



Office of  
Environment & Heritage  
NSW National Parks & Wildlife Service



# Monitoring Framework for Wilderness Horse Riding Trial

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## 1. Introduction

In November 2012, the NSW Government released the *Strategic Directions for Horse Riding in NSW National Parks*, which committed to providing horse riding opportunities in parks, including the implementation of a two-year trial of horse riding in wilderness across five locations. The purpose of this 'framework' document is to detail the process by which this trial will be monitored to establish whether horse riding on wilderness trails can occur in a sustainable way, i.e. without causing irreversible damage to key natural, cultural and social values associated with the wilderness trails.

The specific aims of this framework are to detail the process that will be used to:

- detect impacts that may occur to key values as a result of horse riding on the pilot wilderness trails within the two year trial period
- define thresholds for implementing management interventions to protect key values from irreversible damage and inform park managers of any threshold triggers
- detect whether interventions are successful in ensuring key values are protected from irreversible damage and inform when interventions should cease.

The framework is committed to managing the pilots using an adaptive approach. This involves monitoring for evidence of impacts during the trial and, where impacts are found to be exceeding acceptable limits, applying management interventions that aim to bring the impacts to within acceptable limits. The trial will run for two years, after which the goal of managing horse riding impacts on trails within acceptable limits will be assessed.

## 2. Locations

Trails in five parks were identified to provide trial opportunities in wilderness across NSW (Figure 1). These are:

- Kosciuszko National Park – Nine Mile and Ingeegoodbee Trails
- Monga National Park – Shoebridge Bridle Track
- Deua National Park – Georges Pack Bridle Track and WD Tarlinton Track
- Mummel Gulf National Park – Dicks Hut Fire Trail and River Road Trail
- Curracabundi National Park – unnamed dozer trail/Bicentennial trail



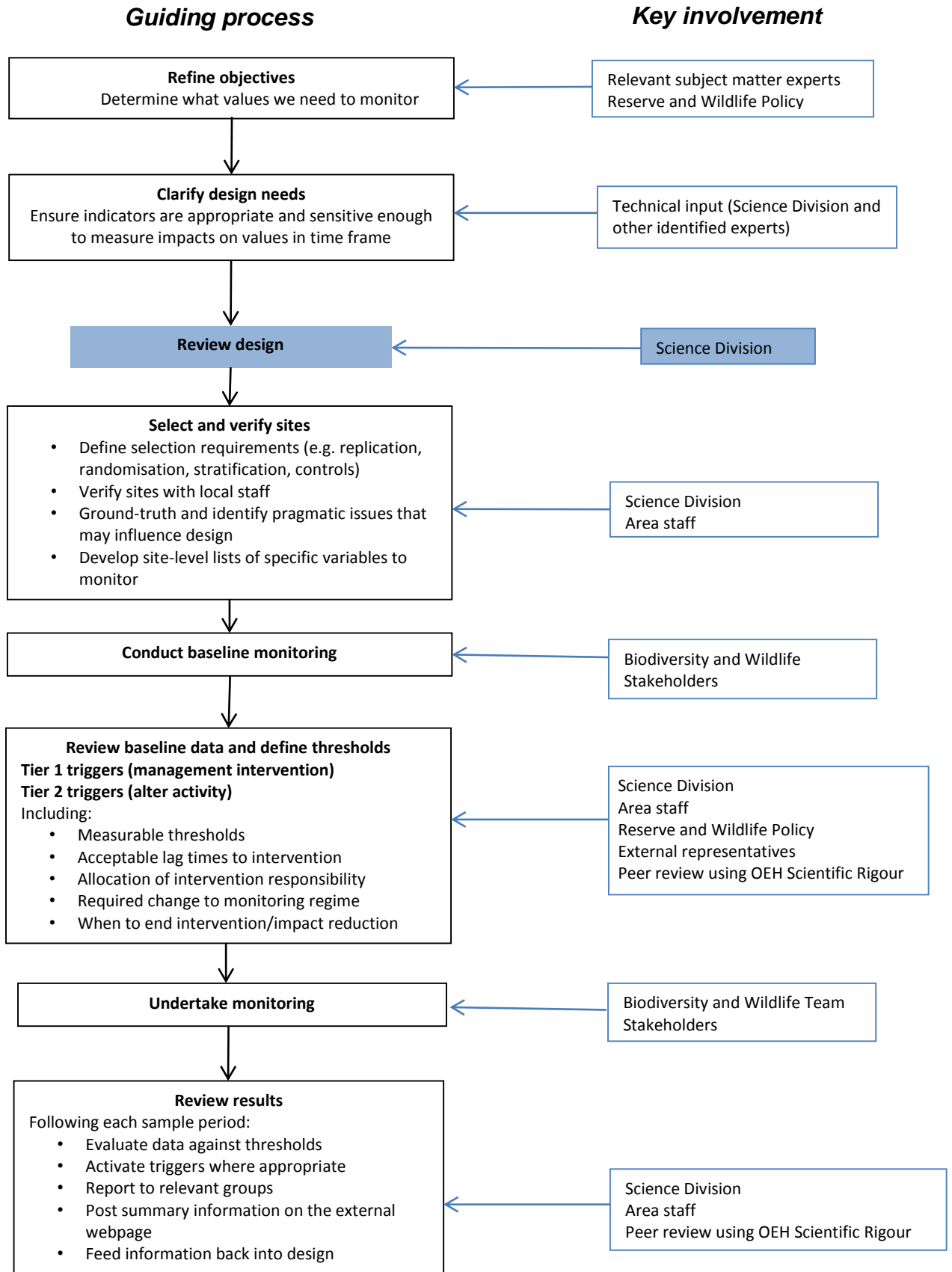
Figure 1: Parks where trial sites for horse riding in wilderness occur

