

Gwymac Landcare Leaky Weir Project – What Difference Has It Made

1. Introduction

Gwymac Landcare installed a series of seven leaky weirs along a small stretch of an ephemeral creek line near Swan Vale NSW in May 2024. The purpose of the weirs was to slow the flow of water and spread it across a greater land area. This would increase the infiltration and thus the water available for plant growth.

This analysis seeks to determine what impact these works have had, nine months after installation, using time series Normalised Difference Vegetation Index (NDVI) freely available data.

NDVI is a commonly used vegetation index that quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs)¹



Figure 1 Creekline where leaky weirs have been installed

2. Location

The location of the works is near Swan Vale NSW just north of the Gwydir Highway. A satellite image of the site, and the area analysed is detailed in Figure 2. Seven leaky weirs have been installed within this area. The length of the creek line within the area analysed is approximately 230 m with an area of 0.7 ha.

¹ For more information, see: [What is NDVI \(Normalized Difference Vegetation Index\)? - GIS Geography](https://www.gisgeography.com/what-is-ndvi-normalized-difference-vegetation-index/)



Figure 2 Satellite imagery of the location. The area analysed is contained within the orange polygon.

3. Method

Freely available Sentinel-2 satellite imagery was sourced from Google Earth Engine for the period 2018 to February 2025. The mean NDVI value for each image was calculated and data downloaded for analysis.

Because the works were completed in May 2024, an analysis period from 1 June to 28 February (a period of nine months) was applied from 2018 for the seven years of downloaded data. The consistent period of time was selected to ensure consistency in analysis periods and ensure that results were not biased.

From this data, basic statistics for NDVI data for each analysis period (minimum NDVI, maximum NDVI, mean NDVI, standard deviation, median NDVI and the number of images used) were calculated and the results plotted. Rainfall data was obtained from Bureau of Meteorology monthly rainfall data for Swan Vale.

4. Results

The time series data for the entire period is detailed in Figure 3 highlight the cyclical nature of NDVI values (aligned with seasonal changes in plant growth) as well as inter year variation due to differences in rainfall.

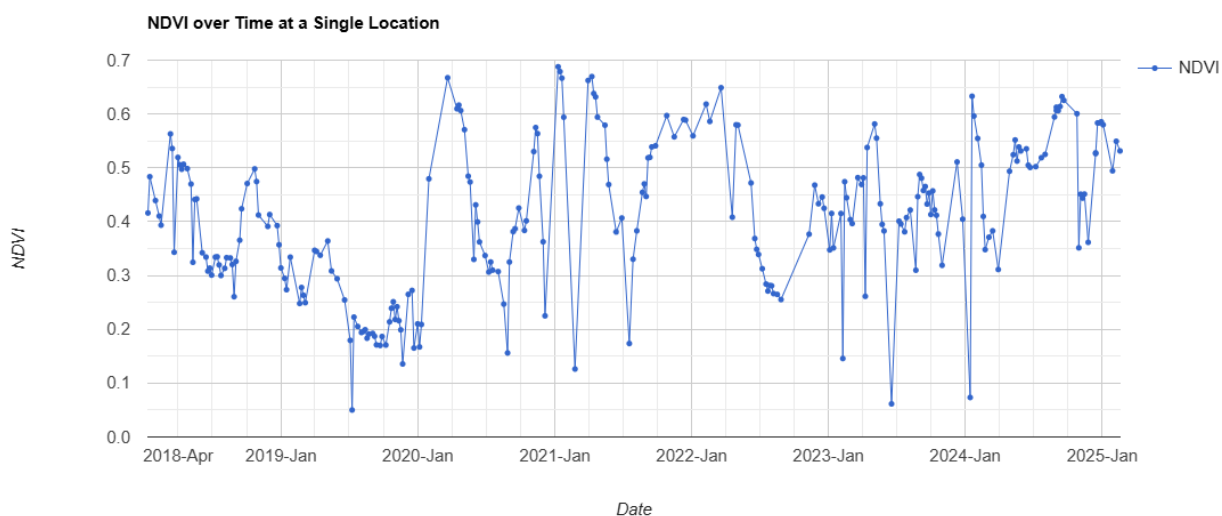


Figure 3 Time Series NDVI Data for Complete Period

The statistics from the analysis are provided in Table 1 for each of the seven monitoring periods.

Table 1 Summary Statistics

Start	End	Min NDVI	Max NDVI	Mean NDVI	SD	Median NDVI	n	Rainfall
1/06/2018	28/02/2019	0.248	0.498	0.346	0.062	0.333	31	416
1/06/2019	28/02/2020	0.05	0.48	0.208	0.066	0.199	31	438
1/06/2020	28/02/2021	0.126	0.688	0.407	0.150	0.384	27	559
1/06/2021	28/02/2022	0.174	0.618	0.487	0.114	0.519	19	883
1/06/2022	28/02/2023	0.146	0.474	0.356	0.085	0.351	25	577
1/06/2023	28/02/2024	0.061	0.633	0.415	0.120	0.422	29	547
1/06/2024	28/02/2025	0.351	0.632	0.536	0.074	0.533	28	527

Figure 4 is a bar plot of the median NDVI versus measurement period. The plot and the results in Table 1 indicate that the greatest median NDVI value occurred in the latest period (2024) with the second highest value occurring in 2021.

