

The power of mapping – an essential tool

With rapid advances in technology over the last few decades, mapping has become a useful tool for land managers.



Purpose of mapping

Property maps provide landholders with a visual representation of a property's natural assets such as soils or land systems, rivers and creeks, vegetation types and landforms. It can also identify infrastructure and paddocks, helping livestock producers with grazing management and infrastructure planning and development. Seeing the natural assets and the layout of infrastructure on a property can aid planning of livestock carrying capacity, waterpoints and other business needs.

The use of good mapping can contribute to pasture management, through planning grazing days by paddock, and by land system in each paddock.

Infrastructure planning can include fence distance for labour and materials required. Water infrastructure can include planning locations using grazing cycles, pipe length and other materials needed.

Maps are a useful tool to help prepare property plans and for aligned activities such as annual grazing plans, property developments, track grading layout and hours needed. As well as completing Farm Business Resilience plans and are a great accompanying document for incentives submissions or grant proposals.

As maps are tailored to each individual landholder's needs, there is a lot of consultation between Desert Channels Queensland (DCQ) staff and landholders to achieve the desired product, via email or in person.

The common starting point are the following maps:

- A base map of satellite imagery with cadastral or property, Lot on Plan boundaries,
- Land types (soils) and Regional Ecosystems (REs), and
- Infrastructure that we can pick up from imagery or landholder information including fence lines, water points, house, yards etc.

DCQ also provides grazing circles (~2 km) around water points to better assist livestock producers with grazing and land management.

This program is jointly funded through the Australian Government's Future Drought Fund and the Queensland Government's Drought and Climate Adaptation Program.

Mapping products

DCQ can provide landholders with digital and/or printed versions of their map, A3 (useful for reports and easy copying) and A0 wall maps.

Digital files can be shared as raw data or maps products, for those who prefer to continue editing the information in their own software or on mobile devices.

The more detail provided by the landholder the more can be on maps. DCQ can provide on farm assistance for some data capture/ mapping to help get detail of items landholders want on their maps.

What are some of the uses?

The following are examples of how mapping has been applied to build drought resilience.

- **Grazing management:** Provides spatial context and base layers to spread the grazing pressures to maintain pastures and implement wet season spelling.
- **Water management:** A bird's eye view to help plan the spatial arrangement of water points. Spreading grazing pressure through placement of strategically placed water points can significantly boost productivity and reduce livestock stress.
- **Long-term biosecurity strategies:** Used to plan weed management activities or placement of quarantine paddocks.
- **Emergency management response:** Sharing location of critical infrastructure, creek crossings for emergency exits and critical assets significantly improves landholders' ability to deal with wildfires. In remote areas, data can be transferred between physical mobile devices without the need for connectivity. Outside of emergency response they also help implement planning fire mitigation activities with neighbours.
- **Climate impact:** Illustrate how climate variability affects different parts of the land, aiding in the development of strategies to mitigate risks like droughts or floods.
- **Business planning:** Helps to understand natural assets on property and layout of infrastructure, identifying business needs. Essential component of documenting location and condition of assets such as fences, tanks, troughs, dams, and key management areas such as weed, quarantine, fire hazard reduction or special management areas (particularly for organics). Maps also provide a particularly useful discussion point for discussions with bank managers, Livestock Production Assurance and other forms of business audits.
- **Grant applications:** Visual tool to help describe current and proposed property infrastructure.
- **Property visits:** Helpful for contactors or new staff on property when working in isolation.
- **Infrastructure planning:** Understanding where to plan new fences or other infrastructure. Detailed maps assist in planning and laying out infrastructure like fencing and access roads, ensuring they're placed in optimal locations.

"We are in the midst of starting the process of getting our country certified Organic, the maps created by your team at DCQ were very helpful with this application for segregating areas that cannot be certified with the exact amount of country and land type easily shown and described"

Lessons learned

Best practice

Too many land managers buy software and don't get the time to sit in the office and get to the finish line. DCQ has an experienced team with keen eyes and dedicated time (through this project) to get a rough draft ready for comment. We specialise in large scale (in the tens of thousands of hectares) property mapping. We use a common symbol and style of mapping shared amongst the other rangeland natural resource management groups. We maintain industry best practice by participating in various Communities of Practice and supplement this with our own research.

One of DCQ's specialities is the efficient capture and analysis of ultra-high-density drone orthomosaics. These are ideal for documenting changes over time when implementing projects.

The efficient capture and analysis of data has been developed over many years while trying to estimate how much chemical would be needed to eradicate prickly acacia. It combines remote sensing, field observation, mobile apps, drone data, machine learning and complex calculator data to deliver some key products:

- Baseline maps: spatially aware pdfs suitable for software such as *Avenza*, A3 to wall size poster prints, offline basemaps in data collection software such as *Fulcrum* or *QField*.
- Survey plan documenting infrastructure and field observations. This includes weed density observations if available, paddock area, fence length, number of watering points, land management areas (within paddocks) etc.
- Investment plan (chemical amounts) includes a draft budget for each polygon / paddock. This may include a summary of the total number of weed plants (particularly for prickly acacia).
- Monitoring Plan with monitoring sites and project areas marked.
- Completed works (A3) project areas database polygons. These are what get submitted spatially and as pdfs for reporting.

