Guidelines for undertaking the Restoration Outcomes Monitoring Protocol (ROMP)

Dr Sacha Jellinek, Dr Joe Greet & Dr Yung En Chee

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Technical Report 22.1

Melbourne Waterway Research-Practice Partnership

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Report to: **Melbourne Water**

Published: November 2022
Produced for: Project A2a: Monitoring, Evaluation, Reporting and Improvement (MERI) for Riparian Revegetation

Cite as *Jellinek S., Greet J. & Chee, Y.E. (2022) Guidelines for undertaking the Restoration Outcomes Monitoring Protocol (ROMP). June 2022. Melbourne Waterway Research-Practice Partnership Technical Report 22.x*

Contact author:

Reviewed by: Dr Paul Rees & Sharyn Rossrakesh (Melbourne Water)

Cover photo: Revegetation on Phillip Island

Version: 1.1

Version Number	Purpose/change	Authors(s)	Date
1.1	Review by Melbourne Water	Yung En Chee, Joe Greet & Sacha Jellinek	14/12/22

Acknowledgment of Country

Melbourne Water and The University of Melbourne respectfully acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Owners and custodians of the land and water on which all Australians rely. This research was conducted on Wurundjeri Woi Wurrung, Wadawurrung, Taungurung and Bunurong Country and we pay our respects to their Elders past present and future as Traditional Owners and the custodians of the land and water on which we rely and operate. We acknowledge and respect the continued cultural, social and spiritual connections of all Aboriginal Victorians, and the broader Aboriginal and Torres Strait Islander community have with lands and waters, and recognise and value their inherent responsibility to care for and protect them for thousands of generations. Melbourne Water is committed to working in partnership with Traditional Owners to ensure meaningful ongoing contribution to the future of land and water management.

1. Table of Contents

2. Background

The Restoration Outcomes Monitoring Protocol (ROMP) is a structured monitoring approach that has been developed to help assess the effectiveness of management interventions such as revegetation, weed control and pest animal management activities, and to track how restored areas change into the future. This monitoring protocol is based off a number of similar protocols (Treloar, 2012; Morris et al., 2015; Jellinek et al., 2019) and other studies (Pryde & Duncan, 2015; Capon et al., 2020; Dell, 2020), and can tie restoration outcomes to the Society for Ecological Restoration guidelines (Gann et al., 2019). The protocol presented here is associated with purpose-designed conceptual models that have been divided into early and medium to long-term monitoring stages (see conceptual models in Appendix 1 and Appendix 2, and associated tables in Appendix 3 and Appendix 4).

ROMP is to be undertaken as a Before After Reference Intervention design, where possible. This means that monitoring should take place before and shortly after interventions, and then at pre-defined periods, with restored sites paired with target (remnant or reference) habitats if appropriate sites are available. The ROMP method breaks monitoring down into three phases. These phases include:

1 Pre-establishment phase: undertaken 1 to 2 weeks prior to any management interventions being undertaken (Appendix 1).
2 Establishment phase (0 to 3 years): monitoring areas within 1 to 2 weeks of management interventions, then every spring for 3 years. Undertaken at intervention and target sites (Appendix 1).
3 Post-establishment phase (5 to 20+ years): monitoring the longer-term changes at the site in spring (intervention and target) every 5 years since establishment (Appendix 2).

In the pre-establishment phase, baseline information is collected prior to management interventions being undertaken. Where possible, this work should involve discussions with on-ground staff to identify exactly where and when management interventions will be undertaken (Appendix 5). During the establishment phase (0 to 3 years), outcomes of interest include revegetation survival and growth, natural recruitment, litter cover and impacts of pest animal and weed management actions (Appendix 1, Appendix 4). In the post-establishment phase (5 to 20+ years), outcomes of interest include progress of restored areas encompassing canopy cover, development of large trees, cover of fallen timber and organic litter and the structural and functional diversity of the site (Kaye, 2021), as well as pest animal and weed species densities, and ideally, native animal use (Appendix 2, Appendix 4). Fauna monitoring alongside vegetation assessments (e.g., Birdlife Australia 20 min, 2 ha count method) will provide information on how animals use and colonise revegetated and restored sites.

It should be noted that target sites may be difficult to locate, especially in highly urbanised areas or in agricultural landscapes, so it may be necessary to have one target site as a reference for two to three nearby (<10 km) sites with management interventions, depending on the landscape context and revegetation effort among sites. It is proposed that control sites (where no management action is undertaken, and where the starting condition is similar to the site that will be restored) are not used, as in many cases it is too difficult to ensure no management interventions are undertaken at these sites, especially if they are privately owned (Kaye, 2021).

2.1 Conceptual models

These serve as tools for thinking, articulating relationships and supporting communication. The conceptual models in Appendix 1 and Appendix 2 have been designed to serve the following purposes:

1. Set out clear objectives for vegetation management

2. Identify the suite of contextual, site and implementation modifiers that must be documented
3. Identify revegetation outcomes relevant to the given timeframe of interest and meaningful measures for each.

