

Our Catchments Our Communities Leadership Development Grants 2019

Project report:

Reading Landscapes and Introducing Sustainable Agriculture Methods Across the Loddon Plains

Danny Pettingill



Project report:

Reading Landscapes and Introducing Sustainable Agriculture Methods Across the Loddon Plains

Danny Pettingill



The author respectfully acknowledges the Traditional Owners and custodians of this country.

I recognise that Indigenous Australians are intrinsically connected to this land and play a crucial role in connection, management and restoration of the landscapes.

I especially would like to recognise the Dja Dja Wurrung Traditional Owners and the role Jarra people have to play in developing, nurturing and restoring country

I pay my respects to Elders past, present and emerging and recognise that Sovereignty has never been ceded. Always was . Always will be . Aboriginal land .

This publication was produced for reporting and presentation purposes as part of the participants reporting requirements for the Victoria State Government Our Catchment Our Communities Leadership Development Grants, 2019.

Report written by Danny Pettingill, 2021

The READING LANDSCAPES project is supported by the Victorian Government.



Leadership Objectives

FIRETALK
www.firetalk.com.au



The OCOC Leadership program provided opportunities to take a position of development and leadership in land and catchment management that would have otherwise taken significantly more time to develop.

The investment provided an opportunity to curate a highly specialised set of training and skills for a greater vision to take out into the community and create leading concepts for the betterment of landscape function, catchment health and decision-making in land management and project design.

Leadership objectives made possible through this funding:

- Consolidate and develop techniques in sustainable agriculture and conservation-based agriculture that are relevant to a drying climate.
- engage with communities and landholders across the Loddon Plains, providing them the opportunity to understand and embrace new techniques.
- Create opportunities for engagement, development and adoption of innovative practices by the Loddon Plains and wider farming community
- promote sustainable practice within the North Central Catchment and across private farming enterprises within local and regional community.
- Introduce innovative farm planning strategies including reading hydrology of the landscapes, identifying and utilise on-farm natural resources, design, and building of landscape structures and overall farm or property design to enhance productivity and methods and strategies to improve landscape function on-farm.
- Continue to contribute to understanding a drying climate of central Victoria and look for appropriate adaptations for conservation and agriculture across the Loddon Plains.

Contribution of Training Toward Objectives

By undertaking funded training, investment from others and investing my own time into this program, the READING LANDSCAPES project has developed to reflect the leadership and community objectives described.

As part of this project, training has allowed greater knowledge and understanding in landscape behaviour, culminating in the development of language, knowledge and opportunities to work with the NRM community to provoke new thinking in catchment management and project design.

Undertaking research within the context of this training has developed opportunities to work closely with Landcare, local communities, CMA's and other stakeholders to adopt innovative management techniques for greater efficiencies in management, design and landscapes function.

By positioning myself as a young leader in the NRM space, I have been able to promote innovative thinking and specifically have been able to impress new thinking and adoption practices in the farming sector, particularly to develop adoption methods in regenerative and sustainable agriculture for the benefit of biodiversity and enterprise.

The above actions have been crucial in continuing to identify appropriate adoption practices for conservation and agriculture in a drying climate.



Training activities undertaken



Training activities undertaken as part of this program included grant funded training and training funded by others.

Funded Training:

- Australian Groundwater School, Aug 2019
- Remote Pilots License (Drone qualification), 2020
- Holistic Management, 2020/21

Funded by others:

- Vic No-Till conference, 2019 (*LPLN*)
- Land to Market Conference, 2021, (*Individual, Land to Market*)
- Remote Operators Certificate, 2021 (Drone commercial operator), (*Individual*)
- Research hours for Reading Landscapes program, 2020/21 (*Individual, LPLN*)

The above activities have culminated in a highly curated and innovative program that includes developed training in hydrology, technology, mapping platforms, agriculture and biodiversity.

This training has developed, and continues to develop Danny Pettingill's Reading Landscapes program, a series of concepts that aim to provide resources and information for farming communities to better understand

This training has developed, and continues to develop Danny Pettingill's *Reading Landscapes program*, a series of concepts that aim to provide resources and information for farming communities to:

- better understand their natural capital
- Make decisions that can impact biodiversity and landscape function on a catchment and micro-catchment scale
- Provide paddock ready monitoring solutions aimed at understanding on farm biodiversity and landscape health
- Provide consultative farm planning options that promote biodiversity within enterprise and work toward increased carbon in soils and plant communities



HYDROLOGY AND GROUNDWATER

Intensive training in groundwater and hydrology at the Australian Groundwater School



HOLISTIC MANAGEMENT

Training with InsideOut Management in Holistic Management for farming and land management in agriculture



DRONE TRAINING

Training in drone and aerial technology to enhance decision making and design for large scale landscape restoration and productive farm management

Training from funding



- **Australian Groundwater School, Aug 2019**

This course, run over 4 days, provided introductory training to Hydrology and Hydrogeology within landscapes. The development gained here created context and concepts that were able to be developed further in the context of landscape function. A particularly useful provocation came in a unit that centred on community lead cooperatives in resource management in the context of ground and surface water management through the MARVI project. This formed the basis of the community lead design framework in the READING LANDSCAPES methodology

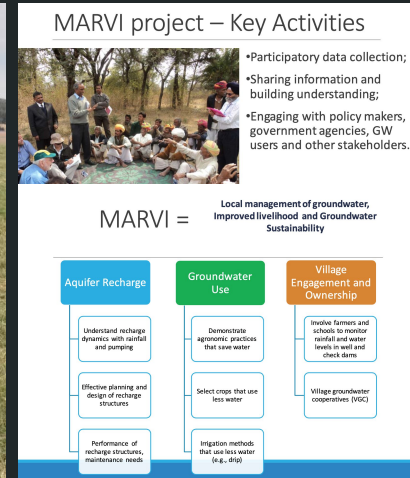
- **Remote Pilots License (Drone qualification)**

This training and qualification process provided technical requirements that enabled commercial flight of RPA to assist in landscape restoration and planning techniques with a focus on the micro catchment. By employing these tools, micro catchments can be aerially assessed for surface water paths, detailed contours, vegetation cover and other metrics to assist in decision making and planning.

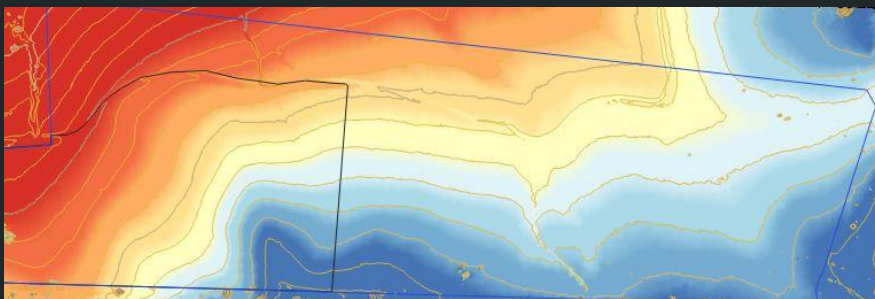
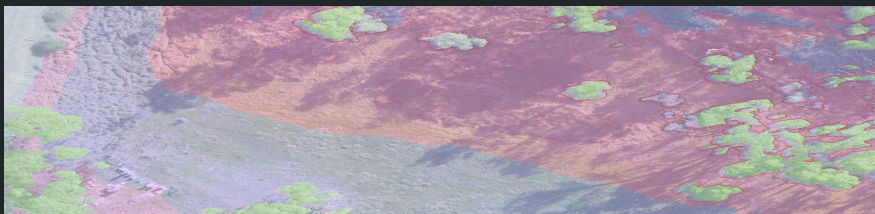
- **Holistic Management**

Undertaking this training was pivotal in putting the READING LANDSCAPES methodology and framework together. The course developed skills to identify and plan around landscape assets to provide greater efficiency on farm, greater moisture retention and promote on farm biodiversity through holistic thinking techniques. With 58% of the Victorian land mass under Agricultural production, introducing alternative methods in farming that provide opportunity for biodiversity and strong community dynamics is crucial for mass adoption.

Grasping a firm understanding of Holistic Management techniques has allowed me to adopt these principles to the Australian landscape with a focus on diversity and indigenous or native species that can play their part in catchment restoration and provide value for localised problems such as feed gaps within the seasonal calendar by being used for fodder and providing more efficient solutions through stock management or cropping for covers.



Training investment from others



- **Vic No-Till conference, 2019** (LPLN)
Undertake conference training at Vic No-Till conference, Shepparton, Victoria. This opportunity provided networking and knowledge benefits, particularly regarding soils and soil carbon.
- **Land to Market Conference, 2021**, (*Individual, Land to Market*)
An opportunity (invited through Holistic Management training) to attend as a guest. This opportunity provided network and knowledge opportunities, resulting in a strong relationship to develop a carbon model that works for farmers and removes excessive consultant costs to promote increased adoption.
- **Remote Operators Certificate, 2021** (Drone commercial operator), (*Individual*)
Investment in continuation of Drone training for commercial operation accreditation. This has provided an opportunity to undertake commercial consultation in agriculture and property management. It has also created further opportunities to work with Catchment managers in monitoring works.
- **GIS Training, 2020/21**, (*Individual, LPLN*)
Self paced GIS training package suited to above training and aims of the project

READING LANDSCAPES RESEARCH AND PROGRAM DEVELOPMENT

INTRODUCTION

A project aimed at understanding relationships between groundwater hydrology, soil health and healthy flora and fauna populations to enhance sustainable farming practices and conservation of the environment through improved biodiversity.

