

# HorsesLandWater Peri-Urban Project

## Land condition monitoring on horse keeping properties



- Soil erosion • Groundcover • Fence line tracking •
- Pasture composition • Weeds • Stream bank erosion •
- Soil health and fertility •

Prepared by Michael Cowin

### HorsesLandWater

PO Box 483  
Plympton SA 5038  
Phone (08) 8294 2460  
Email [horsesa@horsesa.asn.au](mailto:horsesa@horsesa.asn.au)  
Web [www.horseslandwater.com](http://www.horseslandwater.com)

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# Monitoring soil erosion on peri-urban horse keeping properties

## MONITORING PROCEDURE

The first step of monitoring soil erosion in horse paddocks is to identify the areas that are susceptible to erosion.

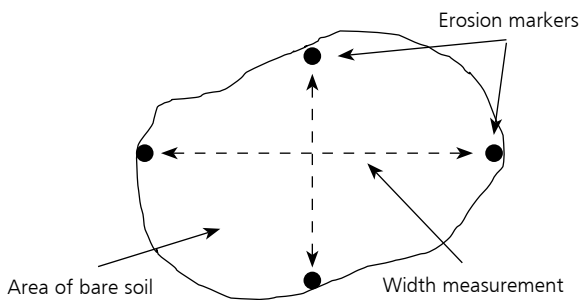
The areas that are the most susceptible to erosion are those that contain large areas of bare soil and/or a small percentage of groundcover.

These areas are likely to occur close to paddock gates, and in and around horse feeding areas.

### Instructions:

- Identify the areas in your paddocks that contain areas of bare soil (areas approximately greater than 1 m<sup>2</sup>).
- These will be the areas where monitoring will take place.
- To monitor these areas, permanent markers will need to be installed in the ground at the outer reaches of the bare soil.
- A permanent marker can simply be a carriage bolt (round-headed bolt) 15 cm in length or longer inserted through a piece of white plastic or metal (such as a tin lid painted white for easy visibility) that can be hammered into the soil to avoid damage to your horses (see photograph for an example)
- The markers need to be installed at the four widest points of the area of bare soil, with two markers forming the ends of a straight line, and the other two installed roughly at right angles (see figure 1).

**Figure 1:** Diagram of where to install pegs, and where width measurements are taken.



- Where the area of bare soil abuts a fence line, a fence post or marker on the fence may be used in place of one of the ground markers.
- The markers installed in the ground allow the area to be revisited over time to provide comparative data on the change in dimensions of the areas of bare soil.
- Record the distance between each of the two sets of markers as shown in figure 1 and record these, along with location information about the area, in a records book that will be kept for future use.

*Soil erosion marker installed at outer reaches of erosion.*

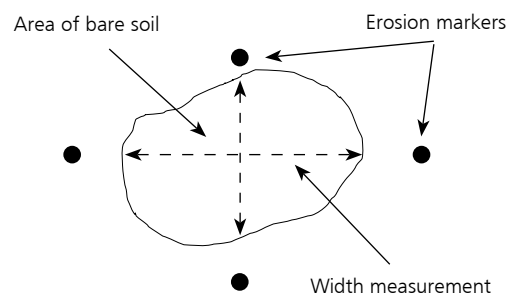


*Measuring tape extending from fence to outer erosion marker.*



- Areas should be revisited on a monthly basis and measurements should be taken once again and recorded a record book.
- When taking follow-up measurements, they should be taken in the same line as the original markers
- Where the area of bare soil has reduced in size, that is an improvement has been made, the measurements taken will fall inside the markers but should still be taken in the same line (see figure 2).

**Figure 2:** Diagram showing where to measure when area has reduced in size.



- Where an area has increased in size, the measurements should be once again taken in the same line as the original markers, however the measurements will go beyond the markers.
- Where an area has completely changed in shape, the markers may need to be removed and reset once again at the new widest points in the same manner as the beginning of this procedure.

# Monitoring groundcover on peri-urban horse keeping properties

## MONITORING PROCEDURE

The following method of monitoring groundcover in paddocks on peri-urban horse keeping properties is based on the wire method of measuring groundcover as set out in the *Field method for measuring soil surface cover – PIRSA fact sheet No. 8/2001 Agdex 571*.

Table 1 sets out a guide to the number of transect lines and sample points that are appropriate for different paddock sizes.

