

fact sheet

Land Soils and Agriculture



Salinity and Sustainable Land Management

Case Study No 1 – Mount Pleasant

Landholder	Jamie Gordon and Garlonn Moulin
Location	North of Collinsville
Rainfall	660 mm
Property size	13,500 ha
Enterprises	Cattle on agistment

The headwaters of the Bogie River may seem an unlikely place for dryland salinity to develop. But small and isolated patches of salinity do occur in these landscapes. The good news is that sensitive management of pastures and the retention of tree cover can assist in the recovery of salt-affected sites, and help to prevent future outbreaks.

Some of these salty patches are on 'Mt Pleasant', a 13,500 ha grazing property run by Jamie Gordon and his wife Garlonn.

"Our property is right on top of the range, in the headwaters of the Bogie River, which runs down into the Burdekin," said, Jamie.

"Most of the cattle on the property are breeders run on agistment, with the clients taking the weaners away. We typically run around about 2100 to 2400 large stock units, long term, across the property."

"When my family first came here in 1917, there were probably just two fences and four sites with natural water. The property's second generation fenced and pretty much controlled the movement of stock, and implemented more water points. Dams started to go down too."

Jamie has been managing the property since 1995. In the past few years, Jamie has worked hard to change the way the cattle work in the landscape, yet again.

"We're going for more rotational grazing, spelling, and more resting country. And we're much more flexible in our stock numbers. We have a pretty strong picture of what we want the grass to look like at the end of the dry season, so we can get the maximum response from whatever wet season we get. We manage our pastures to ensure that there is lots of ground cover," he said. "We are now trying to match the climate we operate in."



Jamie is the third generation of his family to manage Mount Pleasant. His focus has evolved from livestock production to the management of the ecosystem that produces grass and water.

Bores put down by Jamie have allowed him to spread grazing pressure more evenly. "We don't run a lot more stock over the property as a whole, they just don't concentrate as much," said Jamie.

Jamie's increasing focus on pasture management has led to changes in his enterprise. "We used to set our management to a particular sort of market.

We had to produce a particular class of animal and bring it through in stages to specifications. It was a fairly rigid system that you could manipulate, but tended not to," he said.

One of the main problems with the previous system was that it didn't suit the variable rainfall patterns. "If you hit a dry year, you'd tend to hang onto stock and just hope the rain would come," Jamie said. His new agistment operation is much more flexible and enables him to carry livestock at a rate that better suits climate and pasture conditions. Jamie believes that it reduces the risk of overgrazing and damaging his pastures' future growth potential.



Australian Government



Queensland Government

Monitoring pasture growth

Jamie has now divided about 6,000 ha of the property into 40 or 50 paddocks. He ultimately hopes to spit the property into about 76 paddocks.

"With rotational grazing, our approach is to match the stocking rate to the carrying capacity - the amount of available grass. We then match the graze period to the growth rate of the grass," said Jamie.

He also monitors the condition of the pastures by assessing grass cover at the end of the growing season. "We cover a fair bit of country at the end of the growing season to do the assessment. We move the time we do the assessment to fit in with the rainfall, but it's always before winter," he said.

Jamie uses two tools to assess the pasture condition. One approach uses dry matter yield per hectare, and the other calculates the number of stock days per hectare.

"I really love to see about 2,500 to 3,000 kilos per hectare dry matter at the end of the growing season. If you can pull an average of that, you're home and hosed."

Being cautious with fire

Jamie rarely uses fire to manage pastures, and can't see himself doing so for some time. He says that it's critical to allow time for vegetation to fully recover after fire in order to protect soils and maintain healthy, diverse pastures.



One of the small salinity outbreaks at Mount Pleasant located at the bottom of a gentle slope next to a watercourse. The sandy alluvial soils here have bare patches, and parts of the watercourse are eroding. The scalds are slowly recovering after the introduction of rotational grazing. The site is recovering as Chloris and some perennial grasses slowly return.