This project includes 5 monitoring sites in central Victoria with different land management priorities and differing land use.

The project aims to look at differences in compaction, potential in soil moisture retention, vegetation cover and the abundance of flying invertebrate pollinators within different land uses and agricultural practices and ideologies.

READING LANDSCAPES methodology includes a number of elements including;

- localised mapping and drone imagery,
- penetrometer readings for compaction and moisture retention in soils,
- vegetation/grassland quadrat scoring,
- and invertebrate counts

to determine the health and potential of a farming landscape.



This project has been funded as part of the Victorian Government's OurCatchmentOurCommunities Leadership Development Program.

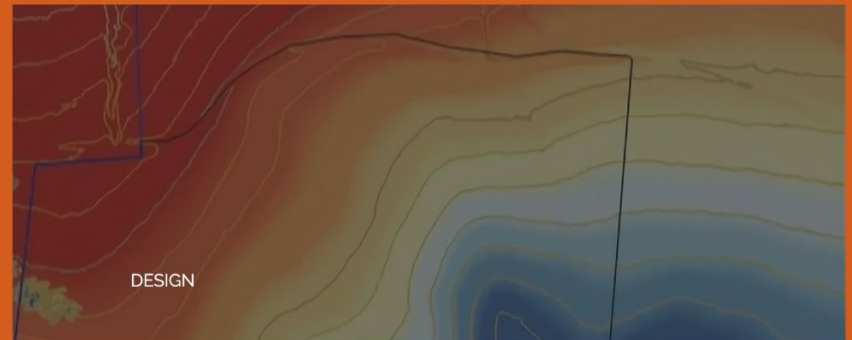
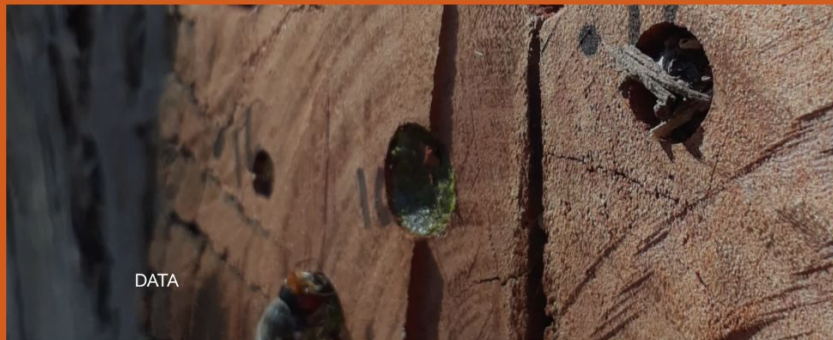
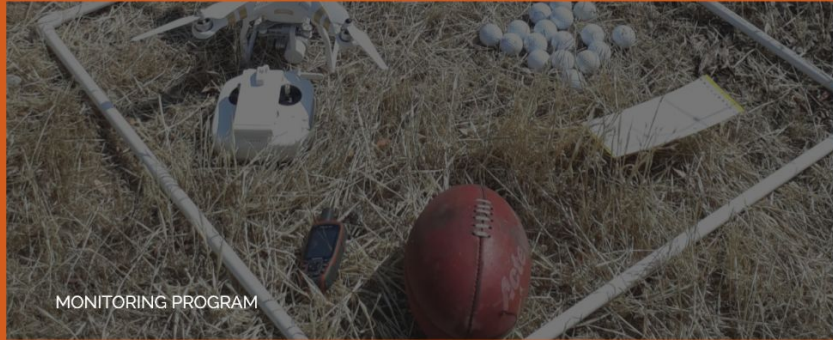
READING LANDSCAPES RESEARCH AND PROGRAM DEVELOPMENT

FIRETAIL
www.firetail.com.au



THE PROJECT

Monitoring . Mapping . Analysis . Design



READING LANDSCAPES RESEARCH AND PROGRAM DEVELOPMENT

FIRETAIL
LANDSCAPE RESEARCH



- Focus on relationships between
 - groundwater hydrology,
 - soil health,
 - carbon sequestration
 - healthy flora and fauna populations
- Aim to enhance sustainable farming practices and conservation of the environment through improved biodiversity.
- Funded by DELWP, allows the opportunity to undertake training in Hydrology and Natural Sequence Farming and commence a monitoring program looking at links between vegetation cover, invertebrate populations and moisture retentions in soils



READING LANDSCAPES RESEARCH AND PROGRAM DEVELOPMENT



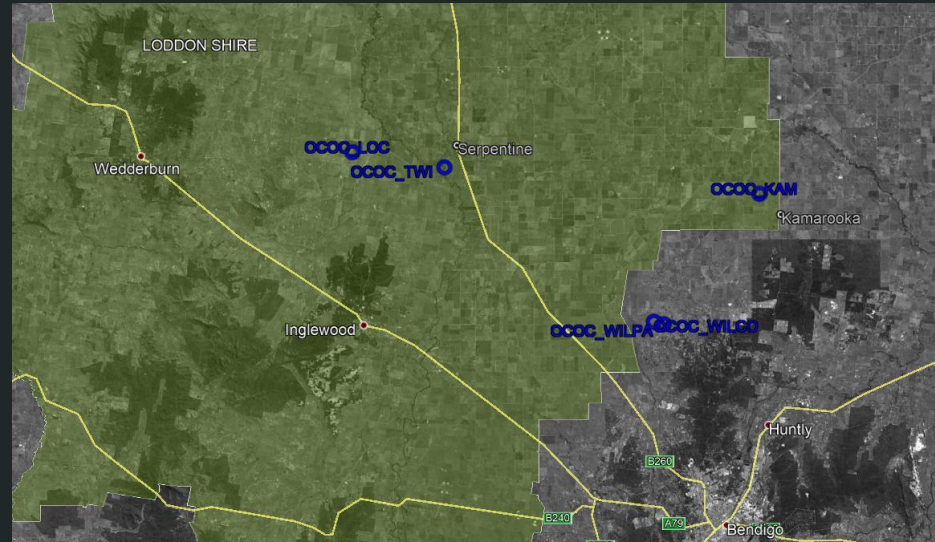
MONITORING

- Aim is to look at correlation between farming methods, conditions and soil health to provide details of links between these measurements and on farm biodiversity and moisture levels.
- Includes a number of elements including:
 - Drone imagery
 - Penetrometer readings
 - vegetation/grassland score
 - Native pollinator hotel and bug strip
- These measurements are tabulated to look at links between these elements, being attributed a score or average.

READING LANDSCAPES RESEARCH AND PROGRAM DEVELOPMENT

MONITORING THE LANDSCAPE

- Aim is to look at correlation between farming methods, conditions and soil health to provide details of links between these measurements and on farm biodiversity and moisture levels.
- Includes a number of elements including:
 - Drone imagery
 - Penetrometer readings
 - vegetation/grassland score
 - Native pollinator hotel and bug strip
- These measurements are tabulated to look at links between these elements and provides a picture of landscape health. This dictates required stewardship actions for implementation in the design phase.

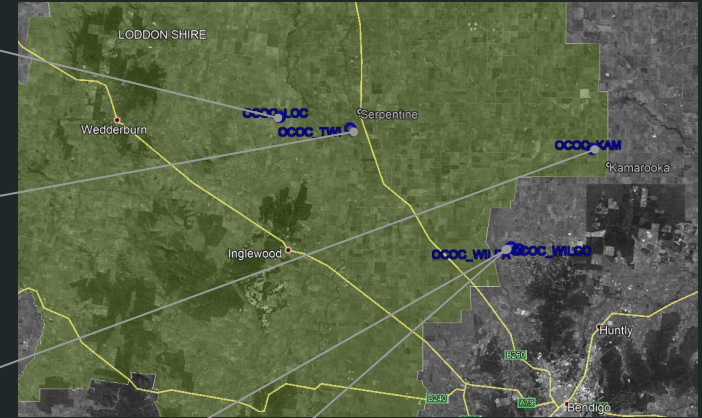


Site monitoring

FIRETAIL
www.firetail.com.au

LODDON PLAINS LANDSCAPE NETWORK

VICTORIA
State Government



Drone data, provides picture of vegetation cover across seasons at 10m, 25m, 50m and 100m. This data provides a picture of land use, water movement and stock movement allowing for design of appropriate land stewardship approaches to provide improved outcomes for biodiversity and enterprise.

Site monitoring



Hotel data provides an indication of bore habiting native pollinators. Sticky traps are employed to provide an indication of small invertebrate abundance. This is broken down into body shape to provide an indication of species abundance to provide overall count and invertebrate diversity.

Nesting behaviour is observed through use of clear tubes in allocated hotel niches.

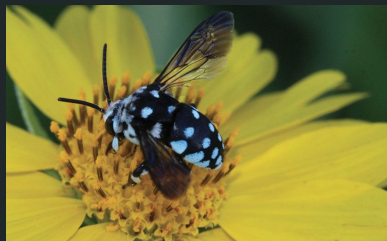
Site monitoring



Golf ball monitoring (*Nick Schultz et al.*) provides a consistent score system in evaluating vegetation cover and height, penetrometer data provides an indication of moisture capacity in soil and an idea of compaction.