### Instructions:

- 1 Take a straight piece of fencing wire that reaches approximately to your shoulder height.
- 2 Bend one end of the wire to form a handle.
- 3 Choose a representative path (transect line) across the area you want to measure for groundcover.
- 4 Hold the wire at arm's length and at shoulder height, with the tip pointing straight down but not touching the ground.
- 5 Looking straight ahead along the transect line, take two steps along the transect line.
- 6 After the second step, while still looking ahead, lower the point of the wire to the ground.
- 7 After the wire has contacted the ground, look down and record the presence (yes) or absence (no) of surface cover directly under the point of the wire (see table 2 for a list of what may be considered as cover).
- 8 Repeat steps 4–7 until you have recorded 25 sample points or more along the transect line.
- 9 Repeat this procedure for the rest of your transect lines.
- 10 The percentage groundcover is equal to the number of 'yes' points along each transect line for the paddock being monitored divided by the total number of points, the result multiplied by 100 to give percentage groundcover (where the total number of sample points

for a paddock is 100, the number of 'yes' points is the percentage groundcover – 67 'yes' points = 67% groundcover).

**Table 1:** Guide to the number of transect lines and sample points appropriate for different area sizes of paddocks

Area Size (ha)	Number of transects	Number of sample points per transect
Less than 10	4	25
10 – 20	6	25
Greater than 20	8	25

Source: "Field method for measuring soil surface cover" – PIRSA fact sheet No. 8/2001 Agdex 571

Note: Where a paddock less than 10 ha is long and narrow, two transect lines running the length of the paddock with 50 sample points along each would suffice.

**Table 2:** Examples of types of groundcover

• Living (green) vegetation	• Dead (brown/yellow) vegetation
• Manure	• Loose leaves
• Plant matter (e.g. a stick)	• Feed (e.g. straw or hay)
• Rocks/stones	• Quarry rubble

Note: Anything that is not bare soil may be considered groundcover as it prevents direct exposure of soil to the elements.



Tip of wire touching groundcover (plant).



Tip of wire touching bare ground.



Tip of wire touching groundcover (leaf).



## Monitoring fence line tracking on peri-urban horse keeping properties

### MONITORING PROCEDURE

The following instructions for the monitoring of fence line tracking on peri-urban horse keeping properties are a guide to help property owners who have read through the *Horses, Land and Water Management Guidelines* and have undertaken the steps outlined in the *Horses, Land and Water Action Planner for Horse Properties*, to assess whether or not the implementation of sustainable management practices as outlined in the above documents has been successful.

Ensure that you read through all of the instructions before you begin the monitoring procedure.

#### Instructions:

- The first step is to identify the areas on your horse property where fence line tracking is occurring.
- For each length of tracking that is occurring along a fence line, measure the five widest points for each 100 m length of fence (where the length of fence line tracking is 200 m long, the 10 widest points should be measured) and record the results in the chart provided.
- The minimum number of points measured should be five for each length of fence line tracking, so where a length of tracking is less than 100 m, still record the width of the five widest points.
- Mark these points by placing a semi-permanent marker (this may simply be a coloured piece of material with a number on it tied to the fence) on the fence adjacent to where each measurement has taken place so that these sites can be revisited for comparative assessment of tracking width.
- Revisit each of the monitoring sites every two months to determine whether the extent of fence line tracking is decreasing, increasing or remaining constant.
- Continue to monitor these sites until they are deemed acceptable in terms of the width of tracking and the presence of pasture plants revegetating the area where tracking was taking place.
- Alternatively, where quarry rubble or a similar product has been used to cover the surface of tracking and prevent further erosion, simply monitor whether or not fence line tracking is occurring outside the area of rubble.
- If fence line tracking is occurring outside the area where rubble has been used, an alternative method of tracking management may well need to be employed (e.g. removing the horse[s] from the paddock).

**Note:** The table provided for monitoring the extent of fence line tracking allows for monitoring over a 12-month period from the time of the first monitoring measurements if width readings are taken at the recommended two-month intervals.

To assist in assessing any change in the extent of fence line tracking, it may be useful to take photo point records of the areas being monitored.



When taking photographic records in the form of photo points, follow the procedure outlined below to ensure that photo points are consistent and that the records are kept in an ordered fashion. This allows easy comparison of the same areas over time and prevents comparison of two different areas of fence line tracking.