This information has been gained from a range of reports and other similar conceptual models (Morris et al., 2015; Melbourne Water, 2018; Dell, 2020). While these conceptual models provide an overview of the hierarchy of interactions, they do not focus on the direct impact of an implementation modifier, for example, on the outcomes of that action. More detailed conceptual models may be needed for individual priorities (for example, bird responses) in order to better understand the interactions of different modifiers.

Over short and longer-term timeframes, contextual and site modifiers remain relatively constant (Appendix 1, Appendix 2). Contextual modifiers include climate regimes and climate change, which may influence extreme weather events such as flooding or high temperatures. Contextual modifiers also include soil type and structure, how the adjacent landuse changes over time (for example, from remnant to agricultural to urban areas) and how that influences restored areas. While measuring water quality and hydrology is important, this would require more research to record the benefits of vegetation establishment on waterways rather than works effectiveness. Similarly, as hydrology and water quality are strongly influenced by upstream processes and impacts, they can be temporally highly variable (e.g. varying seasonally/annually), meaning that detecting a 'signal' as a result of revegetation may be difficult. As such, we have not included this metric in our conceptual models.

Site modifiers are those that have a more direct influence on the area being restored, and include what the vegetation type is at the site and its condition, weed and herbivore abundance, if channel incision is present, what the previous landuse history has been (for example, grazing or cropping land), the topography and aspect of the site, and if the site has been or will be influenced by uncontrolled fire or controlled burns. These modifiers have a direct impact on the outcomes of the management interventions, such as revegetation, and ultimately the site objectives.

More information on the conceptual model and their related modifiers can be found in Jellinek et al. (2021).

3. Method

3.1 Resourcing

It is expected that for each site, a survey would take between 2 to 3 hours, including set-up, but this will depend on the complexity of the site (e.g. target sites may take longer). The method requires two people at any one time, one of which needs to have moderate to good plant identification/botanical skills. Ideally, undertaking monitoring across multiple sites spanning different environmental variables will provide the most robust data to understand the effectiveness of different management interventions.

Equipment required includes:

- GPS, camera & compass
- 20 m tape measure
- 2 m structure pole, marked every 0.5m (see Appendix 6)
- 1 x 1 m quadrat
- Diameter tape or forestry callipers
- GRS Densitometer (if more accurate cover estimates are required)
- 6 metal star pickets & tags (to mark each site)

3.2 Site selection

The selection of sites is critical to ensure the stratification of survey sites across important environmental gradients (e.g. stream size, climate, soil type and landscape context). This stratification would ideally show how revegetation survives and grows in different areas, and what factors, such as contextual (e.g. climate) and site modifiers (e.g. land-use history), etc., are likely to influence intervention planting outcomes (Appendix 3). This knowledge would allow managers to more effectively restore areas in the future, and potentially take into account the detrimental impacts of climate change.

Site selection requirements:

1 Ideally choose sites that have had minimal restoration works undertaken on them previously, as this will make monitoring new plantings easier. However, sites where only some lifeforms are being restored, such as understory plants, could be included in monitoring. This monitoring would follow the outcomes of site preparation (e.g. weed and pest animal control), revegetation and potentially other interventions through time.
2 Areas that are a minimum size (150 x 20 m), as these areas are less likely to be impacted by factors such as edge effects (such as wind, temperature extremes or urban impacts), and larger areas generally provide greater habitat and environmental values.
3 Sites distributed across multiple catchments or environmental gradients in rough proportion to catchment size and total lengths of areas available for management interventions.

Other variables of secondary consideration could be:

4 Close proximity (<10 km) to remnant sites, as these would act as target sites to the revegetated areas. These target sites would need to be a similar vegetation type (e.g. Ecological Vegetation Class) to those areas being revegetated.
5 Landscape contexts such as land-use (e.g. urban, peri-urban and regional landscapes), climatic gradients or the degree of predicted rainfall and temperature change to 2050/2070 based on Victorian Climate Projections 2019 (DELWP, 2019) and soil type (e.g. for Melbourne, granite plains in the west and north, sandstone and mudstone soils to the east and sandy and clay soils in the southeast) (Young, 1956).
6 Alignment with other projects (where possible), especially to do with fauna monitoring.

3.3 Monitoring protocol

Where management interventions such as revegetation, weed control and/or pest animal control have taken place, the ROMP method seeks to monitor sites in three distinct phases, as mentioned above.

Steps in each phase, detailed below, include:

1. Survey set-up
2. Recording site details
3. Plant composition and heights monitoring
4. Vegetation structure and canopy monitoring
5. Ground cover and grazing animal monitoring

Note that in the establishment phase (Phase 2), the recording of site details at intervention sites will only need to be done to note revegetation activities (e.g. the area planted and the time of planting) and any other specific management information, because the gathering of site information and establishing survey plots would have been completed in the pre-establishment phase.

