

Regenerative Agriculture Program, combating erosion caused by extreme weather events case study: Yates, Pinkawillinie

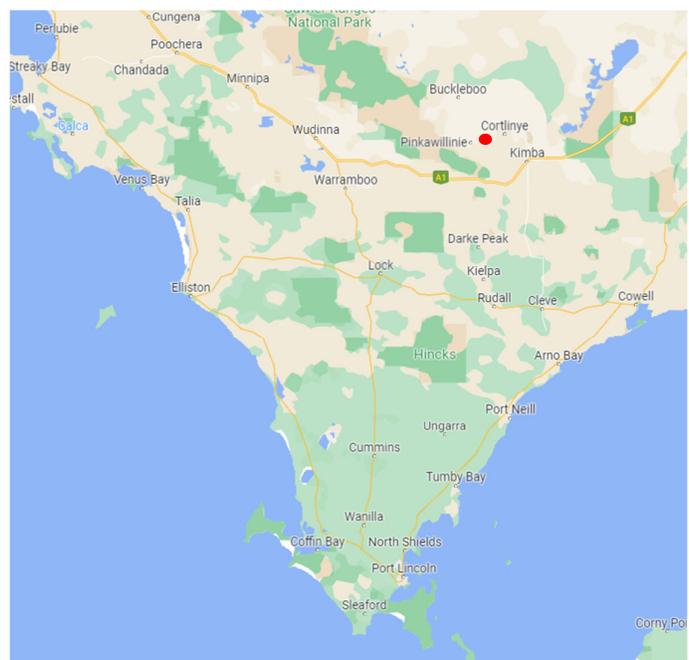


Introduction

Lachlan (Locky) Yates and his father Robert farm in the Pinkawillinie area between Kimba, Kyancutta, and Buckleboo. They run a cropping enterprise with sheep, and their typical rotation includes wheat, barley then a legume which could either be a medic, pea or lupin depending on the soil type in each paddock.

The soil types across their properties vary, with a large proportion being dune swale with clay at depth and areas of heavy red loams. The landscape tends to be gently sloping sand over clay dunes which - in some cases - can act as recharge areas for lagoons and seeps.

Locky's average annual rainfall is 302mm and average growing season rainfall is 211mm.



Location of the Yates farm in the Pinkawillinie district.

The big wet & aftermath

An extreme weather event in late January 2022 brought with it up to 300mm of rain over a 24-hour period causing flooding across large areas of the landscape, resulting in erosion of sandy topsoils. The flow of this water through the landscape also resulted in the deposition of large amounts of wash sand over the previous topsoil (Figure 1, 2 and 3), and in some cases the formation of gutters through paddocks and large pools of water at low points in the landscape. The wash sand in some areas was as deep as 40cm with very little organic matter in this sandy material.

Locky compared this event to a similar but not as severe event in 1983.

“We had a lot of rain back in 1983, not as much as 2022, but back then everyone was fallow farming and everything was bare and we still saw runoff and lagoons form back then. So yes, I think our farming systems today had a very positive outcome with limiting run off and erosion from a large area. The outcomes could have been worse if we were working our paddocks, and the stubble wasn’t there to protect them.”

The extreme weather event caused the formation of several lagoons and washouts. One of the larger lagoons of approximately 5ha formed on what had previously been productive cropping land. This lagoon was visible in the landscape until early 2023.



Figure 1. The force of the flood waters breaking through a tree line and fence on the Yates's property. Photo: Daniella Yates.



Figure 2. It can be seen just how much wash sand was deposited in some areas and the depth to the originally fertile topsoil. Photo: Brett Masters



Figure 3. The foreground shows large deposits of topsoil/wash sand in low lying areas, in the background you can see a large lagoon. Photo: Brett Masters

Making a plan

Once the skies had cleared and the waters started to recede, it was time to begin assessing the damage across the property. When asked what he did first in the recovery process, Locky said: "I cried, but then thought, hang on this is going to be a good positive thing for us, we have got moisture and lots of it."

With his father Robert, they began the jobs they were able to accomplish with the resources they had on hand.

When asked if they followed a plan or triaged recovery jobs, Locky spoke about it being a more mental process for him rather than taking pen to paper with most of the plan in his head. Debris removal was a very large part of the clean up as there had been a lot of trees and fences washed into paddocks, and these had to be removed before soil remediation could start.