The methodology and sites can then be shared through workshops and engagement opportunities. Multiple workshops have been delivered, where pandemic restrictions have allowed, with positive feedback.

Monitoring - collecting data



Data is collected and entered into a custom formulated database.

Data is split into categories including land use, area, condition, farming or conservation etc.

Abundance is entered for vegetation scores, species abundance and diversity, penetrometer, hotel use and moisture indexing allowing for comparison between habitat quality, characteristic, land use etc.

This collation of data, along with GIS and drone data, provides a narrative for land improvements through absences in diversity and ecosystems for efficient landscape function.

Plot 1 Coordinates				Penetrometer		
Southing	Easting	Golf ball sco	Vegetation sc	600 psi	900 psi	1200 psi
	143.855	17	70	18	38	38
	143.51.18.749	17.5	40	3	12	16
	143.51.20.823	17	50	15	22	33
	143.57.35.5	10	60	0	5	10
	-	-	40	-	-	-
	144.12.41.18	17.5	30	20	25	45
	144.12.40.86	15	90	5	5	12
	144.12.00.01	13	60	2	6	11
	144.12.01.15	18	70	2	3	3
	144.19.16.33	9	50	7	12	13
	144.19.12.75	17.5	50	2	2.5	13



Site Index	Site number	Hotel no.	Site Name	Area	Condition	Use	Category	Notes
1	101	Fairy Flat Conservation block	7	100	Raywood Pasture block	A	Agriculture	e Environmental
2	101	Fairy Flat Pasture block	8	100	Raywood Conservation block	C	Conservation	e Pasture
3	102	Fairy Flat Saltbush pasture block	9	104	Raywood Training track and pasture			c Cropping
4	102	Serpentine Lucerne Pasture	10	100	Kamarooka Cropping paddock			f Forestry
5	102	Serpentine River corridor	11	100	Kamarooka Forestry Block			
6	100	Raywood River and grassland corridor	12	100	Kamarooka Project cropping			

Site Details	Survey #	Site no.	Hotel no.	Site	C	Sub Cat	Date	Time	Conditions	Location name	Landholders	Hotel coordinates
1	1	101	Fairy Flat Conservation block	C	e		28/1/19	1200	Fairy Flat			
2	2	101	Fairy Flat Pasture block	A	p		28/1/19	1210	Fairy Flat			
3	3	101	Fairy Flat Saltbush pasture block	A	p		28/1/19	1220	Fairy Flat			
4	4	102	Serpentine Lucerne Pasture	A	b		18/12/19	1000	Mid to high 30's, fine and clear	Serpentine		
5	5	102	Serpentine River corridor	C	e		18/12/19	1010	Mid to high 30's, fine and clear	Serpentine		35.25.48.7
6	6	100	Raywood River and grassland corridor	C	e		18/12/19	1200	High 30's, clear, fine	Raywood Paddock		38.34.27.91
7	7	100	Raywood Pasture block	A	p		18/12/19	1210	High 30's, clear, fine	Raywood Paddock		38.34.27.91
8	8	104	Raywood Conservation block	C	e		18/12/19	1250	High 30's, clear, fine	Raywood Con block		38.34.19.91
9	9	104	Raywood Training track and pasture	A	p		18/12/19	1310	High 30's, clear, fine	Raywood Con block		38.34.19.91
10	10	105	Kamarooka Cropping paddock	A	c		18/12/19	1310	High 30's, clear, fine	Kamarooka Project		38.27.14.81
11	11	100	Kamarooka Forestry Block	C	f		18/12/19	1300	High 30's, clear, fine	Kamarooka Project		38.27.14.81
12	12	100	Kamarooka Project cropping	A	c		18/12/19	1300	High 30's, clear, fine	Kamarooka Project		38.27.14.81

Sustainable Agriculture

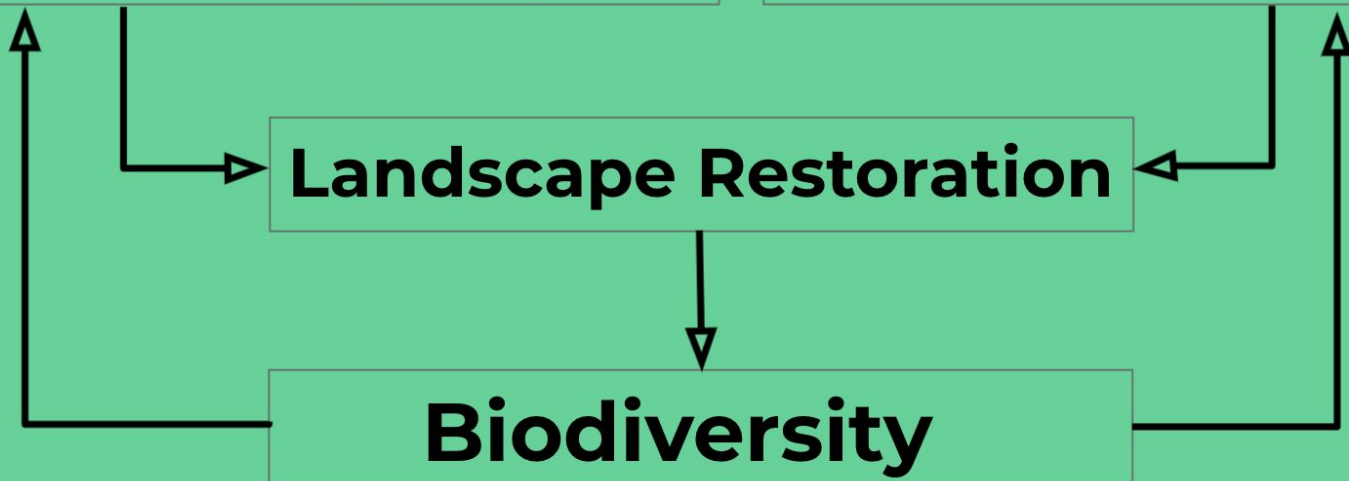
- Soils
- Vegetation covers
- Pasture & grazing management

Conservation & Environment

- Corridors
- Erosion
- Protection of remnant veg.

Landscape Restoration

Biodiversity



READING LANDSCAPES ADOPTION FRAMEWORK



PROJECT FRAMEWORK

The development of this framework starts with identifying primary drivers for 4 main project outcomes:

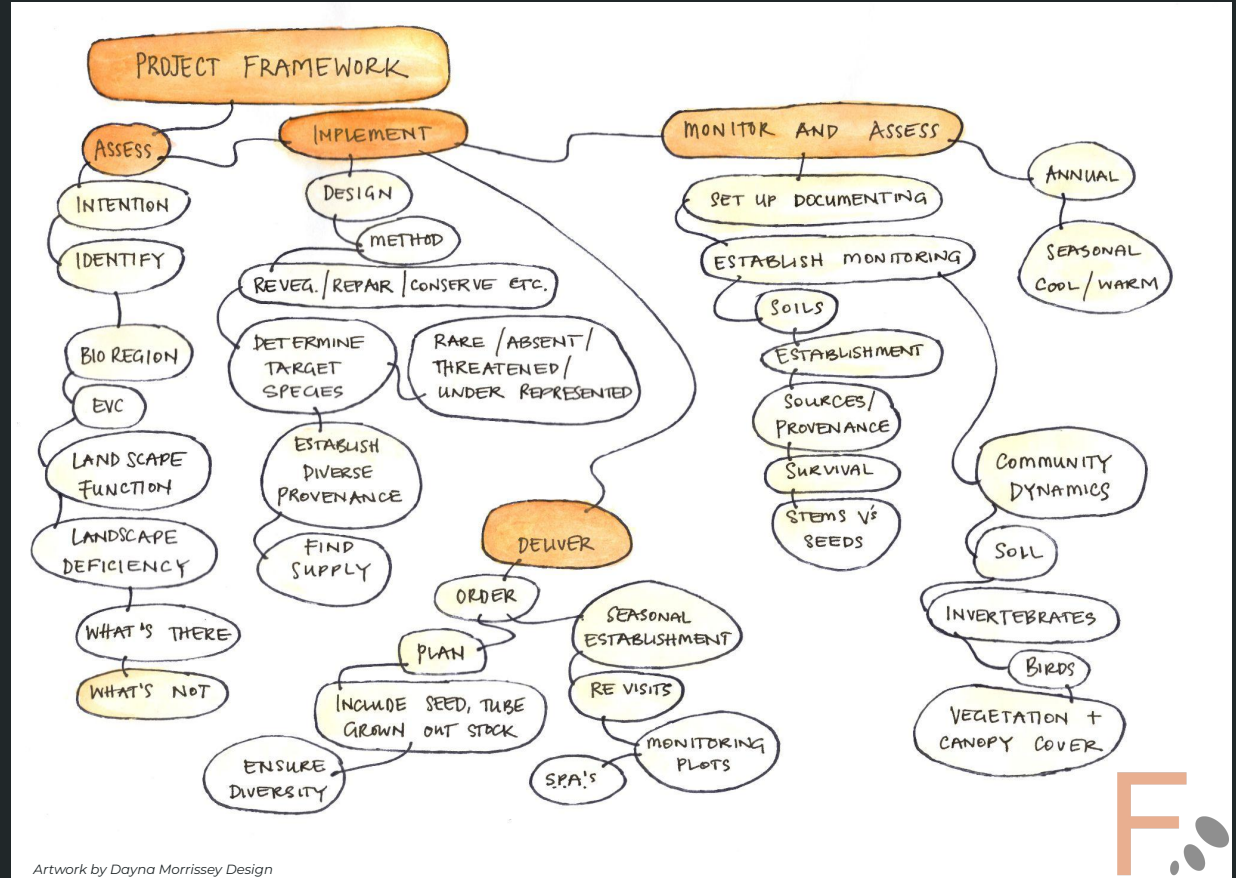
Landscape Assessment; Recognise intentions, landscape assets, requirements of landscape function and what within the landscape is under represented, absent or required in order to restore function to the landscape.