Most of the information captured below relates to the gathering of data online and/or on site (Appendix 3), implementation modifiers (IM) and revegetation outcomes (RO, Appendix 4), as well as implementation outcome metrics (Appendix 1, Appendix 2). Some of the implementation modifiers, such as recording seed viability (IM 3) and the use of climate adjusted seed (IM 6) require experimental trials and are not described in this document but are covered in the Climate Future Plots publication for climate adjusted seed (Jellinek & Bailey, 2020). Example data sheets for ROMP have been provided in Appendix 7.

3.3.1 Survey set-up

If the site will have management interventions (revegetation, pest animal control and/or weed control) undertaken on it, consult on-ground personnel to determine the area that will be restored and survey the site approximately 1 to 2 weeks prior to the management actions being undertaken (although timing may differ depending on access and interventions being undertaken).

1 Mark out a 250m long and 20m wide survey area within the site using a GPS (Figure 1). If the site is having management interventions undertaken, such as planting, ensure that at least 50% of the monitoring site will have works undertaken. The length of the survey area (250 m) should run adjacent to the stream.
2 Establish **6 belt transects** within the survey area, again prioritising areas that will have management interventions (Figure 1).

   a. Run a 20m tape perpendicular to the stream from the stream edge (where the vegetation changes from largely aquatic or semi-aquatic to terrestrial, or the low water mark). Where the bank is eroded, start from the top of the bank.
   b. Place a metal stake at the end of the 20m tape (farthest end from the stream). The belt transect survey area is 2m either side of this line, giving a survey area of 20 m x 4 m for each belt transect.
   c. Metal stakes should be capped and marked with a metal tag. The metal tag should identify the site name/number and transect number (1 - 6) (e.g. ID15WattsT3).
   d. Record the start and end point of each belt transect using a GPS, and take photographs of the stake with the metal tag, looking along the transect towards the stream edge. Where possible draw a diagram of the site, marking the overall site area and the location of each stake and belt transect.
   e. Each belt transect should be spaced at least 30 m apart within the 250 m survey area, where possible. If the belt transects do not include revegetation in the intervention sites, consider moving to adjacent areas where revegetation was undertaken. Record where these belt transects were moved to and from.

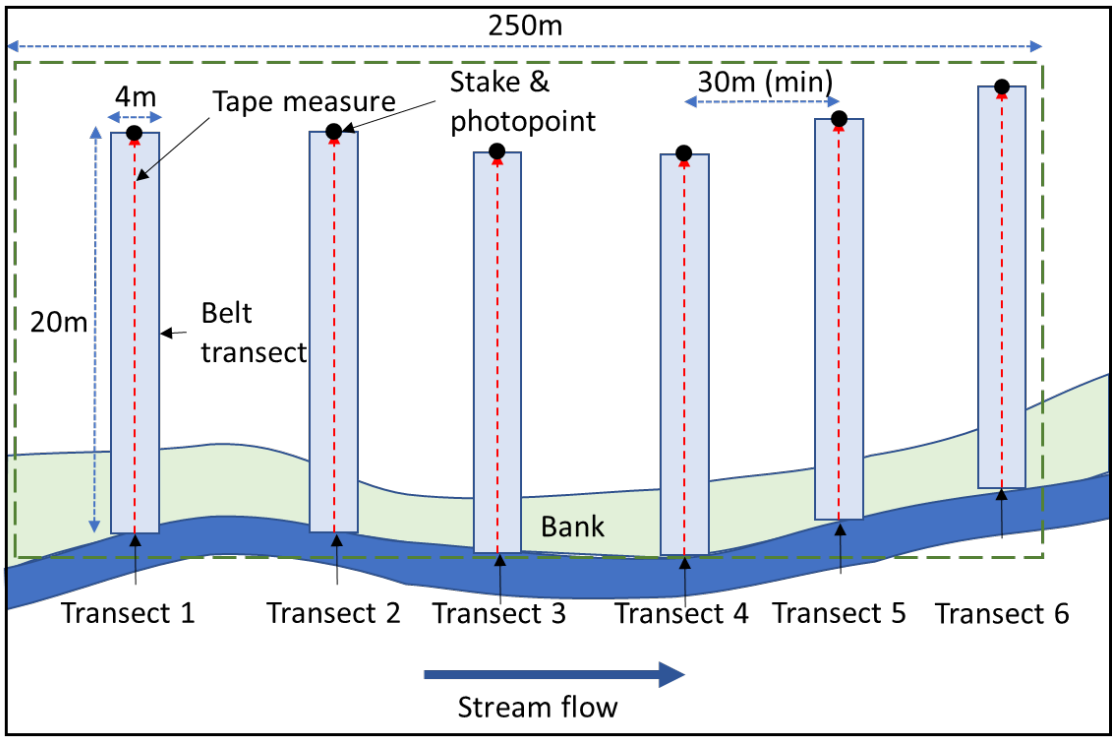

Figure 1. Suggested layout of the Restoration Outcomes Monitoring Protocol survey setup (diagram adapted from Morris et al. 2015).

