edge effects (see 'Glossary'), such as sites 7 and 8 in figure 5 and allocate these areas to another use – for example, grazing. With your knowledge of the country and other sources of information, you can better assess the effect of such a decision on your existing or alternative uses for this land.

Early detection and documentation of native vegetation that is re-establishing in previously cleared areas may be useful if you are participating in any incentive schemes which support land managers to maintain, restore and manage native vegetation as part of their activities.

Your monitoring data and any other vegetation monitoring activities can be used to improve your fire and biodiversity (see 'Glossary') management planning. For site 7 in figure 5, for example, it may be clear from your historical records that any investment in maintaining this strip of vegetation is pointless, but rather greater biodiversity value would be obtained by considering fencing to manage stock access between sites 3 and 4, and sites 5 and 8 to eventually reconnect them.

# Other information sources

## Fact sheets

Queensland Department of Natural Resources and Water has several fact sheets relating to vegetation and mapping your property (<www.nrw.qld.gov.au/factsheets/groups.php?group=Vegetation> and <www.nrw.qld.gov.au/factsheets/groups.php?group=Mapping>). Fact sheet topics include:

- Guide to property mapping (L70)
- Choosing a property map (L71)
- Property mapping – sources of information (L72)
- Property mapping – adding information (L73)
- Property mapping – measuring distance and area (L74)
- Using topographic maps (L75)
- Property mapping – computer-based options (L76)
- SmartMaps – property sales, valuation, surveying and cadastral maps (L99)
- Regional ecosystems (V2).

## Websites

For more information on regional ecosystems see EPA's regional ecosystems introduction and status <www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems/introduction_and_status>. If you want to participate in regional biodiversity or vegetation management-related incentive programs you may also need to assess and monitor other vegetation indicators in addition to native vegetation area.

CSIRO Mathematical and Information Sciences provides information on Assessment of Change in Remnant Vegetation Area and Condition <www.cmis.csiro.au/rsm/research/remveg/vegassess.html>

EPA provides a report on 'Remnant vegetation in Queensland' < http://www.epa.qld.gov.au/publications?id=1209> and a 'Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland' <www.epa.qld.gov.au/publications?id=1418>.

# Glossary

**Baseline**

The initial data or information collected, against which subsequent monitoring data can be compared.

**Biodiversity**

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 defines biodiversity as: "... the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems" (AG 2001).

**Bioregions**

Queensland is divided into 13 bioregions <www.nrw.qld.gov.au/vegetation/bioregions.html > based on broad landscape patterns that reflect the major underlying geology, climate patterns and broad groupings of plants and animals (NR&M 2005).

**Edge effects**

Edge effects are the range of influences that occur as a result of the creation of an edge between disturbed and undisturbed vegetation in what was previously a continuous area of similar vegetation. This may be as a result of clearing, land use, management practices or extreme natural events. The size and shape of the

remaining vegetation has a major influence. These effects are physical increases in variation in air temperature, wind speeds and exposure to wind and lower relative humidity. These can be moderated by location factors of aspect, slope, history and vegetation type.

**Endangered vegetation**

The conservation status of each regional ecosystem is based on its current extent in a bioregion. Regional ecosystems are classified as 'endangered' if less than 10% of the pre-clearing extent remains (or 10–30% of the pre-clearing extent remains if the area of remnant vegetation is less than 10 000 ha) (NR&M 2005).

**Native vegetation**

Native vegetation is any vegetation that occurred in an area prior to European settlement and for regulatory purposes in Queensland is mapped as 'remnant' or 'woody non-remnant'.

**Non-remnant vegetation**

For regulatory purposes in Queensland any vegetation which does not fall into the 'remnant vegetation' category as per the 'remnant vegetation' definition is classified as 'non-remnant vegetation'.

**Not of concern vegetation**

The conservation status of each regional ecosystem is based on its current extent in a bioregion. Regional ecosystems are classified as 'not of concern' if more than 30% of the pre-clearing extent remains and the area of remnant vegetation is more than 10 000 ha (NR&M 2005).

**Of concern vegetation**

The conservation status of each regional ecosystem is based on its current extent in a bioregion. Regional ecosystems are classified as 'of concern' if 10–30% of the pre-clearing extent remains (or more than 30% of the pre-clearing extent remains if the area of remnant vegetation is less than 10 000 ha) (NR&M 2005).

**Projection (map)**

The way the geography of the Earth is taken from the globe and reassembled on a flat surface is called the map's projection. Another way of thinking of projection is that every point on the globe can be projected by a straight line onto a transparent form wrapped around the globe. The shape of the form and how the points are spread onto it determine the type of projection. Some common forms are cylinders, cones, ellipses and flat planes, giving rise to cylindrical, conic, elliptical and orthographic projections. There are many types of projection. Each distorts the spherical surface of the Earth in a different way and each has its practical advantages and disadvantages.

**Regional ecosystem classification**

The Queensland Government uses the regional ecosystem (RE) classification for mapping native vegetation. Regional ecosystems are organised into bioregions, which are subdivided into land zones and these in turn are based on the dominant vegetation. Information on regional ecosystems can be obtained from the regional ecosystem description database <www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems>

**Remnant vegetation**

A general definition is any remaining vegetation from an original area of vegetation prior to European settlement but importantly in Queensland for regulatory purposes, it has a number of more specific definitions. The definition depends on its context.

- 'Remnant vegetation', for an area of Queensland within a regional ecosystem map, means the vegetation mapped as being within remnant endangered regional ecosystems, remnant of concern regional ecosystems and remnant not of concern regional ecosystems shown on the map.
- 'Remnant vegetation', for an area of Queensland within a remnant map, means the vegetation mapped as remnant vegetation on the map.
- 'Remnant vegetation', for an area of Queensland for which there is no regional ecosystem map or remnant map, means the vegetation, part of which forms the predominant canopy of the vegetation:
    - Covering more than 50% of the undisturbed predominant canopy
    - Averaging more than 70% of the vegetation's undisturbed height
    - Composed of species characteristic of the vegetation's undisturbed predominant canopy (AG 2004).

**Time series**

A time series is a set of data collected sequentially, usually at fixed intervals of time.

**Woody non-remnant vegetation**

Woody non-remnant vegetation describes all woody vegetation that fails to meet the structural and/or floristic characteristics of remnant vegetation. It may include regrowth, heavily thinned or logged and significantly disturbed vegetation. Non-remnant vegetation may retain significant biodiversity values.

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