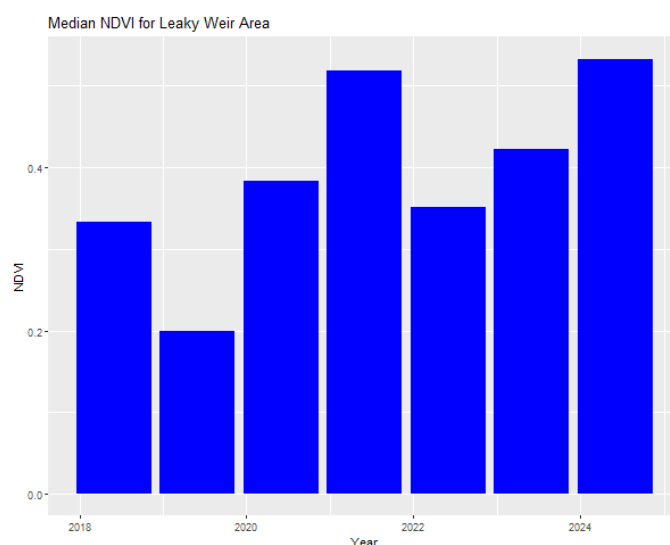


Figure 4 Median NDVI Value By Measurement Period

The results in Figure 4 Median NDVI Value By Measurement Period are indicative that the leaky weirs may have had a positive impact, however does not account for rainfall. Figure 5 plots rainfall versus median NDVI with each labelled point representing that measurement periods value.

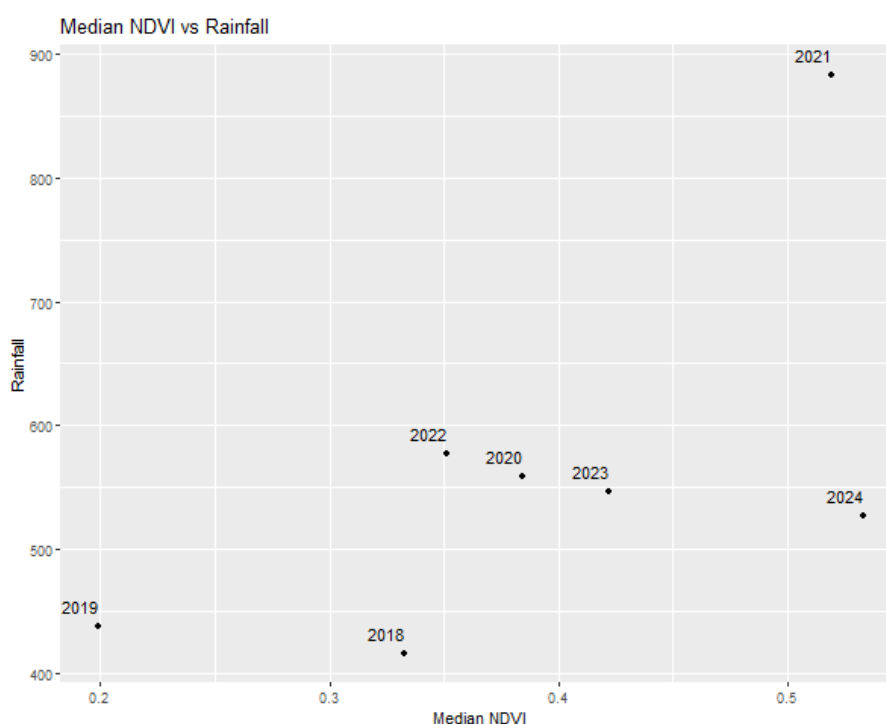


Figure 5 Rainfall vs Median NDVI for each measurement period

The results as presented in Figure 5 indicate that the highest median NDVI value occurred during the third driest period. When compared to the closest value for median NDVI which occurred in 2021 (0.519 vs 0.533 in 2024) and the amount of rainfall (883 mm in 2021 and 527 mm in 2024, a difference of 356 mm), it is suggestive that the leaky weirs have had a major positive impact since their installation.

5. Conclusion

This initial time series analysis of NDVI data applied to the area influenced by the leaky weirs indicates that they have had a substantial positive effect on photosynthesis, and hence plant growth since their installation. It is particularly noteworthy that the highest median NDVI period has been measured since the installation of the leaky weirs in the third driest period.

It is recommended that this analysis be repeated in 12 – 24 months to provide a longer-term perspective on the effectiveness of these works.

A limitation of this study is that it has not accounted for any changes to grazing management (e.g. stock exclusion) since the works have been installed and this should be considered in interpreting the results.