3.3.2 Recording site details

3 Record information on the site that you are going to monitor, and map the monitoring site using a GPS (coordinates should be recorded using GDA94, MGA zone 55). If the site has been revegetated and/or other management interventions have been undertaken, also map the planting area (as a polygon). Record all of the relevant site information (see Appendix 3 for the source of information to be collected - on-site or online), especially those related to site modifiers (e.g. land-use history) and implementation modifiers (e.g. site preparation). Contextual modifiers can largely be collected from online sources (Appendix 3). Refer to the first data sheet (Appendix 7) for more information on the data that needs to be recorded whilst on site.

3.3.3 Plant composition and heights monitoring

4 Following the centre line (where the measuring tape is laid out) of the belt transect, record all of the **existing and recruiting trees and shrubs**, and *if planted* the **revegetated trees, shrubs and understorey species** in the 20m x 4m belt transect to species level. Provide counts of each species (IM 2, 5 + RO a, b). This can be done by walking along the centre of the belt transect and recording all the woody plants which the 2m structure pole touches/reaches. In separate columns:

a. Record the **heights** of *five* randomly selected trees and shrubs of each species (RO a) in the belt transect, to the nearest 0.5 m using the 2 m long structure pole. Record the heights for existing, recruiting and revegetated trees and shrubs separately. For plants >2 m, estimate to the nearest metre.
b. Separately record (tally) the number of plants for each species that are **existing, recruits** or have been **revegetated** (planted). Recruits are individual plants which may be seedlings or re-growth between 20 cm to 3 m tall for trees (Morris, 2016) and 20 cm to 1 m tall for shrubs that have not been planted. Do not count recruits that are <20 cm in height.

c. Record (tally) the number of plants for each species that are **dead**. If a plant cannot be identified to species or genus level, record as 'dead unknown' in the *Species name* field.
d. Note if the species are **reproductive** (flowering, producing seeds, etc).
e. For all trees within the belt transect that are >5 m in height, measure their diameter at breast height (DBH - 1.3 m above the ground) using forestry callipers (RO h). Measure all stems if the tree is multi-stemmed.

Note: If infill planting has taken place in previous years, record if the revegetated plants are from that infill planting, noting the planting year (IM 14). If different provenances were planted (and are marked accordingly), record the provenance number as well as the species planted (IM 6).

3.3.4 Vegetation structure and canopy monitoring

Every 5 metres along the belt transect place the structure pole vertical to the ground, making sure it is placed directly beside the 5m point along the transect (i.e. at 0 m, 5 m, 10 m, 15 m, 20 m, see Figure 2).

5 Structure monitoring (RO j): Starting from the bottom of the pole, record the plant forms touching the pole (tree, shrub, herb, sedge/rush, grass, fern, vine) at each height class (0 – 0.5 m, 0.5 – 1 m, 1 – 1.5 m, 1.5 – 2 m).

6 Tree canopy (RO g): Look up along the line of the structure pole towards the canopy. If the structure pole continued all the way up to the canopy and would pass within the bounds of any tree crown, record this as present (P), or absent (A) if it is does not. If the canopy is present (P), record if it is a native or exotic plant species (N/E). Where possible, a GRS Densitometer should be used.

Note: Within the bounds means that if a polygon was traced around the tree crown, the line of the structure pole would sit inside the area contained by the polygon.

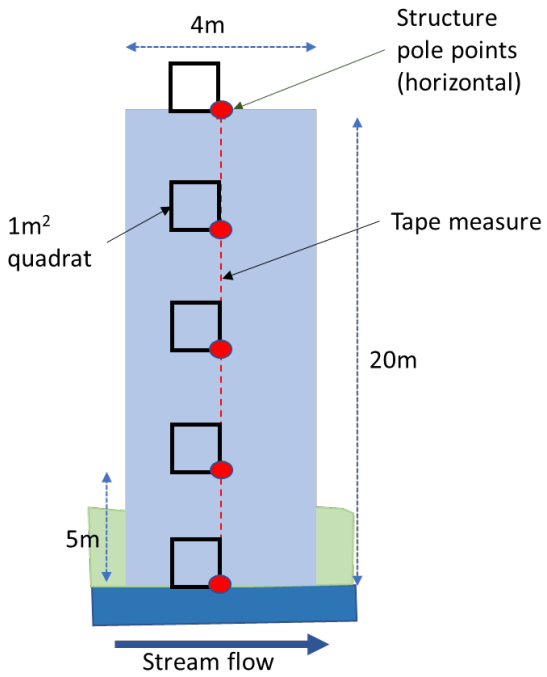

Figure 2. A belt transect containing five 1 m square quadrates and five structure poll points, each 5 m apart along the 20 m long belt transect.

3.3.5 Ground cover and grazing animal monitoring

Every 5 metres along the belt transect place a 1 x 1 m quadrat on the upstream side of the transect line (i.e. at 0 m, 5 m, 10 m, 15 m, 20 m – see Figure 2). Try and avoid trampling this side during site set-up. When

recording details for each 1 x 1 m quadrat, number them 1 to 5 starting from the stream edge. Record the following:

7 Ground cover estimates: Estimate the percentage cover to the closest 5% of: bare ground/soil, rock, litter/fine woody debris (width <10 cm, RO c), coarse woody debris (width >10 cm, RO i), native vegetation (that is alive, RO j), exotic vegetation (that is alive, RO e) and water (Appendix 4). If the ground layers are as a result of planting activities, such as woodchips or jute matting, also record the cover of these elements.