### TAKING PHOTO POINT RECORDS

#### Instructions:

- Position yourself facing perpendicular (at 90° to the direction of the fence) to the fence line where the measurement of tracking has been taken, immediately in front of the semi-permanent fence marker, at a distance of 3 m from the fence (this may need to be 4 or 5 m, depending on the width of the tracking).
- Point your camera down toward the area of fence line tracking with the centre of the view approximately lined up with the centre of the tracking.
- Once you are positioned appropriately, take the photograph, which will be your photo point record.
- For areas that aren't easily discernible from others, place a photo point indicator inside the field of view of the camera which will allow the photo point to be easily recognised (this is simply an object that allows the photo of the area to be differentiated between photos of other areas that look similar, e.g. a horse shoe).
- Ensure that you record the details of the photo point indicator and include a corresponding description of the area where the record has been taken (e.g. Indicator: single horse shoe – Horseville paddock, northern fenceline, fence marker: yellow tag no. 3)

These photo point records will serve as a visual aid for assessing the change in severity of fence line tracking on different areas of your property.

Where there is a large area of ground disturbance near a gate or fence caused by a horse circling over the area (e.g. a feeding area), photo point records will be useful in determining whether or not procedures implemented to prevent damage of the ground surface are having a positive impact.

## Monitoring pasture composition on peri-urban horse keeping properties

### MONITORING PROCEDURE

The first step of monitoring perennial grass and clover plants in pastures is the construction of a quadrat (a square sampling frame) within which sampling will take place.

The dimensions of the square may either be 1 m by 1 m to form a quadrat with an area of 1m<sup>2</sup>, or 31.6 cm by 31.6 cm to form a quadrat with an approximate area of one tenth of a square metre (1000 cm<sup>2</sup>)

#### Instructions:

- To randomly sample the pasture composition of your paddocks, start from one corner of your paddock, take a few steps into your paddock then randomly throw (gently) your quadrat out in front of you so that it lands on your pasture.
- Count the number of perennial grass plants and the number of clover plants that are located entirely within the quadrat, and estimate the percentage of weed species within the quadrat.
- Record the number of each perennial grass and each clover plant within the quadrat along with the percentage of weed species and mark this record as number 1.
- Repeat this procedure throughout your paddock until you have reached the recommended number of sampling points for the relative paddock size (a guide to the number of sample points is listed in Table 1).
- Be sure to gather a representative sample of your paddocks, so don't complete all of your samples within an area that is only representative of one quarter of your entire paddock
- Repeat this procedure for each of the paddocks on your property.
- If the practices you are employing to improve the composition of your pastures are working, the total number of sample points that have at least the recommended number of perennial grasses and clover plants will increase each time you complete a new survey.
- Your pastures will have ideal composition when the random sampling method returns results where every sample point has at least the recommended number of perennial grasses and clover plants, and your paddock has an overall percentage of weed species of less than 10%.
- This is the perfect case scenario however, and may be impractical to achieve, so if your sampling returns results of 80% of sample points containing the recommended number of perennial grasses and clover plants then your pastures can be considered to have good pasture composition.
- For those choosing the quadrat size of 1 m<sup>2</sup>, the ideal

number of pasture plants that are representative of healthy pastures is 20 perennial grasses and 60 clover plants.

- For those choosing the quadrat size of one-tenth of a square metre (31.6 cm x 31.6 cm), the ideal number of pasture plants is two perennial grasses and six clover plants.
- Sampling of pasture composition in your paddocks should be conducted on a seasonal basis as there will be natural variations in your pasture composition between seasons depending on weather conditions such as rainfall.

**Table 1:** Guide to the number of sample points appropriate for different area sizes of paddocks

Paddock area (ha)	Number of random sample points (1 m <sup>2</sup> quadrat)	Number of random sample points (1000 cm <sup>2</sup> quadrat)
Less than 10	50	150
10 – 20	75	225
Greater than 20	100	300

*Good mix of clover and perennial grasses.*



*Clover-dominant pasture.*



*Grass-dominant pasture.*



## Monitoring weed species in native vegetation on peri-urban horse keeping properties

### MONITORING PROCEDURE

The weed species that are to be monitored include the following:

- blackberry
- gorse
- cape broom
- bridal creeper
- feral olive
- salvation jane
- periwinkle
- boneseed

Additional weed species may need to be monitored depending on the location of your horse property.

Different areas have different declared weed species so it is recommended that you contact your local council to find out exactly which weeds are declared weed species in your local area.

### Instructions:

- Starting from one corner of your fenced area of native vegetation, walk along the fence line recording the presence of any of the above listed weed species and any additional declared weed species in your area.
- Use the table provided at the end of this document to record the incidence of each of the target weed species of your survey.
- When you get to the other end of your fenced native vegetation area, walk approximately 10m away from the fence line which you travelled alongside, toward the inner area of your native vegetation (see Figure 1 for a diagrammatic representation of the sampling method).
- Once again, walk slowly through your native vegetation area recording the presence of weed species as you spot them, walking in the opposite direction to which you first travelled.
- Be careful not to double count species as this may give the impression that the problem is worse than the true extent of weeds.
- Continue to conduct this method of recording weed species until you have traversed the entire area of native vegetation.
- This survey technique should be conducted two times a year to assist you to determine whether or not the weed management techniques you have employed on your property to control weed species is in fact having a positive impact on reducing weed numbers and the potential for them to enter native bushland .