Implementation; Understand design parameters, methods for delivery, requirements for landscape (reveg. repair. conserve. restore etc.), select target species for the state of the landscape with an aim to establish opportunity for greater community dynamics in time.

Deliver; Deliver the outcomes with a clear long term vision and goal ensuring that design and delivery builds in landscape function restoration qualities or, if allowable, focusing on rare, absent and threatened species.

Monitor; build in continual monitoring in order to understand what is working, adapting to what is not (including provenance and species diversity) and ensuring community dynamics and diversity are increasing.

This model of design and long term establishment is transferable into conservation or revegetation efforts and private land farming outcomes. With the model being developed as an approach that can provide flexibility in decision making for enterprise and biodiversity outcomes.



Artwork by Dayna Morrissey Design

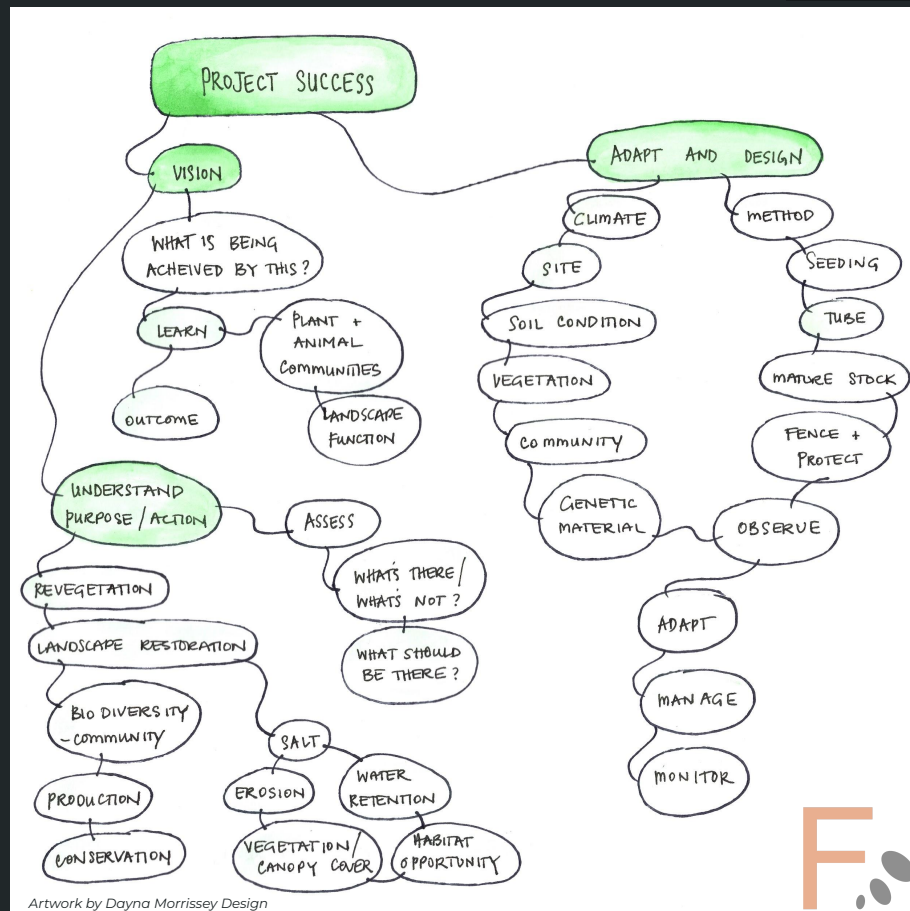


READING LANDSCAPES ADOPTION FRAMEWORK



Sitting alongside the READING LANDSCAPES Framework are other guides that address identifying challenges that a landscape is facing and avenues toward success.

These steps are still in development but allow users of the decision making framework to investigate the problems that each landscape requires and lays out a long term success model for the delivery of land stewardship practices.



PLAINS PLANT SELECTION MATRIX



PLN Area EVC list	Common Name	classification	EVC	Garden	KL	DH	KW	Primary use	forestry	Firewood	Industry use - furniture or artisan	Boggy	Food plant	Ornamental/garden	Wall/urban gardens	Revegetation	Wildlife indicator	Suit small garden	Bird Attracting	Wild and insect forage	Water species	Fodder	
1	Acacia meurnsii	T	0	1																			
2	Acacia melanoxylon	T	0																				
4	Acacia acinacea s.l.	M5	1	1																			
5	Acacia dealbata	T	1	1																			

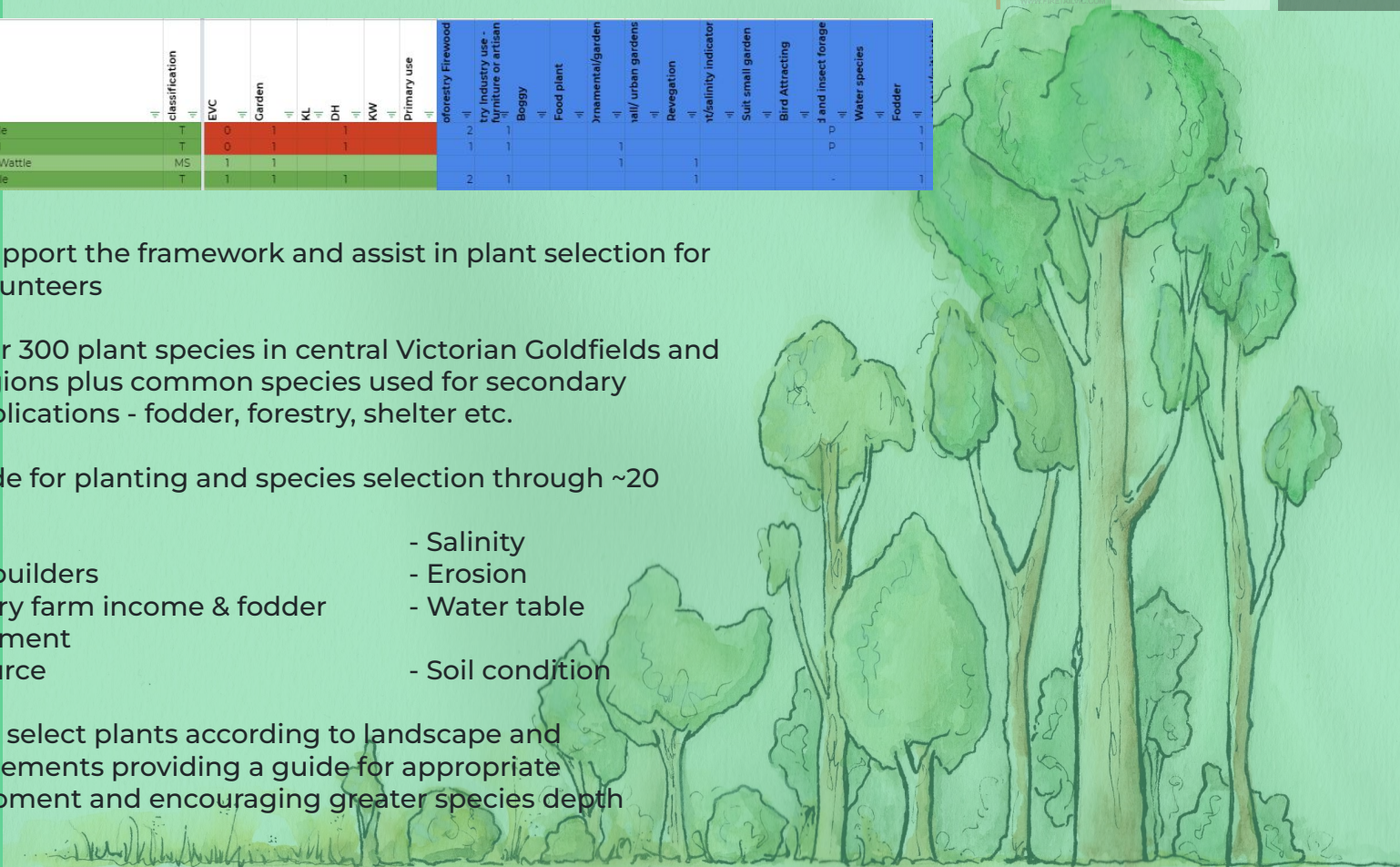
How can we support the framework and assist in plant selection for groups and volunteers

Brings together 300 plant species in central Victorian Goldfields and Riverine bioregions plus common species used for secondary agriculture applications - fodder, forestry, shelter etc.