   Note: These estimates can be over 100% overall. If a standing tree is obscuring the quadrat area, move the quadrat up the transect line (away from the stream) until it can be laid on the ground.

8 The presence of up to five dominant native grass or herb species in each quadrat.

9 The presence of all environmental weeds in each quadrat. See https://www.ari.vic.gov.au/__data/assets/pdf_file/0027/125919/ARI-Technical-Report-287-Advisory-list-of-environmental-weeds-in-Victoria.pdf for a list of these species.

10 Count the pellet groups for macropods (M), rabbits (R), deer (D) and other species (note animal species) in each of the quadrats (RO d).

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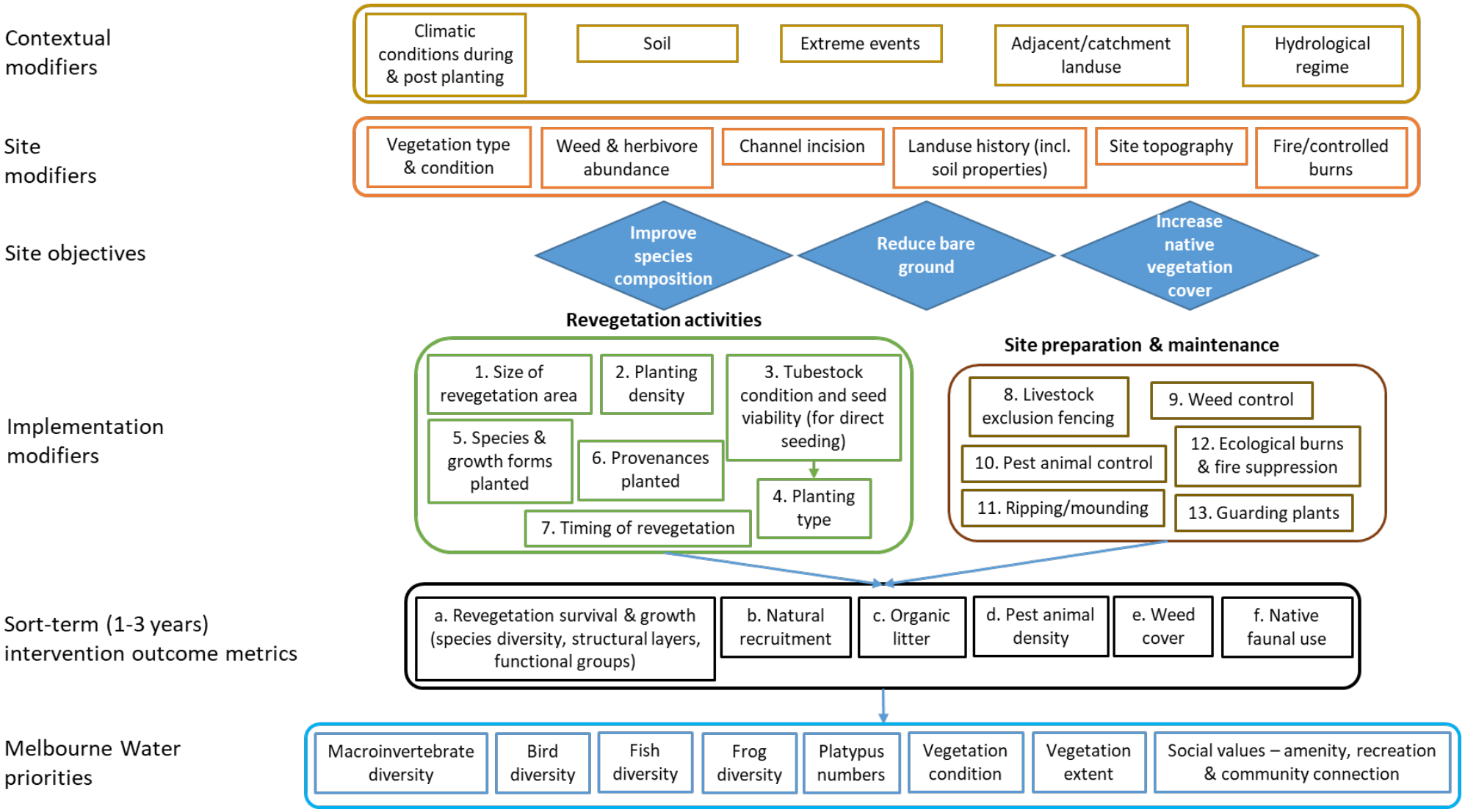
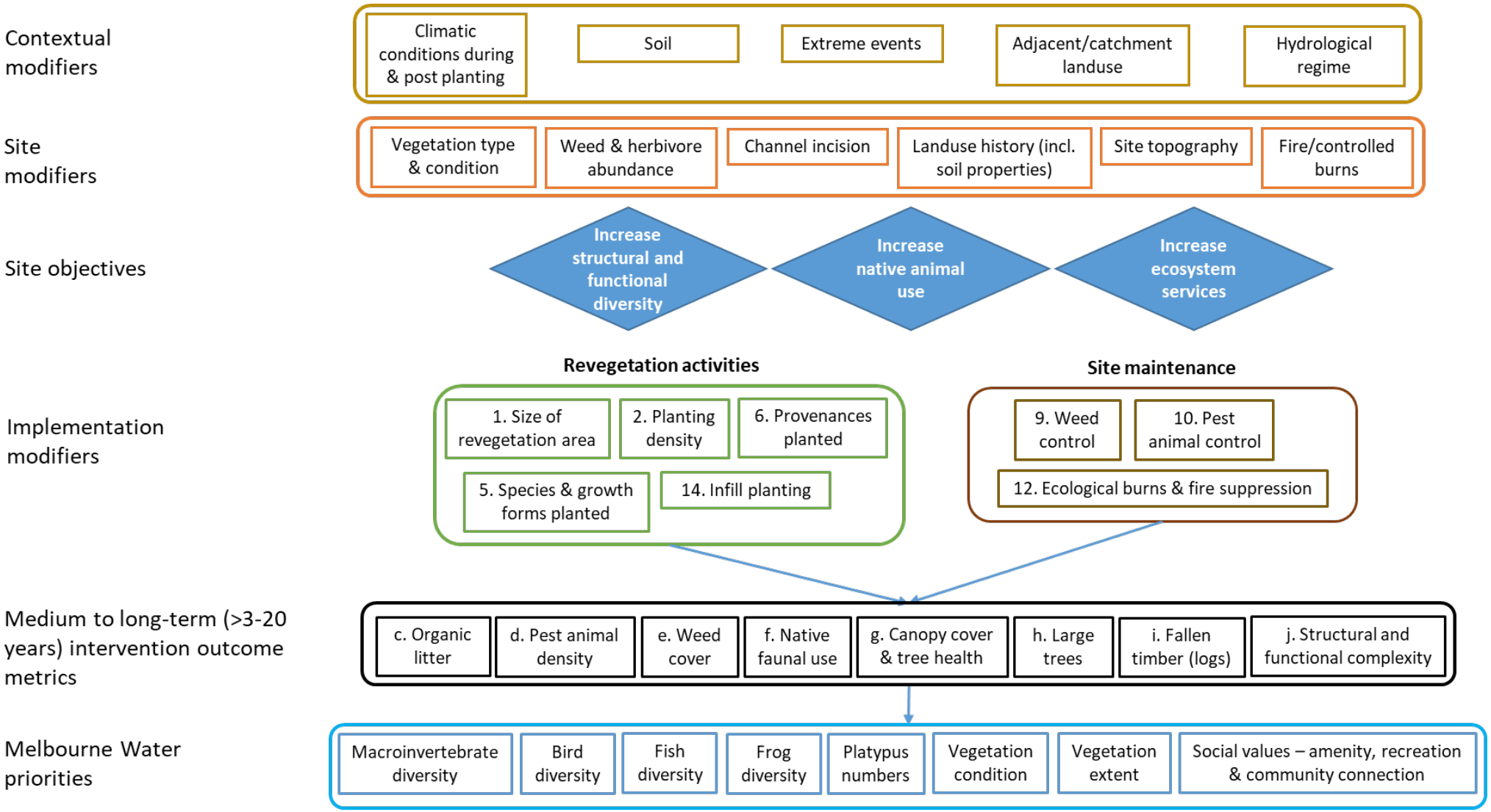
Appendices