### 3. Monitoring design process

The development of the framework is based on the process and consultations outlined in Figure 2.

#### 3.1 Technical input

The development of methods to monitor horse riding in wilderness was guided by scientific and technical advice provided during a workshop and consultation. Representatives were from Science, Regional Operations and National Parks and Wildlife Service in the Office of Environment and Heritage (OEH) as well as experts from the Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA) that developed and currently implement the [Scientific Monitoring Program for the South East Queensland Horse Riding Trail Network](#).



**Figure 2: Process for the development of the final monitoring design for the trial of horse riding in wilderness areas**

## 3.2 Design parameters and considerations

### 3.2.1 Monitoring design

The key considerations guiding design development were:

1. the ability to **adequately detect change** including ensuring that techniques were:
  - a. **targeted** to the value and to the activity being monitored
  - b. **sensitive** enough to detect impacts within the time frame of the trial
2. that the design is at the **appropriate scale**
3. that it is **flexible** enough to respond to unanticipated usage or impacts.

Monitoring the impacts associated with the introduction of horse riding on wilderness trails requires understanding the condition of variables chosen for monitoring before and after the new use. Table 1 outlines the values considered for monitoring. Assessing the condition of variables before the introduction of horse riding means we can gauge the additional impacts that may occur once horse riding commences. This baseline data collection gives an indication of the sum impacts of users and management activities prior to the addition of impacts associated with the introduction of horse riding on wilderness trails. The condition of variables is also monitored while horse riding occurs. The change in condition associated with the introduction of horse riding will be gauged by comparing the condition of variables during horse riding with the baseline levels. Depending on the variable, this will be assessed at the trail or site level.

Comparisons will not be made between trails, as the differences in environmental characteristics between sites will vary greatly and any comparison would be of no scientific value. The merits of pairing treatment sites with control sites (on wilderness trails with no horse riding) was considered, but was deemed unfeasible due to limited options for suitable paired sites, and timeframe restrictions that were unlikely to yield meaningful comparisons.

The trial is not designed to detect what impacts are associated with horse riding in wilderness, rather those impacts associated with horse riding on wilderness trails can be managed to ensure that horse riding occurs without causing irreversible damage.

Sites for physical monitoring were selected at a desktop level, based on soil wetness and erodibility maps. These areas are likely to be most sensitive to change and also show a response to disturbance sooner than more resilient areas. These sensitive areas are where the best indication of impact on natural values such as vegetation and soil are likely to occur. Desktop-selected sites were ground-truthed and amended, based on local information before baseline data collection. Site selection and techniques are detailed in *Wilderness horse riding trial: Monitoring methods*.

### 3.2.2 Monitoring for management

The framework is driven by the expectation that the trial will include management of impacts if required and monitoring of the success of this management. The design relies on the identification and clear definition of:

1. **Values** that may be affected, e.g. vegetation, soil
2. Possible **impact**, e.g. weed incursion, erosion
3. **Indicators** that an impact is occurring, e.g. presence of a new weed species, trail incision
4. **Thresholds** that define when an indicator has reached a point where management intervention must be implemented, e.g. presence or density of a particular weed species, trail incision to a given depth

5. **Management intervention**, e.g. weed control, temporary trail closure or remediation works.