Provides a guide for planting and species selection through ~20 attributes

- Pioneers
- Habitat builders
- Secondary farm income & fodder management
- Food source
- Salinity
- Erosion
- Water table
- Soil condition

Allows users to select plants according to landscape and function requirements providing a guide for appropriate project development and encouraging greater species depth



Applying Training into the Future

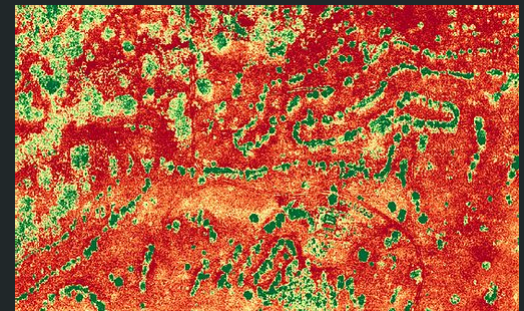
In undertaking this program, I have been able to develop a unique skill set that can be shared through project development, private land management, management of catchment priorities and provide information and consultation through community programs such as Landcare.

As a Landcare professional, this knowledge and EG&S focus within the developed methodology can be delivered to community with a saving of over \$70 per hour through a Landcare framework opposed to an agency framework.



With this in mind, I am committed to further development of this project in order to:

- Find opportunities to continue the study and monitoring for the continual development of paddock ready monitoring and decision making solutions to be implemented on community level
- Use localised mapping through drone and GIS techniques to assess and restore vegetation cover, improving soil health and opening carbon opportunities
- Use this information in LPLN Sustainable Agriculture Strategy 2020 to build engagement programs for the farming community.
- Make myself available to the Victorian and Australian Landcare community to continue to work within this type of framework to benefit biodiversity, soil health, hydrology management and agriculture enterprise for enhanced community dynamics across the landscape
- Continue to speak at events locally and otherwise to share knowledge and experience



Opportunities arising from Leadership Development and READING LANDSCAPES Framework



Opportunities that have been influenced, directly or indirectly, by funding made available through this program have been significant, varying from presenting the READING LANDSCAPES methodology and framework to undertaking project work in partnership with LPLN and North Central CMA and Board and Advisory positions and individual recognition including:

- **Landcare Australia Final 12, 2020 Bob Hawke Award for contribution to community and sustainable agriculture**, this nomination was built around work done within sustainable agriculture adoption and the READING LANDSCAPES project methodology among other activities.
- **Development of Sustainable Agriculture Strategy for Loddon Plains Landcare Network**, what is believed to be the first Sustainable Agriculture strategy by a Landcare Network in Victoria with a focus on community and social capital, biodiversity, improvements to development and adoption to Sustainable Agriculture and increased Landcare capacity in Sustainable and Regenerative Agriculture
- **Adoption of READING LANDSCAPES framework by Loddon Plains Landcare Network for project design and delivery**
- Securing of funding to initiate **Loddon Plains Future Farmers Regenerative Agriculture group - 2021 - 2023**
- Securing a **partnership with Bendigo TAFE to deliver Certificate III in Agriculture within the Loddon community with a focus on landscape function and improving agriculture process to enhance landscape function and biodiversity**
- **Leading contribution to developing the Regenerative Farmers Mutual**, a start up that places farming enterprises at the top of entering carbon market transactions, limiting investment in consultants and brokering to maximise profits for EG&S services into the carbon market.
- **In-principle agreement with Catchment Management Authority to test READING LANDSCAPES methodology within a CMA project over 3 years**
- Presentation as part of Landcare Australia Webinar Series March 2021 - **Resilient and Adaptive Community-based Landscape Restoration Projects**
- Presentation to National Landcare Conference, 2021 - **On-Farm Value of Biodiversity Through Sustainable Agriculture Practices**
- Presentation at **DELWP Wimmera Biodiversity Summit, September 2021**
- **NCCMA Pale Yellow Water Lily aerial monitoring trial**, using aerial imagery and GIS assessments to monitor weed cover on water surface pre and post treatment in order to better understand treatment efficacy.
- **Landcare Victoria Inc. Board appointment - 3 year term**
- **Appointment to City of Bendigo Farming and Agribusiness Advisory Committee - 3 year term**
- Provide interview and media material, Clean Energy Regulator & Carbon Market Institute, Carbon Case studies - **Revegetation, Ploughshare Ploughshare in Wedderburn, Victoria, 2020**

Project Expenditure Summary



Details		Grant Contribution	In-kind contribution
Training			
	Australian Groundwater school, Introduction to groundwater science and management, Sydney	2500.00	
	RePL Training	1995.00	
	ReOC Training	286.00	
	Holistic Management Training	800.00	1200.00
Accommodation and Travel			
	Travel to Sydney, return	126.86	
	Fuel - Travel to Albury	79.31	
	Accommodation, Sydney	320.88	80.00
	Accom costs - Echuca	99.00	
	Travel, Koyuga, fuel	91.29	
	Travel, Koyuga, fuel	76.92	
Total Wages			
	Australian Groundwater school, Introduction to groundwater science and management, Sydney		Loddon Plains Landcare Network 1106.56
	Holistic Management Training		Loddon Plains Landcare Network 1106.56
	Research, on-farm surveys		Loddon Plains Landcare Network 1747.20
	Development of literature and resources for central Victorian conditions - Firetail Environments		Firetail Environments (personal consultancy time) 6000.00
Other expenses			
	Administration of grant	300.00	
	Research administration expenses and publication - Monitoring equipment and consumables, Tubing, hotel materials, 2 x moisture probe, golf balls, sticky traps	102.81	1100.00
	- Website documentation	303.37	
	- Research materials and resources		289.00
	Total Grant exp.	6781.44	
	Total in-kind		12629.32
	Grant funds available	6724.00	
	Balance of grant funds	-57.44	
	Total Project value inc in kind	17910.76	