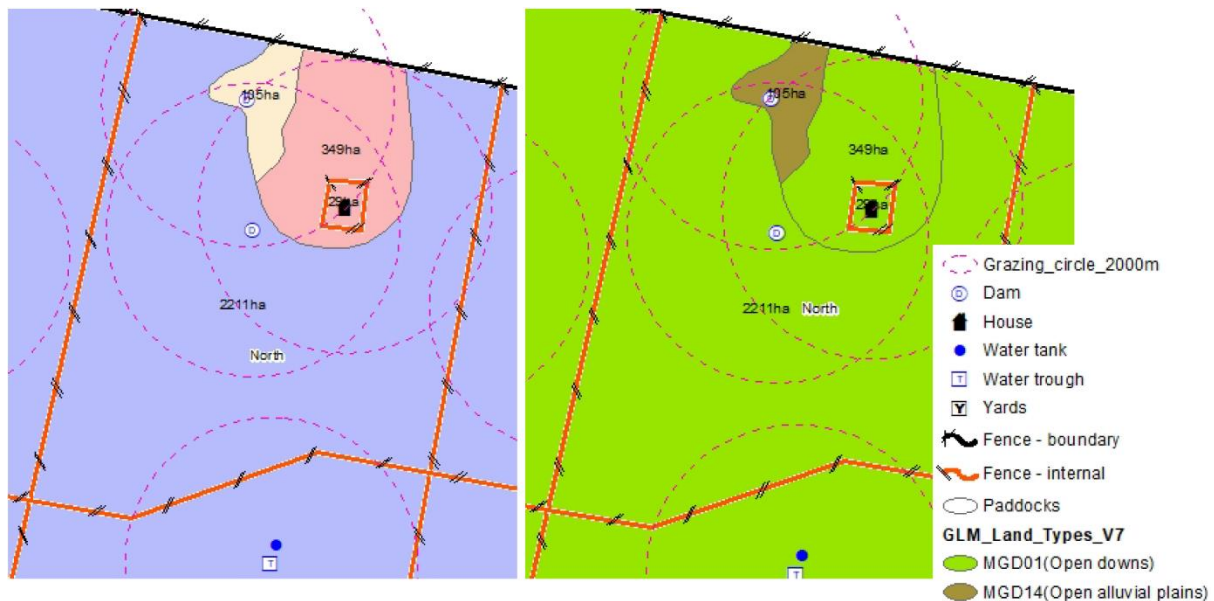
Scalability and adaptability

Mapping strategies can be easily scaled and are readily adopted in regions with better mobile coverage. This delivery model has been designed to suit the vast, disconnected central west Queensland Rangelands. A3 maps produced for reports and handy physical copies. Larger wall posters used for more detailed property planning.

Vegetation based regional ecosystems (RE) and grazing land management (GLM) type mapping have a significant body of supplementary information available from various government agencies. Long-term forage budgeting, presence of threatened species and ideal fire regimes are available from auto generated maps online, however they may be missing local infrastructure and information needed to make them relevant to the landholder.

Grazing distribution according to land type and livestock preference can be managed to a certain extent through paddock design such as fencing and water point positioning. In extensive grazing systems the distance livestock travel to water effects pasture utilisation and can result in a grazing gradient. Overgrazing is likely to occur closer to watering points, while pasture remains underutilised in areas further from water. The following draft maps show 2 km '**grazing circles**', from water infrastructure in a paddock. While cattle can walk up to 10 km from water, around 80% of grazing occurs within 2 km of water.

The extract from a sample property map below (RE on left, GLM on right) shows around a third of the paddock (southern end) is likely to be underutilised. Livestock are likely to congregate in the northern half where there are more watering points.



Outcomes

The fundamental outcomes of having good property maps are:

- improved decision-making
- increased confidence
- improved safety
- improved ability to plan
- an easier visual tool for landowner, bank manager, property staff or contractors.

Wrap up

Landholders are often time poor and managing vast tracts of rangeland. Natural resource management organisations such as DCQ can take the pain out of learning a new technology and jump start the mapping process by digitising the bulk of property data remotely. DCQ can use our experience to guide landholders through identifying key features they may need and deliver a working, bespoke product ready for use.

Where funding is available, DCQ will continue to support landholders by drafting their property maps. For those who would like to edit and update their own property maps, there are multiple ways to achieve this:

1. *Maps and apps* workshop for land management (using mobile devices)
2. Data supply and advanced tutoring is available for those interested in implementing their own Geographic Information System (GIS). There are several free and paid software applications that make this possible, including Queensland Globe (<https://qldglobe.information.qld.gov.au/>). As a general principle all data on the maps is transferable to the preferred platform.

This document prepared by Desert Channels Queensland, as part of the *Maps and apps for grazing land management* series, October 2024. Visit DCQ.org.au for more information.