Values and impacts considered are outlined in Section 3.3. Development of thresholds and management interventions is addressed in Section 5.

### **3.2.3 Consideration of non-horse riding factors**

There are three broad types of influences that vary at each location and must be considered when interpreting data collected over time:

- **Other trail users**, both legal and illegal, e.g. walkers, mountain bikers, trail bike riders – the passage of management vehicles, including those used by the monitoring team, must also be considered as an influencing factor.
- **Trail management activities**. Many of the trails involved in the horse riding trial are management trails that may be periodically maintained at a width dictated by fire management requirements or to meet OHS requirements for users.
- **Environmental influences**, e.g. rain, stream-scouring events, wildlife and feral animal activity.

### **3.3 Selection of values to be monitored**

The values potentially linked with horse riding impact (e.g. Newsome et al. 2008, Pickering 2008) were considered in the development of the monitoring methods for the OEH horse riding on wilderness trails pilot. Table 1 outlines the values considered and the rationale for including or omitting them from monitoring in the OEH trial.

The decision about which impacts should be monitored was based on:

1. Identification of values that may be impacted by horse riding – these values include vegetation, soil, water, threatened species and visitor attitudes.
2. Identification of the ways in which these values may be impacted.
3. Assessment of whether these impacts could be feasibly monitored within the time frame of the trial.



**Table 1: Values considered for monitoring and the rationale for their inclusion or omission\***

<b>Value</b>	<b>Potential impact (indicators)</b>	<b>Included in framework?</b>	<b>Considerations and limitations</b>
Native vegetation	New weed incursion or spread	Yes	Monitored at sites selected based on soil wetness Focus on new incursions and known horse vector weeds Two years unlikely to be adequate time to effectively assess weed spread
	Grazing or browsing at key locations along trail	Yes	Can be easily captured and quantified at sites and may be relevant at stopping/camping locations Most relevant in locations with sensitive plant communities or populations None are currently recorded from trial sites, but all sites will be monitored using a rapid assessment method
	Introduction of pathogens	Yes	Can be captured at sites and along trails by rapid visual assessment (e.g. signs of dieback) but would be difficult to attribute to cause of introduction
Soil	Erosion (track incision)	Yes	Monitored at all sites
	Compaction		Monitored at all sites
	Trail widening		Monitored at all sites Unlikely to be relevant on management trails, which are maintained at a width dictated by fire management requirements, unless trail braiding occurs
	Trail braiding/formation of informal trails	Yes	Captured responsively, in addition to identification of likely locations for trail deviation Difficult to capture in Kosciuszko due to the presence of a large population of feral horses
Water	Increased turbidity	No	Considered practically unfeasible and unlikely to yield meaningful data at a local or catchment level
	Increased nitrification	No	Highly influenced by rainfall and flow and subject to temporal variation Likely to be influenced by increase in erosion and/or manure, both of which are included in the monitoring methods

Value	Potential impact (indicators)	Included in framework?	Considerations and limitations
Threatened species	Interruption of life cycle	No	Desktop assessment of threatened species recorded in a 5 km area of the trails used to decide whether or not to include Monitoring of threats to habitat likely to be more meaningful and practical in the time frame of the trial than developing specific local monitoring for threatened species
Social	Decreased visual amenity	Yes	Changes in rubbish and vandalism captured at sites and along trails by rapid visual assessment Landscape Classification system provides a rapid assessment tool that captures change in sense of wilderness
	Decreased visitor satisfaction (horse riding or non-horse riding groups)	Yes	Survey designed to target riding and non-riding trail users Change can be captured using Landscape Classification system
	Increased visitor satisfaction (horse riding or non-horse riding groups)		
	Negative public perception	Can be quantified by tracking of correspondence and on-line survey responses	
Increased public support			

\* Methods to monitor them are detailed in *Wilderness horse riding trial: Monitoring methods*.

### 3.4 Quantifying frequency and intensity of trail use

Quantifying the frequency and intensity of trail use by horse riders and other users was considered crucial to adequately assess and interpret any level of impact and to inform sustainable trail use.

The methods considered are presented in Table 2.

**Table 2: Methods considered for monitoring frequency and intensity of trail use**

<b>Method</b>	<b>Merits/drawbacks</b>
Counter system	Prone to error, expensive to establish system that can distinguish adequately between users
Trail log books	May be used as a data source, but not in isolation Cannot guarantee use by all users Could be compared to camera data to assess comprehensiveness
Horse rider registration system	May be used as a data source, but not in isolation Cannot guarantee all users will register and not effective way to ensure compliance with registration requirement Could be compared to camera data to assess comprehensiveness
<b>Remote cameras – PREFERRED OPTION</b>	Passive, continuous, unbiased Processing time required for data Some initial cost outlay 100% detection cannot be assumed. Technical issues may hamper detection.