*Appendix 1. Restoration outcomes monitoring protocol (ROMP) conceptual model of the **short-term (1–3 years)** management intervention outcomes.*



Appendix 2. Restoration outcomes monitoring protocol (ROMP) conceptual model of the medium to long-term (>3 to 20 years) revegetation outcomes.



Appendix 3. Contextual and site modifiers listed in the ROMP conceptual models and how this information will be recorded in the ROMP method and the metrics that would be measured.

Modifiers	**Data source**	**Metrics recorded/measured**
Contextual modifiers		
Climate conditions	Bureau of Meteorology	Monthly, seasonal & annual average rainfall. Monthly, seasonal & annual average temperature. Evapotranspiration.
Soil type and properties	Data Vic	The soil type at the site being planted. While not detailed in these guidelines, soil samples could be greatly beneficial to more accurately assess the soil's physical and chemical properties and soil biotic communities.
Extreme events	Bureau of Meteorology	Extreme high and/or low rainfall events. Extreme high and/or low temperatures (e.g. days over 35 degrees C). Floods
Adjacent/catchment landuse	Data Vic (depending on accuracy) or other database	Amount of remnant native vegetation, urban and agricultural land within 50m, 100m & 1km radius.
Hydrological regime	WERG database	Waterway flows, salinity levels and permanency
Site modifiers		
Vegetation type	Data Vic & onground assessment	Approximate EVC at a site. Onground assessments can more accurately assess the site's EVCs.
Vegetation condition	Onground assessment	Dominated by exotic or native vegetation.
Weed & herbivore abundance	Onground assessment	Weed or herbivore species presence and their density/abundance.
Channel incision	Onground assessment	If the stream bank is moving/being eroded.
Landuse history	Onground assessment	Previous use of land and how intensively it was used.
Site topography & aspect	Onground assessment	The topography of the site (e.g. hillside, ridge, gully, flats) and the aspect.
Fire/controlled burns	Onground assessment	Record if and when a fire has occurred, including extent and intensity if known.