CASE STUDY and APPLIED LEARNINGS

KURACCA LAND HOLDER

Landscape problems and observations

Significant erosion

Absence of vegetation cover

Soil caps/crusting

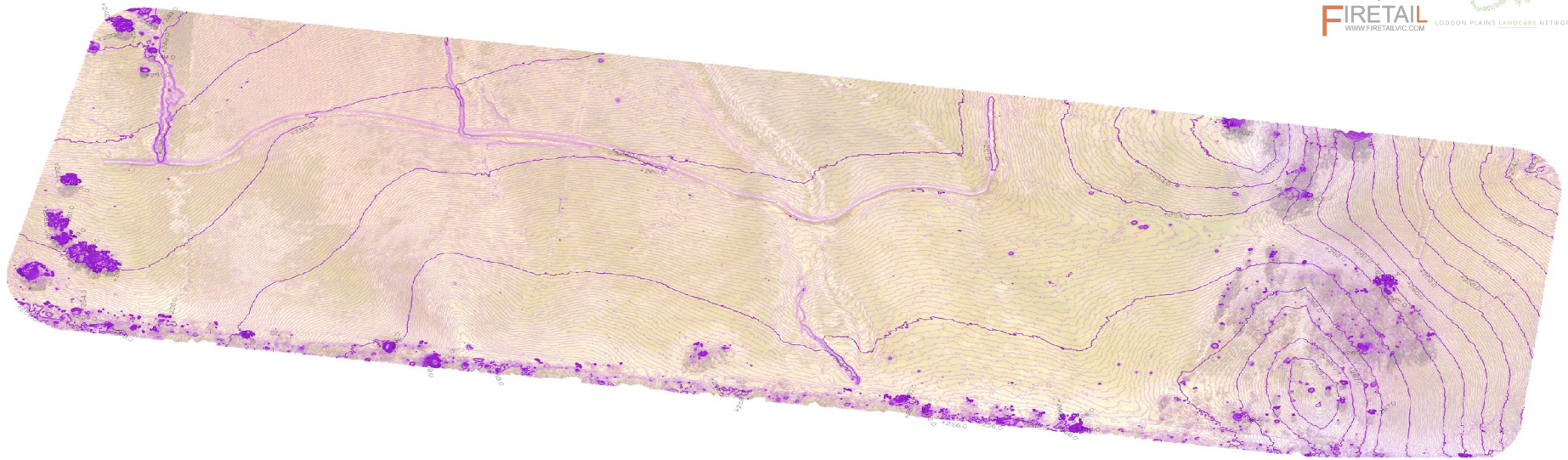
Water logging

Brittle tending landscape

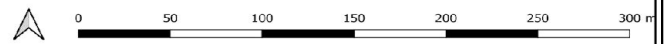
Surface water

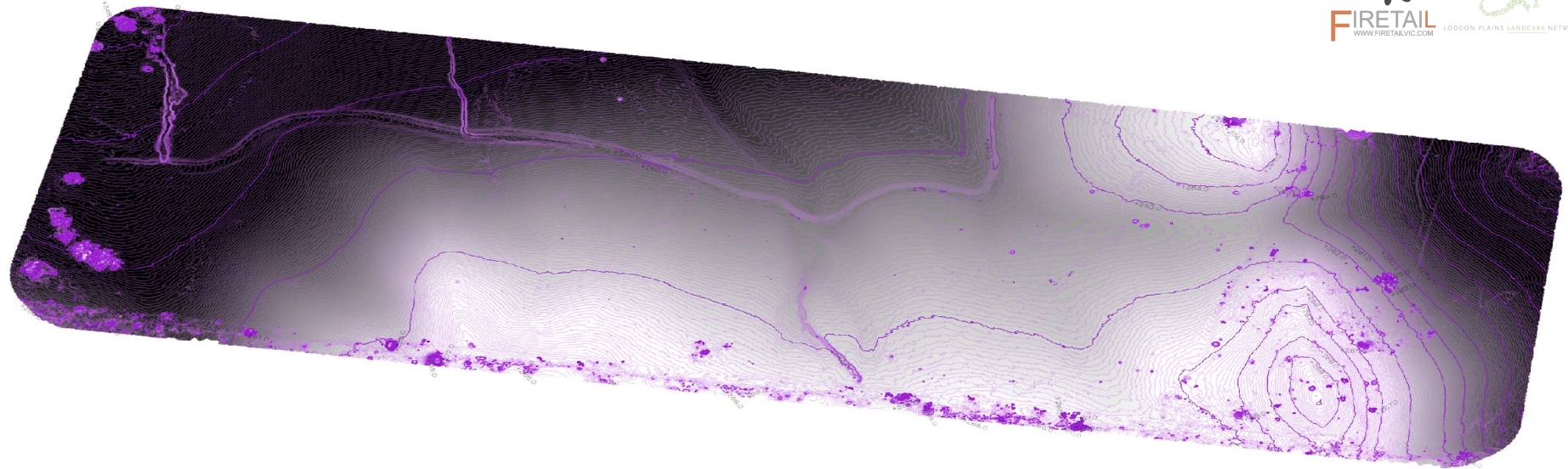
Low fertility

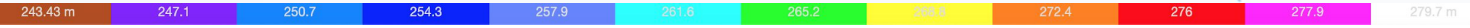
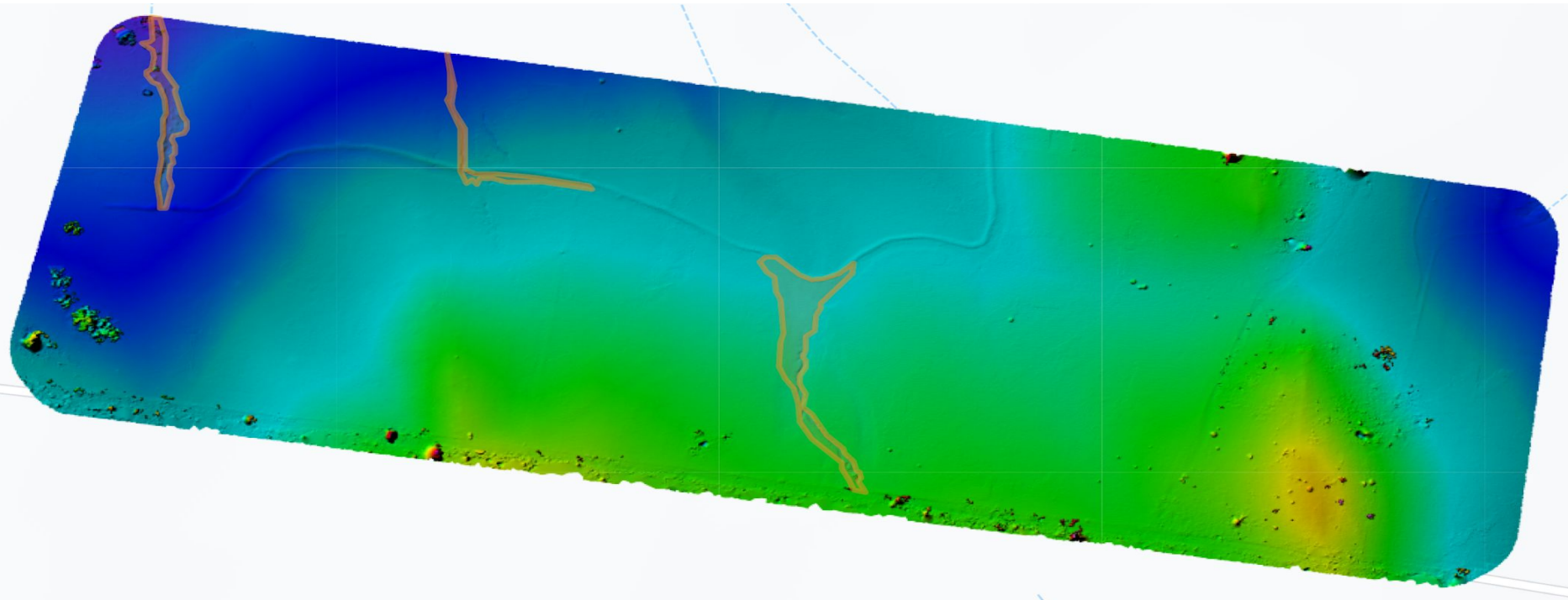


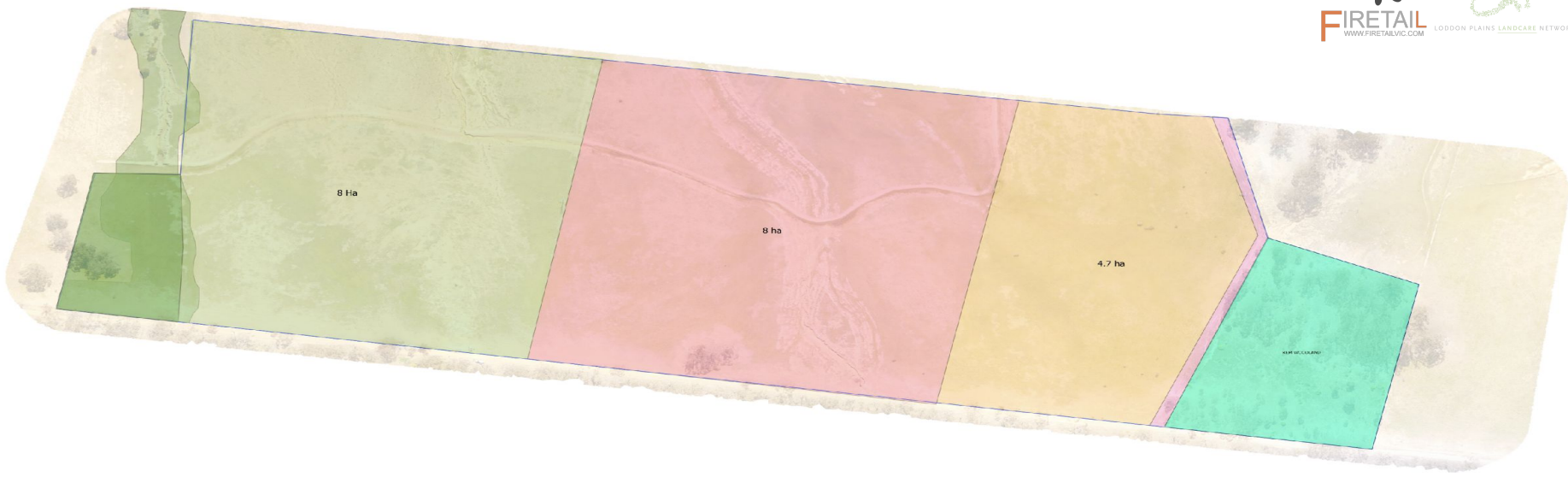


- | | |
|---------------------|-----------------------|
| ASSETS_POS | AM_SCOPE_2A |
| AM_REM_WOOD_ASSET_1 | AM_SCOPE_1A |
| SCOPE | FEATURES_IMPROVEMENTS |
| AM_SCOPE_WET | AM_FEA_SK01 |
| SCOPE_ENTIRE | AM_FEATURE_DRIVE |
| AM_SCOPE_3A | |

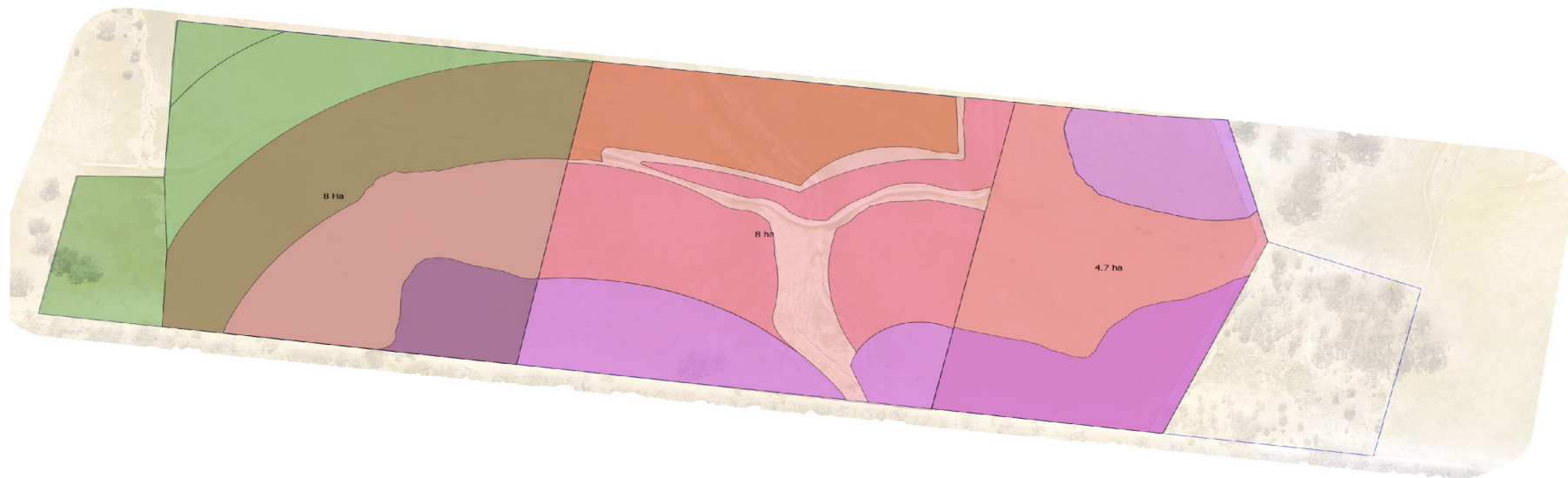












CREEK AREA
Revegetate with riparian species, particularly grasses, rushes and sedges along banks.