#### 4. Frequency of sampling

Baseline data collection was completed prior to the commencement of horse riding. Monitoring while horse riding occurs will occur twice yearly. Table 3 summarises the timing of monitoring events over the two-year trial.

**Table 3: Proposed timeline for sampling**

<b>2014</b>	<b>Summer</b>	Baseline data collection
	<b>Autumn</b>	Baseline data collection Commencement of horse riding
	<b>Winter</b>	
	<b>Spring</b>	Post-commencement data collection
<b>2015</b>	<b>Summer</b>	
	<b>Autumn</b>	Data collection
	<b>Winter</b>	
	<b>Spring</b>	Data collection
<b>2016</b>	<b>Summer</b>	
	<b>Autumn</b>	Final data collection End of trial

## **5. Thresholds and management interventions**

Baseline data for values and indicators selected for the monitoring program for the OEH horse riding in wilderness trial will be used to guide the following:

- development of thresholds
- identification of appropriate management interventions
- allocation of responsibilities and acceptable lag times for the implementation of management actions.

Thresholds and management interventions will be developed and placed on the OEH website following a series of facilitated workshops.

### **5.1 Development of thresholds**

Thresholds represent points when management intervention is needed, i.e. when monitoring shows that an impact is occurring to an unacceptable level. Thresholds may be based on scientific research and/or current understanding based on experience and stakeholder views. It is important that thresholds are applied consistently.

Thresholds were developed using the following process:

- review of baseline data to identify parameters for meaningful and measurable thresholds with input from the technical representatives involved in the methods development
- input of stakeholders and NPWS staff.

The development of thresholds was facilitated by experts in structured decision making from the University of Melbourne (Dr. Kelly Hunt De Bie and Mr. Will Morris). The process was undertaken over a series of four workshops; one to address overarching objectives and decision framework and three workshops held in the regions where trails were established (Narooma, Jindabyne and Armidale). The process undertaken and workshop outcomes are detailed in De Bie & Morris (2015).

The thresholds developed during this elicitation process were reviewed by NPWS and OEH Science staff in relation to data from the first two sample periods (baseline and Spring 2014) to ensure that applied thresholds had the resolution required to provide an alert to change in each relevant indicator. Revised thresholds are listed in Table 4.

### **5.2 Development of management interventions**

Management interventions are intended to return the value to a desired range of condition. They should be implemented as soon as possible after a threshold is breached.

Management options to address potential issues and impacts associated with the horse riding in wilderness trial were identified during threshold development workshops. This process involved identifying potential issues for each trail, available management actions and developing decision points to trigger the various management options identified. Following the workshops, management interventions were reviewed by staff, along with the thresholds (section 5.1). The indicators and associated management interventions developed using this structured decision making approach are detailed in Table 4.

**Table 4:** Indicators, management thresholds, and management responses for all horse riding in wilderness trial locations as set May 2015. Far South Coast thresholds and responses apply to Georges Pack Track, WD Tarlinton Track and the Shoebridge Track. Thresholds were developed through a series of facilitated workshops using a Structured Decision Making approach, and follow-up review by NPWS staff in relation to baseline data. This approach is adaptive, and may be refined as further information becomes available.

Indicator	Monitoring level	Far South Coast		Kosciuszko		Mummel Gulf	
		Threshold	Response	Threshold	Response	Threshold	Response
Track width	Average	+10%	Notify Area Manager & key groups	+10%	Notify Area Manager who will assess need for hardening and implement as appropriate. Notify relevant stakeholders if action is required.	+10%	Notify Area Manager, who will assess options including minimal hardening/restricting with barriers (logs etc.) and implement as necessary. Consider track head signage.
		+20%	Assess need for hardening				
	Site	-	-	+20%	Assess need for hardening and implement as appropriate. Notify relevant stakeholders if action is required.	+20%	Assess need for hardening or restricting with barriers (logs etc.).