Appendix 4. Implementation modifiers (IM) and revegetation outcomes (RO) listed in the ROMP conceptual models (Appendix 1 and 2), including the metrics that are measured. Numbers/letters refer to those listed in the conceptual models.

Number	Modifiers	Metrics measured
Implementation Modifiers for revegetation and site maintenance		
IM 1	Size of revegetated area (m^2)	The total revegetated area at a site and the proportion of the survey area (250m x 20m) that has been revegetated (as a percentage of the total area).
IM 2	Planting density	The number of plants planted in a given area.
IM 3	Tubestock condition/seed viability	Requires pre-planting assessment (health of tubestock in accordance with Melbourne Waters *Standard for Plant Supply*) & specialised equipment for seed viability testing (for direct seeding).
IM 4	Planting type	Tubestock or direct seeding.
IM 5	Species & growth forms planted	The type and number of species & growth form types planted at a site. Provide a detailed species list the number/kg's of seed for each species.
IM 6	Provenances planted	Methods not covered here, but if different provenances from hotter/drier climates were used.
IM 7	Timing of revegetation	Date(s) when plants were planted (start and end dates if it is undertaken over a number of days or weeks).
IM 8	Fencing	If the site was fenced & fence type.
IM 9	Weed control	Type of weed control and when it was undertaken.
IM 10	Pest animal control	Type of pest control and when it was undertaken.
IM 11	Ripping/mounding	How the site was prepared.
IM 12	Burns/Fire suppression	If fire was used in site preparation/maintenance, or if it was otherwise impacted by fire.
IM 13	Guarding	If the plants were guarded & guard type.
IM 14	Infill planting	If infill planting was undertaken & when.
Revegetation Outcomes		
RO a	Plant survival & growth	Individual species counts & height of 5 randomly sampled plants per species in 6 belt transects per site
RO b	Natural recruitment	Individual species counts in 6 belt transects per site
RO c	Organic litter	Ground cover measurements at 5 points (1 x 1m quadrat) per belt transect
RO d	Pest animal density	Presence of pellets at 5 points in each 1 x 1m quadrat per belt transect
RO e	Weed cover	Ground cover estimates at 5 points (1 x 1m quadrat) per belt transect
RO f	Native faunal use	Methods not covered here. Where possible align with existing programs
RO g	Canopy cover	Canopy cover measurements at 5 points (line intercepts) per belt transect
RO h	Large trees	DBH and vegetation structure measurements at 5 points (line intercepts) per belt transect
RO i	Fallen timber	Ground cover measurements at 5 points (1 x 1m quadrat) per belt transect
RO j	Structural/functional diversity	Vegetation structure pole measurements at 5 points (line intercepts) per belt transect.

Appendix 5. Example of what the first year and subsequent years of monitoring might look like.

	Prior to the start of the calendar year	Jan – Feb	Mar – Apr	May – Jun	July – Aug	Sep – Oct	Nov – Dec	Following years (Sep – Nov)
Sites identified and seeds collected/plants ordered								
Discussions with field staff		Workshop with field staff						
Weed/pest animal control undertaken								
Pre-establishment surveys (before any interventions have been undertaken – intervention sites only)								
Establishment surveys (directly after planting/interventions – intervention and target sites)								
Post-establishment surveys (every 5 years – intervention and target sites)								

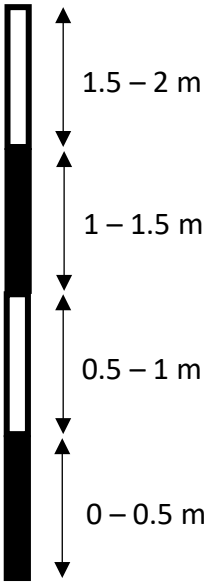
Appendix 6. Making a structure pole (from Treloar et al. 2012)

Make a structure pole using two pieces of electrical conduit and a joiner, to allow the structure pole to be easily taken apart for transport

Instructions:

1 From your local hardware store, purchase a piece of electrical conduit exactly 15 millimetres in diameter and 2 metres in length

2 Use a permanent marker or coloured tape to mark out height sections along the pole: 0 – 0.5 m, 0.5 – 1 m, 1 – 1.5 m, 1.5 – 2 m.



Appendix 7. Data sheets for the ROMP methodology. Where possible digital data collection (e.g. Survey123) should be used.