Experience has shown that it is easy to misjudge fire. "You burn an area during the dry season with the expectation that pastures will recover during the wet season." Seasonal conditions may mean that more land burns than is intended, or that recovery during a poor wet season is less than expected. Both situations can lead to stock grazing paddocks before pastures have sufficient time to recover. Some areas are then overgrazed, exposing soils to erosion or hard-setting. This risks setting up a cycle that that continues the decline in land condition.

Localised salinity outbreaks

The property has a few salty sites, with patches of bare ground surrounded by poor quality annual grasses. At some of these sites, the soil has been dug away by stock looking for salt, and some bare areas are eroded.

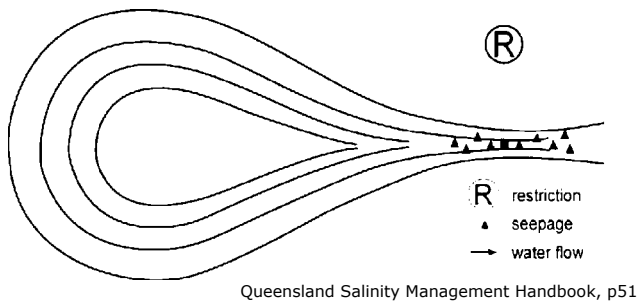
One of the larger of the small salty patches on Mt Pleasant is located on a drainage line, just upslope of a point where higher ground either side of the creek creates a 'bottleneck' in the small catchment (see below). Jamie recalls that the site started to change after his family cleared the upper and mid slope areas, in about 1973 (see aerial view page 4).

"My guess is that this was probably just another salty creek, before any interference, and once we did the clearing, the salt rose to the surface," Jamie said. "Salt patches became evident soon after the clearing. But it was not until the 1980s or 90's that the soil started to move and the watercourse became a lot deeper."

"The cattle always stopped on this part of the paddock. We never got enough grass cover on it to hold it," said Jamie. "Back when the paddock was set-stocked, this patch hardly grew grass. Cattle just lived here, and kept the grass very short. Since we've rotationally grazed it, the grasses have started to recruit back in."

Local species of Chloris (a native grass) are evident. Jamie has noticed that it is not good quality feed, but it provides an environment for other species of grass to establish.

Other annual grasses at the site are now beginning to cover up the bare ground. Perennial grasses such as Rhodes grass and Buffel grass are also starting to establish.



This diagram shows how a restriction to the outflow of groundwater from a catchment restriction can cause salinity outbreaks upstream.

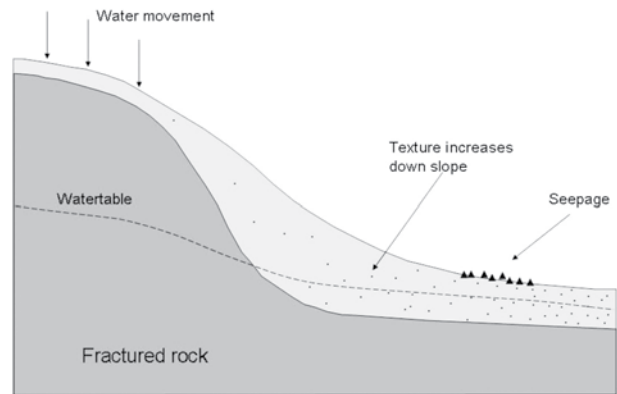
Why salinity has developed

The landscape conditions in this area mean that it is naturally at risk of developing salinity. With changes in management, such as clearing, less rainfall is used by plants and more infiltrates into the soil and weathered rock below. Not all of the increased volume of water trying to drain out of the small sub-catchment can do so, because of the catchment constriction or 'bottleneck'.

Water backing-up behind the constriction caused a shallow water table to form. Salt mobilised by the water table were then concentrated by evaporation. In some places, salt has accumulated to the point where it has killed the pasture and contributed to erosion of the naturally erodible soils.

Salinity where slopes and soil textures change

A second paddock on Mount Pleasant shows signs of salinity despite the rising country immediately beyond supporting a good cover of trees.



This second diagram shows how the restriction of water flow at a change of slope & soil texture can contribute to the rise of water tables and salinity outbreaks.

Cattle can be attracted to salty spots. They lick at the salt, and may eat the soil and the nearby grass. Erosion can then occur in these bare and disturbed areas where the overland flow is concentrated.