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Indicator	Monitoring level	Far South Coast		Kosciuszko		Mummel Gulf	
		Threshold	Response	Threshold	Response	Threshold	Response
	<b>Sites without existing trail</b>	-	-	-	-	Any evidence of trail formation (Sites MDH002 & MDH007 only)	Notify Area Manager, who will assess options including restricting with barriers (logs etc.) and implement as necessary.
<b>Soil compaction</b>	<b>Average</b>	+/-100%	Notify Area Manager who will assess options for on-ground response.	+/-50%	Notify Area Manager who will assess options for on-ground response	+/-40%	Notify Area Manager, who will assess options including minimal erosion control measures and implement as necessary.
	<b>Site</b>	+/-50%	Notify Area Manager who will assess options for on-ground response.	+50% (fan out sites only KNP017, KNPCAMP2, KNPCAMP3)	Notify Area Manager who will assess need for remediation work as appropriate. Notify relevant stakeholders if action is required.	+/-25% (fan-out site MDH007 only)	Assess need for erosion control measures.

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Indicator	Monitoring level	Far South Coast		Kosciuszko		Mummel Gulf	
		Threshold	Response	Threshold	Response	Threshold	Response
Erosion area	Average	+20 percentage points	Notify Area Manager who will assess options for on-ground response.	20 percentage points	Notify Area Manager who will assess need for remediation work as appropriate. Notify relevant stakeholders if action is required.	+40 percentage points	Notify Area Manager, who will assess options including need for track hardening and/or erosion control and implement as necessary.
	Site	+50 percentage points	Notify Area Manager who will assess options for on-ground response.	+ 50 percentage points	Notify Area Manager who will assess options for on-ground response	+50 percentage points (steep site)	Assess need for erosion control measures.
						+25 percentage points (lowland site)	Assess need for track hardening and/or erosion control.
Depth in quadrat	Average	-	-	-	-	+5cm	Assess need for minimal track hardening and/or erosion control.

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Indicator	Monitoring level	Far South Coast		Kosciuszko		Mummel Gulf	
		Threshold	Response	Threshold	Response	Threshold	Response
	Site	+5cm	Notify Area Manager who will assess options for on-ground response.	+10cm	Notify Area Manager who will assess need for remediation work as appropriate. Notify relevant stakeholders if action is required.	-	-
Weed species number	Trail	+1	Enact Regional Pest Management Strategy	+1	Enact Regional Pest Management Strategy. Notify relevant stakeholders if action is required.	+1	Enact Regional Pest Management Strategy and Walcha Area Pest Plan.
	Site	+1	Notify Area Manager and key groups	+1	Enact Regional Pest Management Strategy. Notify relevant stakeholders if action is required.	+1	Enact Regional Pest Management Strategy and Walcha Area Pest Plan.
Weed species % cover	Site	+20 percentage points	Enact Regional Pest Management Strategy	+100%	Notify Area Manager. Enact Regional Pest Management Strategy. Notify relevant stakeholders if action is required.	+25%	Enact Regional Pest Management Strategy and Walcha Area Pest Plan.



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Indicator	Monitoring level	Far South Coast		Kosciuszko		Mummel Gulf	
		Threshold	Response	Threshold	Response	Threshold	Response
Pathogens	Site	1) Visual evidence	Soil testing	1) Visual evidence	Soil testing	1) Visual evidence	Soil testing and possible temporary site closure
		2) Confirmed presence	Temporary closure, treatment, hygiene protocol implementation	2) Confirmed presence	Temporary closure and treatment, hygiene protocol implementation	2) Confirmed presence	Temporary closure and treatment, hygiene protocol implementation
Heritage assets	Site	No heritage items of concern identified in trial area	-	Damage or deterioration	Enact existing management plan. Notify relevant stakeholders if action is required.	No heritage items of concern identified in trial area	-
Landscape class	Site	+1	Investigate and treat physical, social or managerial factor that caused increase.	+1	Investigate and treat physical, social or managerial factor that caused increase.	+1	Investigate and treat physical, social or managerial factor that caused increase.
Social cohesion	Trail	Complaint	All reports followed up and communicated to user groups.	Confirmed complaint	Reports followed up and communicated if necessary to users	Validated feedback	Reports followed up and communicated if necessary to users.

### **5.3 Evaluation**

Biannual data will be assessed against baseline data and agreed thresholds following each sampling event. The efficacy of established thresholds and management interventions will be assessed as the trial proceeds. This will be informed by further work to determine if more detailed separation of effects is feasible.

## **6. Reporting**

Data will be compiled and evaluated following each data collection event. Monitoring data compared to thresholds will be posted on the OEH website and updated after each data collection event so the community has access to key information as the trial proceeds. The data from monitoring will also be reported regularly to those responsible for management interventions. The outcomes of management interventions will also be reported in the following reporting round.

An evaluation will be undertaken at the end of the two-year trial.

## **References**

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