Recording site details

Site name:	**Date:**
Assessor name/names:	**Organisation name:**
Waterway ID:	
Location (nearest road name & town):	
Site entry coordinates (for future access) **Easting (GPS):** **Northing (GPS):**	
Soil type (select one or more): ***Gravel*** ☐ ***Sand*** ☐ ***Loam*** ☐ ***Clay*** ☐ ***Other*****……..**	
Site topography (select one or more): ***Floodplain*** ☐ ***Slope*** ☐ ***Ridge*** ☐ ***Flats*** ☐ ***Other*****……..**	
Main vegetation type (select one): ***None*** **(*bare ground*)** ☐ ***Pasture Grass*** ☐ ***Scattered Trees*** ☐ ***Remnant Bush*** ☐ ***Other*****……..**	
Remnant EVC type or Revegetation goal (vegetation type/target EVC):	
Management Intervention information (if interventions have been undertaken)	
Management intervention undertaken (select one or more): ***Revegetation*** ☐ ***Weed control*** ☐ ***Woody Weed Control*** ☐ ***Pest Animal Control*** ☐ ***Other*****……..**	
Purpose of management intervention:	
Land-use before planting (select one or more): ***Grazing*** ☐ ***Cropping*** ☐ ***Horticulture*** ☐ ***Plantation*** ☐ ***Reserve*** ☐ **Other……..**	
Planting date/s:	**Planting type:** ***Direct seeding*** ☐ ***Tubestock*** ☐
Planting area (ha):	**Previously planted (Y/N):**
Planted by (select one or more): ***Contractor*** ☐ ***Volunteers*** ☐ ***Landholder*** ☐ ***Other*****…….**	
Plants guarded (Y/N):	**Guard type:** ***Cardboard*** ☐ ***Soft plastic*** ☐ ***Corflute*** ☐ ***Mesh*** ☐ ***Deer guard*** ☐
Weed control done (select one): ***No*** ☐ ***Spot Spray*** ☐ ***Strip Spray*** ☐ ***Whole Paddock*** ☐ ***Other*****…….**	
Weed control date/s:	**Herbicide used:**
Site fenced from livestock (Y/N):	**Fence type:**
Pest animal control done (select one or more): ***No*** ☐ ***Baiting*** ☐ ***Burrow Ripping*** ☐ ***Shooting (deer)*** ☐ ***Shooting (other)*** ☐ ***Other*****……** **Pest animal control date/s:**	
Other site preparation (select one or more): ***Ripping*** ☐ ***Scalping*** ☐ **Burning** ☐ **Other……..**	
Were any of these agents used (select one or more): ***Wetting Agent*** ☐ ***Fertiliser*** ☐ ***Pest Repellent*** ☐	
Were the plants watered during planting (Y/N):	**Were the plants watered after planting, and if so how often?**
Notes:	

Plant composition and heights monitoring (belt transect) - note: 6 copies needed in the field

Site Name:	**Site Type (Works, Remnant):**
Date:	**Assessor Names:**
Belt transect size (select one): ***20m x 4m*** ☐ ***Other……***	**Belt transect position (select one):** ***Floodplain*** ☐ ***Slope*** ☐ ***Ridge*** ☐ ***Flats*** ☐ ***Other……***
Belt Transect Number:	**Photopoint Number:**
Transect location: Easting (GPS):	**Northing (GPS):**

Species Name	**Existing** (tally)	**Recruits** (tally)	**Revegetated** (tally)	**Dead** (tally)	**Heights** (5 of each existing, recruits and revegetated species)	**Reproductive** (Y/N)	**DBH** (all trees >5m, measure at 1.3m)

Notes:

Vegetation structure and canopy monitoring (structure pole) + quadrat assessments

- note: 6 copies needed in the field

Site Name:		**Site Type (Works, Remnant):**								
Date:		**Assessor Names:**								
Belt Transect Number:		**Strata heights**							**Tree Canopy & health**	
Belt Intercept	**Pole height**	Tree	Shrub	Grass	Herb	Sedge	Fern	Vine	Canopy (P/A)	Native/ Exotic
0m	**1.5-2m**									
	1-1.5m									
	0.5-1m									
	0-0.5m									
5m	**1.5-2m**									
	1-1.5m									
	0.5-1m									
	0-0.5m									
10m	**1.5-2m**									
	1-1.5m									
	0.5-1m									
	0-0.5m									
15m	**1.5-2m**									
	1-1.5m									
	0.5-1m									
	0-0.5m									
20m	**1.5-2m**									
	1-1.5m									
	0.5-1m									
	0-0.5m									

Quadrat Cover Estimates (%)								**Pest Animal Pellet Counts**			
Quadrat Belt intercept	**Exotic plants (weeds)**	**Native plants**	**Coarse WD**	**Fine WD & litter**	**Bare ground**	**Rock cover**	**Water**	**M**	**R**	**D**	**O**
0m											
5m											
10m											
15m											
20m											

Environmental weeds present	**0m quadrat**	**5m quadrat**	**10m quadrat**	**15m quadrat**	**20m quadrat**
Native herbs/grasses present	**0m quadrat**	**5m quadrat**	**10m quadrat**	**15m quadrat**	**20m quadrat**
Notes:					