Plant southern depression (in green) with species tolerant to inundation

HEAVY EROSION WITH RUNOFF SURFACE WATER
Volume void : 1 231.21m³
Native and exotic pasture mix that can tolerate inundation. Consider broadcasting with Spring and Winter covers to promote growth

ERODED AND LOW VEGETATION SOILS
Lucerne dominant, treat eroded areas with rush and grass species. Add Allocasuarina sp. to high side of contour line (avoid flooding), sow with native and exotic pasture. Plant with Anameka and Lucerne pastures

HEAVY EROSION WITH RUNOFF SURFACE WATER
Volume void : 1 231.21m³
Consider planting higher areas with Saltbush, Lucerne and native and exotic pastures. Consider broadcasting with Spring and Winter covers

RUNOFF OF SURFACE WATER
Plant with Lucerne, sow with exotic and native pasture species. Consider Planting Saltbush and Acacia species Palatable to stock

SEE FERTILITY, ROCKY SOIL
Notes for treatment and planting

MID CONTOUR SOILS, MODERATE CONDITION. MORE CONDUCTIVE TO FRIABILITY
Plant with palatable Acacia sp. Saltbushes, native and exotic pasture mix to improve soil health. Lucerne system dominant in in this and lower contour

LOW FERTILITY, ROCKY SOIL WITH HARD CAP.
Plant with Anameka saltbush (Cultivar:OLDMAN SB), Acacia sp. particularly A. stenophylla, A. pendula, A. pycnantha & Atriplex sp. - see Species list provided

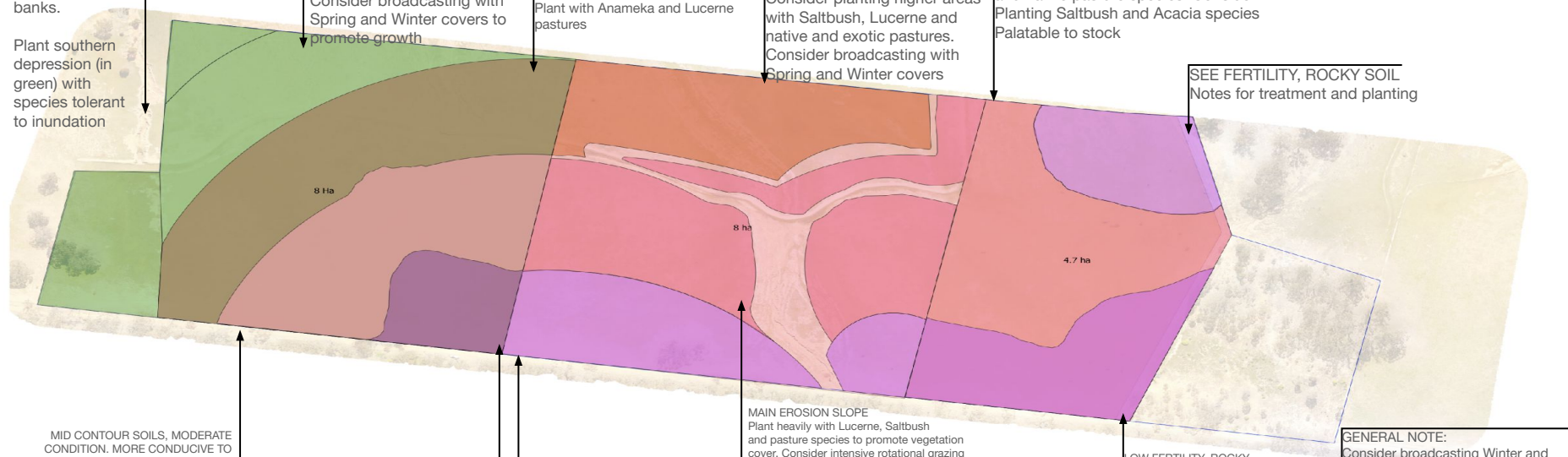
LOW FERTILITY, ROCKY SOIL WITH HARD CAP.
Planting: Anameka saltbush (Cultivar:OLDMAN SB), Acacia sp. particularly A. stenophylla, A. pendula, A. pycnantha & Atriplex sp. Consider planting heavily with tree and shrub species at 1 tree to 18 shrub across top contour to slow surface water

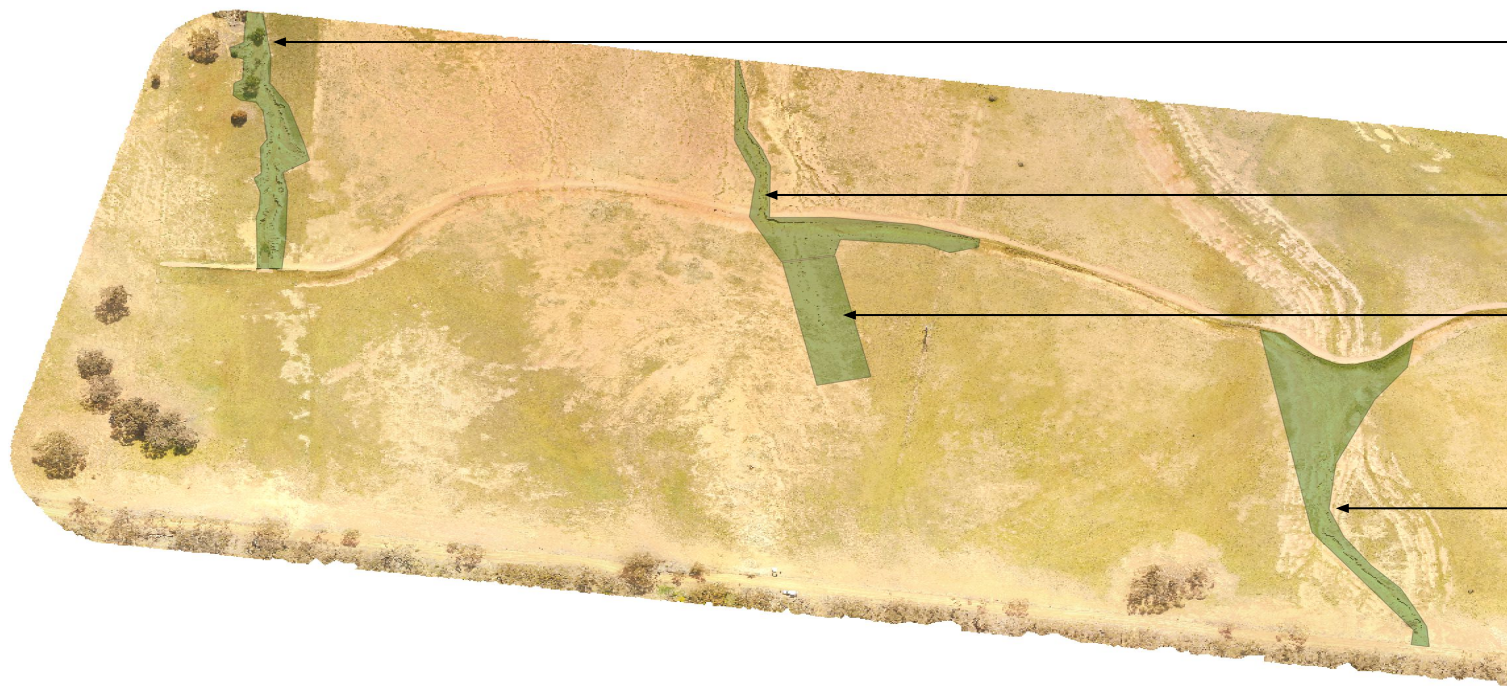
MAIN EROSION SLOPE
Plant heavily with Lucerne, Saltbush and pasture species to promote vegetation cover. Consider intensive rotational grazing of stock at high density to improve erosion and promote soil disturbance for establishment of ground cover (Rotational grazing)

LOW FERTILITY, ROCKY SOIL WITH HARD CAP.
Planting: Anameka saltbush (Cultivar:OLDMAN SB), Acacia sp. particularly A. stenophylla, A. pendula, A. pycnantha & Atriplex sp. Consider planting heavily with tree and shrub species at 1 tree to 18 shrub across top contour to slow surface water

GENERAL NOTE:
Consider broadcasting Winter and Spring covers across site in order to promote vegetation cover.

