



Pastoral Remote Sensing frequently asked questions

About Pastoral Remote Sensing (PRD)

How do I know if my pastoral lease is covered by PRD?

Pastoral Remote Sensing covers all pastoral leases in Western Australia. The list is provided as you enter the app. If your lease is not covered, advise the Department of Primary Industries and Regional Development by enquiries@dpird.wa.gov.au.

About PRS satellite imagery

What are the base map options?

The base map is either Landgate aerial photo mosaic or Geoscience Australia 1:250,000 Topographic Map. They contain historical data that was obtained at various dates. These base maps are for location reference purposes only and should not be relied on for current information.

What effect does cloud cover have on satellite images?

Clouds obscure a satellite's ability to get ground images however, there are ways around this. The method used by PRS is to compile daily cloud-free pixels into a single weekly 'cloud minimised' composite image.

What is the lower resolution imagery on PRS?

This is imagery derived from MODIS 'Terra' and MODIS 'Aqua' satellites, which pass over Western Australia each day. MODIS imagery has a resolution of 250m, i.e., each pixel is 250m x 250m or 6.25ha. MODIS imagery is processed each Wednesday.

What is the high-resolution imagery on PRS?

This is imagery derived from European Space Agency Sentinel 2A and 2B satellites. Sentinel 2A and 2B each pass over the same point every 10 days but one is only 2 or 3 days behind the other, so on average, you should get a picture every 5 days, depending on cloud conditions.

Sentinel 2 imagery has a resolution of 10 m, that is, each pixel is 10m x 10m or 0.01 ha. Sentinel 2 imagery is processed every 14 to 16 days to generate a 3-pass cloud minimised composite.

What are the advantages and disadvantages of the two types of satellite data?

The coarse resolution MODIS satellites pass over twice daily, providing many opportunities to capture cloud-free pixels in a week. The weekly composite images from MODIS are usually minimally affected by cloud however, the pixel resolution is coarse at

250 m x 250 m. These factors make MODIS data more suitable for modelling and monitoring plant growth because of less cloud affected coverage each week.

The high-resolution Sentinel satellites only pass over the same location every 5 days, which means it is more difficult to collect cloud-free pixels and create a composite image that does not span too large a time frame. To overcome this, Landgate uses 3 passes to create a half monthly composite. Because some pixels can be cloud-affected in all 3 passes, there are more gaps (cloud affected pixels) in Sentinel 2 data and you will see the underlying base map through these gaps. Sentinel 2 pixel shows much more detail of the landscape and its vegetation, with a resolution of 10 m x 10 m.

When I zoom in, some of the land systems don't align with the map borders. Why is that?

The land systems were originally mapped at a coarse scale. The land system boundaries are most relevant at whole of pastoral lease scale.

In the total green biomass (TGM) and normalised difference vegetation index (NDVI) land system maps, some of the smaller land system areas contain no data. Why is this?

The underlying data used to calculate and graph values such as total green biomass and rainfall is in a gridded format as large as 5 km x 5 km, including satellite data at 250 m x 250 m. If a land system on your station does not contain sufficient data grid cells or satellite pixels, it is left out of the calculation.

Using PRS

Can I download the data/export to Excel?

No.

Can I add my own rainfall data?

No, we use data from the Bureau of Meteorology (BOM).

Can I change the graph's year ranges?

Yes, you can turn on or off any year back to 2004. You can also display graphs using a calendar year (January to December) or financial year (July to June). The calendar year is more suited to southern areas and the financial year is more suited to northern areas, in line with their normal seasonal patterns.

Can I download a report of the information for my station?

Yes. Go to the Pastoral Remote Sensing [station reports page](#), select your station, and download the PDF summary report. To save bandwidth, only a selection of the full PRS information is included.

Interpreting images and data

Can I view or interrogate individual pixel values?

No. Pixel values are summarised in the charting tools located on the left-hand-side of the map.

What is NDVI?

Normalised difference vegetation index, or NDVI, is an optical sensor derived index of greenness, in this case, seen by the satellite. It is a unitless index. It is a ratio between the values of near infrared light (NIR) and red light (R) received by the satellite. A healthy, actively growing plant reflects more NIR and less R, relative to a stressed plant, which will reflect less NIR and more R. The formula is: $(NIR - R) / (NIR + R)$. Essentially, NDVI is an indication of the amount of green vegetation.

Does a higher NDVI value indicate coverage of green vegetation in a paddock?

Yes. The higher the NDVI value, the more ground that is covered by green vegetation. In Pastoral Remote Sensing, an NDVI of ~120 or below suggests there is no green vegetation. An NDVI of ~180 or above suggests the ground is heavily covered in green vegetation.