Locky was also able to access support through the Eyre Peninsula Landscape Board 'one on one site visits' initiative as part of the Regenerative Agricultural Program funded by the National Landcare Program. This gave him access to personalised and timely soils advice, and soil testing to establish baseline measurements of the affected areas. The information was able to give insights into what practices might need to be undertaken to get the areas producing a crop.

Locky's report gave the following insight: *On the deposition site, the more fertile historical topsoil is buried some 13cm below the 'new' surface sand - suspected to have low inherent fertility due to low organic carbon. The remainder of the paddock, whist unaffected by erosion/deposition also has evidence of hard setting subsurface layers.* From these recommendations, the Yates' began to use a ripper implement as a method to incorporate the wash sand into the historic topsoil, but also to ensure the paddock was trafficable.

Recovery and remediation

Advances in farming practices have resulted in farmers having the ability to sustain more groundcover after harvest, thereby providing improved protection to the soil from potential wind and water erosion. This was particularly highlighted on the Yates property with their use of no-till methods and knife point seeding equipment, so even though the stubble was grazed before the extreme weather event, there were still significant amounts of groundcover in many areas to protect the soils where the flooding was not extreme.

When asked if he believed if his farming practices helped to mitigate the erosion, Locky was very adamant in saying: "The 40 acre paddock nearly held its ground with the stubble retained from the last season, even with the water going through, so absolutely the stubble retention definitely had a positive effect.

"The first job was to pull all of the fences out of the paddock, second job was to pull all of the trees and stumps out of the paddocks, then we acquired a 20-foot cultivator with shears, and ripped as much of the shallow erosion as we could without getting bogged."

The main aim of cultivation for Locky was to ensure the paddock was trafficable and he says that using the cultivator while the paddock was still wet was probably the best thing he did, and should have done a lot more of it at the time. This process continued as the lagoons dried out, with the last parts finally water free in March 2023, when they were able to finish clearing debris, ready to sow for the 2023 winter season.

Previous to all water clearing, in 2022 following the initial cultivation, Locky was able to sow around the lagoons and wet areas as best as possible. Seeding was challenging with lots of silt around meaning getting bogged even after taking time to assess paddocks.

There were still issues of levelling the landscape, particularly the areas where gutters and creeks had formed due to the water flow. He spent many hours using a notch bucket dragging the wash sand or silt back into the creeks to make some paddocks trafficable.

When asked if he would do anything differently Locky says: "I would have gotten in early and ripped more of the shallow erosion earlier while it was still wet, because these areas lost the majority of their sandy topsoil, they were trafficable much earlier - the results being easier to manage and get back into production sooner.



Figure 4. March 2023, a dried lagoon area. Photo: David Davenport

"Where the water ran in some areas there was a lot of compaction, and the outer edges of the lagoons didn't grow as well. It was like a dart board with different layers of compaction that was noticeable as the lagoons dried out."

Weed control has been an ongoing process since the rainfall event to ensure the Yates' were able to make the most of the stored soil moisture for the foreseeable seasons.

Also challenging has been the movement of some unwanted plants into the production zone, namely saltbush from a nearby windbreak on their property which could be detrimental to their cropping operation.

They have also noticed an increase in marshmallow weed in paddocks they previously had under control and are hoping they can again get this weed under control soon.

18 months on

Almost all the affected areas on the Yates' property have been remediated and the process of increasing the soil organic matter has begun with cropping of these areas.

Locky has also been able to access support from the Eyre Peninsula Landscape Board through the Eastern Eyre Storm Recovery project, which allowed affected farmers in the region to gain access to soils expertise to further support the recovery of areas with exposure to prolonged water-logging.

Locky's experience emphasises that there will need to be a focus on improving the fertility of the areas with deposited sand, by maintaining current practice with increased addition of mineral nutrients. The addition of a carbon-based fertiliser may improve both nutrient levels and biological function. Alternatively, the area could be green manured with either a mixed species pasture system or a bulky legume crop such as vetch. Discing the plant material into the sand and planting a summer cover in spring would also be a way improve organic matter levels.

By June 2023, all the areas that were once lagoons have been sown to wheat. With Locky commenting, "they have germinated and got away, it will be interesting to see how they actually perform later in the season when things start to maybe dry out".

Acknowledgements

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More information

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