Consider high intensive rotational grazing for short periods to stimulate growth and promote soil disturbance, generating seed growth



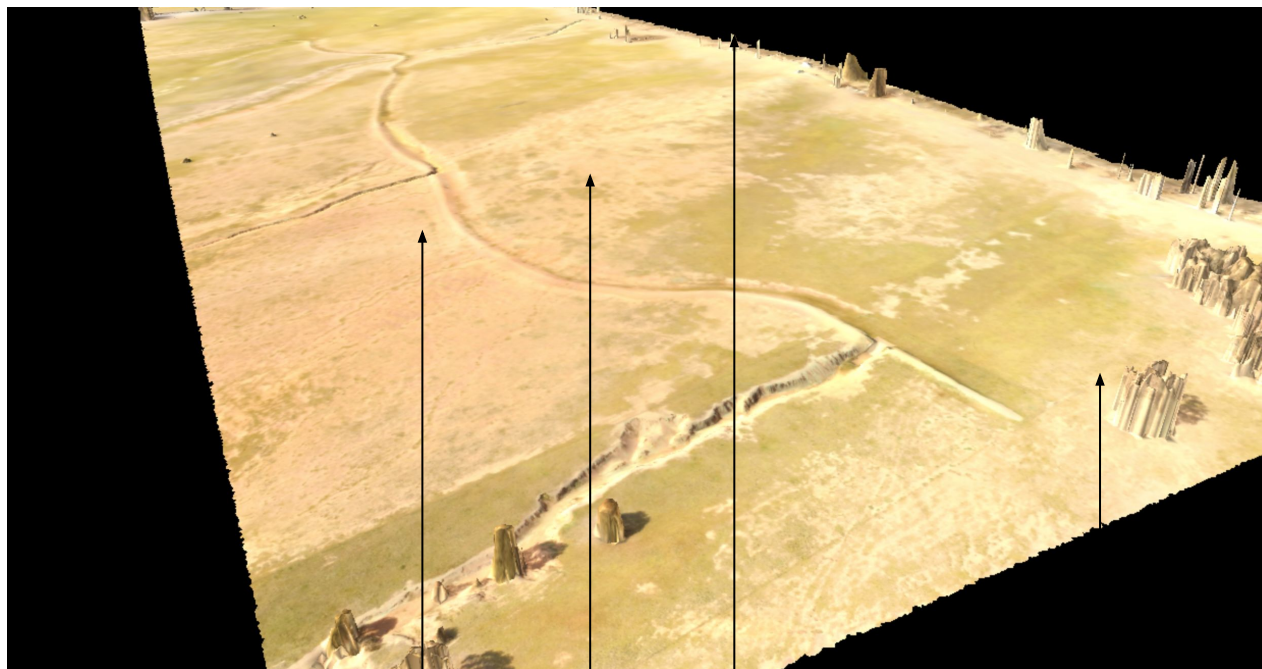


CREEK LINE
Volume void : 14 671.6m³
Area: 1383.55m²
Min height: 243.89m ASL
Max height: 260.67m ASL

LOW CENTRE CATCHMENT
Volume void : 1 231.21m³
Area: 570.96m²
Min height: 225.80m ASL
Max height: 259.47m ASL

**TUNNEL EROSION
PRESENT**
Cut and backfill or treat
accordingly

MAIN EROSION, SLOPE
Volume void : 8 512.27m³
Area: 2960.80m²
Min height: 260.84m ASL
Max height: 265.10m ASL

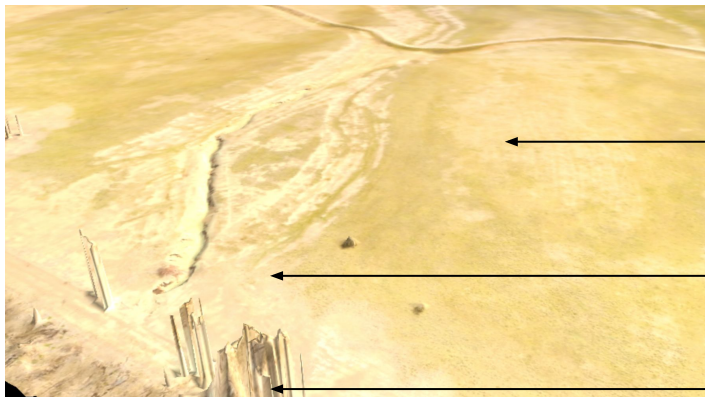


LOW CENTRE CATCHMENT
Volume void : 1 231.21m³
Area: 570.96m²
Min height: 225.80m ASL
Max height: 259.47m ASL

MAIN EROSION, SLOPE
Volume void : 8 512.27m³
Area: 2960.80m²
Min height: 260.84m ASL
Max height: 265.10m ASL

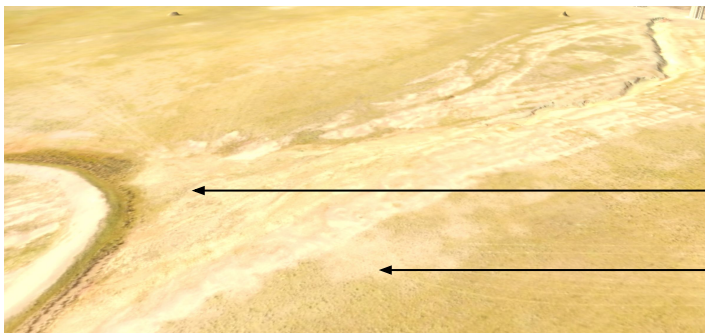
TUNNEL EROSION
PRESENT
Cut and backfill or treat
accordingly

CREEK LINE
Volume void : 14 671.6m³
Area: 1383.55m²
Min height: 243.89m ASL
Max height: 260.67m ASL



MAIN EROSION, SLOPE
 Volume void : 8 512.27m³
 Area: 2960.80m²
 Min height: 260.84m ASL
 Max height: 265.10m ASL

PROPOSED MANAGEMENT
 Fence with hot wire or netting and graze with dense sheep mob to break up top soil crust and deposit animal waste for fertility. Prior management to include feeding sheep seed or broadcasting prior to moving stock into area. High density of animal numbers is critical. Place mob in area for maximum 24 hours every 18 days



SLOW/DIVERSION POINT
 Water is caught at mineral break and diverted downslope to West towards creek. Plant with riparian species, juncos and sedges to provide soil protection and retain moisture in soils.

HIGH WATERSHED VELOCITY
 Water sheds from forested block Upslope at high velocity creating erosive Effects on farm. Vegetate upslope at fence line to slow watershed.

AREA AT RISK
 Lack of vegetation cover indicative of area at risk of erosion. Plant with riparian species or use high density stock management with broadcast cover crop seed for restoration of soils and pastures. Will suit perennial species.



TUNNEL EROSION
PRESENT
Cut and backfill or treat
accordingly

LOW CENTRE CATCHMENT
Volume void : 1 231.21m³
Area: 570.96m²
Min height: 225.80m ASL
Max height: 259.47m ASL



CREEK LINE
Volume void : 14 671.6m³
Area: 1383.55m²
Min height: 243.89m ASL
Max height: 260.67m ASL

WETLAND/MARSH AREA
Cautious with earthworks and
livestock management, would
suit planting of riparian species
or those can handle boggyess.



Project resources developed by Danny Pettingill, Firetail Environments:

[READING LANDSCAPE PLANT SELECTION MATRIX](#)

[Resilient and Adaptive Community-based Landscape Restoration](#)
[Resilient and Adaptive Community-based Landscape Restoration - LANDCARE AUSTRALIA WEBINAR SERIES](#)

Other resources can be found at the following link:

<https://www.firetailvic.com/resources>

Please contact the author, Danny Pettingill (firetailvic@gmail.com) for access

<https://www.firetailvic.com/land>
firetailvic@gmail.com

Acknowledgements:

The author thanks the Victoria State Government, Department of Environment Land Water and Planning (Victoria), Loddon Plains Landcare Network, participating landholders in the READING LANDSCAPES project, Bendigo TAFE, Dayna Morrissey Design, Ben Boxshall, Brian Wehlburg and others that made contributions to this project

The READING LANDSCAPES project is supported by the Victorian Government.

Plant Selection Matrix thanks and references:

Ben Boxshall, *Trees on the Treeless Plains* (David Holmgren), *Neangar Nursery plant list (forestry)* (Ken Wellard), *The Useful Native Shrubs of Australia (including Tasmania)* (JH Maiden), *DELWP Naturekit, Recreating the Country* (Stephen Murphy), *Indigenous Plants of Bendigo* (City of Greater Bendigo and Bendigo Native Plant Group Inc.), *Native Trees and Shrubs of South-Eastern Australia* (Leon Costermans), *Honey and pollen flora of South-Eastern Australia* (Dr Doug Somerville), *collections, journals, notes, records and observations of Danny Pettingill including interviews with land holders and farmers in central Victoria*

This document forms part of the READING LANDSCAPES framework, working towards advanced understanding of land stewardship for enhanced biodiversity, community dynamics, landscape function and farming enterprises.

Golf Ball scoring method adapted from: Nick Schultz et al. The golf ball method for rapid assessment of grassland structure. *Ecological Management & Restoration*.

All images by Danny Pettingill except Grey Crowned Babbler and Diamond Firetails (page 15) credit: Malcolm Cousland.

FIRETAIL
WWW.FIRETAILVIC.COM





FIRETAIL

WWW.FIRETAILVIC.COM