Does NDVI show digestibility of vegetation?

No. Digestibility has to be measured from samples cut from the paddock. However, higher resolution satellite images of NDVI can show areas being preferentially grazed. Total green biomass can be estimated from NDVI if vegetation cuts are used to calibrate the satellite pixels.

How are NDVI and total green biomass related?

NDVI values can be used to estimate total green biomass, if biomass cuts have been taken and calibrated against located NDVIs for different vegetation types and regions.

The NDVI value peaks when the total green biomass reaches about 2,500 kg/ha.

Generally, the trends in total green biomass and the comparison of the growth curves from year to year are more important than the absolute values.

What is the best way to use weekly NDVI data?

A revealing use of weekly NDVI data is graphing it for areas with a similar pasture type so you can compare patterns of growth and decline. Graph a group of similar land systems in a single year to see which ones are greener and which are recovering better after grazing. NDVI data is also good for comparing a single land system over multiple years, hence identifying comparable seasons.

What is fractional cover?

Fractional cover is a percentage of each pixel classed into green vegetation, dead vegetation and bare ground, expressed as percentages. Fractional cover is used extensively for monitoring rangeland condition. NDVI on the other hand, is an average of the greenness of each pixel and is calculated using the red and near infrared parts of the light spectrum.

What is total green biomass (TGB) and how is it estimated?

Total green biomass is an estimate of how much 'green' material (in kg dry matter/hectare) is present in each land system. It is based on a calibrated relationship (model) between NDVI and physical vegetation sampling on the ground. These measurements were done on Liveringa Station in 2012 and 2013 (Donald et al, 2015). The correlation between NDVI and the ground-sampled total green biomass had a coefficient of determination (R²) of 0.65 and a root mean squared error (RMSE) of +/- 825 kg DM/ha.

This means that 65% of the ground-measured total green biomass on Liveringa in 2012 and 2013 is explained by the NDVI number for each sample location, on the day of sampling. The error of +/- 825 kg DM/ha is mostly at total green biomass levels greater than 1,000 kg DM/ha. That is, the estimate of TGB is more accurate below 1,000 kg DM/ha.

Why do my total green biomass values seem different from what I am observing?

Generally, the trends in total green biomass and the comparison of the growth curves from year to year are more important than the absolute values. However, these factors influence the satellite-derived data:

- Total green biomass is averaged for a land system but can vary within that land system. You can see the variation by toggling the TGB imagery icon in either the Weekly Data drop-list or the Hi-resolution Imagery drop list.
- Dead vegetation may mask the underlying green pasture, and the satellite cannot see the green.
- Different species are growing in the paddock than those used to develop the total green biomass model and some species may be preferentially grazed.
- The model may not have enough data about measured green biomass on your lease.
- The conditions were too cloudy during the week and new growth hasn't yet been detected by the satellite.

Why doesn't the total green biomass (TGB) index go higher than 2,500 kg/ha?

A typical benchmark is to have a minimum of 3,000 kg/ha TGB at haying off. The NDVI number (and hence the TGB) stops increasing at approximately 2,500 kg DM/ha. Once the ground is fully covered by green biomass, it's difficult to measure TGB levels above this. You can see the estimated TGB value in the land system report, or in the land system information window at the bottom-right of the screen when you move the mouse over the land system.

Does total green biomass only detect green total green biomass?

Yes, total green biomass is estimated from the measure of greenness via the NDVI.

Does Pastoral Remote Sensing provide a total green biomass for the whole property?

Yes, on the left-hand-side of the map you can select Whole of Property summary and charting, averaged across your property. You can also select summary and charting for each land system, averaged across your property. In this case, when you click on the chart icon for land system X and there are two areas of land system X on your property, one in the north doing well and the other in the south is not doing as, you will get charts based on the average of the two areas. The same averaged information appears in the information window in the bottom right of the screen when you hover the mouse over a land system. You will notice all areas of that land system highlight.

What is cumulative total dry matter?

Cumulative total dry matter is an estimate of the gross primary production, or the total amount of vegetation (in kg DM/ha) that was grown over the growing season. It is a

number accumulated from the beginning to the end of the growing season from weekly vegetation growth rate (kg/ha/day). That is: Week 1 vegetation growth rate x 7 + Week 2 vegetation growth rate x 7 + Week 3 vegetation growth rate x 7, and so on. It is reported in weekly cumulative steps as year to date in Pastoral Remote Sensing.

References

Donald, G, Stovold, R, Santich, N, Lamb, D and Mundava, C 2015, 'Rangewatch: An NDVI based method of estimating forage biomass in northern Australia. A case study in the western Kimberly region of Western Australia', in *Proceedings of the Australian Rangelands Society Biennial Conference*, 2015.

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