Identifying and investigating salinity

Salinity can often be identified by visual indicators, such as soil condition, types of vegetation present and landscape position (see next page). To confirm the presence of salinity it may also be necessary to conduct other tests, including the construction of groundwater observation bores or conducting tests of soil and/or water salinity.

The figure below shows the results of salt load measurements using a portable ground conductivity meter (EM31). It can highlight the location and levels of salt in the landscape. In the example (see next page) the higher salt readings (red and orange sections of line) were located along the drainage line and surrounding lower slopes and corresponded with scalded areas.



This salinity outbreak is located where there is a change in topographic gradient and soil texture from the freely changing soils on the ridges, to the heavier textured soils on the lower slopes and creek flats. While the site itself has been cleared, the slopes above this point are well timbered

Salinity at this spot seems to occur naturally because of the change in soil texture from the freely draining soils on the ridge, to the heavier textured soils on the lower slopes and creek flats. There is also an effect because of the break-of-slope. The water slows down and infiltrates to depth because of the change in slope and soil texture. Shallow water tables form over time as this water accumulates.



This figure shows areas with high salt levels (red parts of the lines) in the drainage line associated with scalding. The coincidence of bare ground with higher soils salinity levels suggests that there may be other areas of salinity nearby (e.g. below the dam, on the western side of the railway line).

A small problem on the mend

Of the 13,500 ha at Mount Pleasant, there may be 10 ha or so of that are affected by salinity. Because of this salinity needs to be managed in the context of all of Jamie's objectives and the natural resource challenges he faces on the property. It is an important concern, but is not the most significant issue he faces.

Jamie's pasture and stock management helps to maintain or improve productivity and will also assist with the rehabilitation of salty patches.

Key Points

- Some parts of Mt Pleasant are predisposed to develop dryland salinity, reflecting the level of salt storage in the landscape, and natural constraints on water drainage due to topography, changes in soil texture and changes in slope.
- The salinity hazard has been activated in places by clearing. This has increased the amount of water moving through parts of the landscape.
- Rotational grazing and wet season spelling has allowed annual grasses and some pioneer perennial grasses to re-establish in salt-affected areas.
- These practices also contribute to the build up of perennial grass cover across the landscape, which reduces groundwater recharge and the potential for further outbreaks of salinity.

Salinity indicators

Rotational grazing encourages perennial grasses to establish and recruit and helps to reduce groundwater recharge on the slopes above salty patches. By continuing with this type of management, Jamie is likely to continue to see salty sites recover.

Jamie's view is that the threat of salinity in the Burdekin Dry Tropics reflects his own experiences. He believes that the threat is of a much different scale to some other regions. "I don't think it's as much of a problem here as it is in some of the other catchments in Australia. Salinity in the Burdekin region is probably more a case of don't be scared of it, just be more aware of it."

Salinity indicators

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| Soil indicators | <ul style="list-style-type: none"> • Soil is bare or 'scalded' and prone to erosion; • Soil is permanently damp or waterlogged or remains damp well into the dry season; • White crusts or salt crystals form on the soil surface when it becomes dry or the soil surface becomes 'fluffy'; • Gleying (bluish-grey sticky clay) is present, carbonate nodules, or iron and manganese concretions or staining • Livestock preferentially graze in such areas, sometimes disturbing the soil |
| Vegetation indicators | <ul style="list-style-type: none"> • Failure of salt-sensitive pasture and crop species to germinate or thrive, reduced production; • Change in pasture composition, with known salt-tolerant species increasingly abundant (e.g. salt couch, button grass); • Decline and death of older trees, sometimes while younger trees survive. |
| Landscape indicators | <ul style="list-style-type: none"> • Reduced pasture, damp ground and/or scalding; • upstream of areas where surface water and groundwater flow from a small catchment area is constricted; • along the break of slope between mid and lower slope areas or between foothills and floodplains; • in low-lying areas and along drainage lines. |

The BDTNRM Dryland Salinity Project was funded by the Australian and Queensland Government as part of the National Action Plan for Salinity and Water Quality. The final report is available at BDTNRMs website or contact BDTNRM for further information.