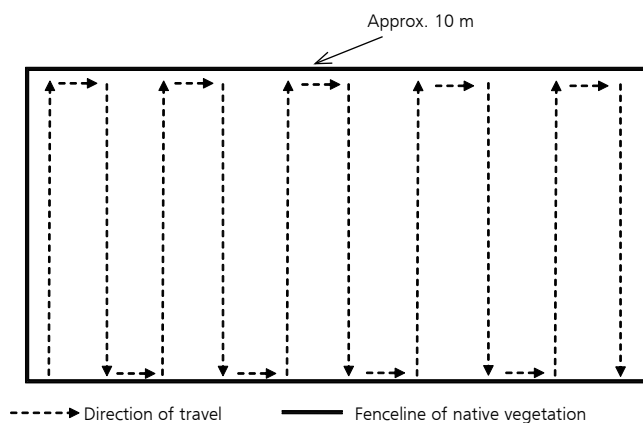
- Through comparison of the results of total numbers of weeds over time, you should be able to determine if you are reducing the incidence of weed species in areas of native vegetation located on your property.
- Additional surveys may be conducted shortly after the implementation of a specific weed management plan, and may be used to target a single species of particular concern.
- For areas of native vegetation that are not uniform in shape, simply alter your walk through survey technique to suit the area (e.g. you may need to walk in a zigzag fashion).

To assist with identification of weed species, visit the website link provided below to access weed identification sheets for the weeds of significance on your property. Alternatively you may be able to acquire weed identification fact sheets from your local council.

### Weed identification website:

[www.dwlbc.sa.gov.au/biodiversity/pests/weeds/plant\\_id.html](http://www.dwlbc.sa.gov.au/biodiversity/pests/weeds/plant_id.html)

**Figure 1:** Example of the way to traverse native vegetation to sample the presence of weed species.



## Monitoring stream bank erosion on peri-urban horse keeping properties

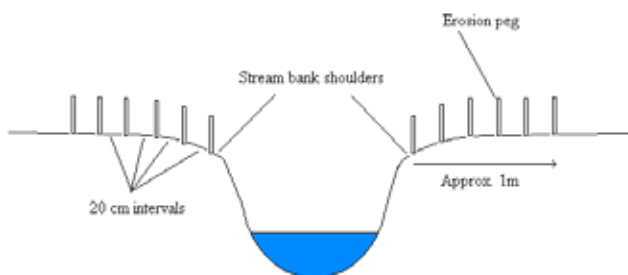
### MONITORING PROCEDURE

The first step of monitoring stream bank erosion in horse paddocks is the establishment of monitoring sites which will be revisited over time for comparative assessment of erosion levels.

Monitoring should begin once watercourses have been fenced off, preventing access by horses.

#### Instructions:

- Select a number of sites along your stream bank where you will monitor erosion of the stream bank; select sites where you believe erosion is actively occurring
- Install 6 monitoring pegs at 20 cm intervals from the shoulder of the bank (see figure 1) with the first placed on the shoulder of the bank. The pegs may simply be wooden stakes or tent pegs that can be firmly located along the bank, progressing away from the shoulder of the bank



**Figure 1:** cross section of erosion pegs installed along a stream bank

### OPTIONAL ADDITIONAL MONITORING

- If you believe erosion is occurring but not on a scale sufficient enough for the pegs to be dislodged from the soil, you can choose to mark the initial height of the soil on the pegs to see whether or not any erosion is occurring.
- This is done by placing a mark on the peg at the soil level using a marking pen or paint that is water resistant.
- Monitor the relative height of the mark on each peg to the soil surface, if a gap is developing between the mark and the soil surface, erosion is occurring. If the mark is no longer visible then there has been a build up of soil and organic matter.

- Revisit the sites of the pegs on a monthly basis.
- Where a peg (or more than one peg) has fallen over or fallen into the watercourse, erosion has taken place.
- As the pegs are placed at set intervals, the number of pegs that have been disturbed will give some indication of the extent of the erosion. This coupled with the time taken for a peg or pegs to be disturbed (e.g. 1 month) will give some indication of the speed at which erosion is occurring.
- If all pegs remain standing in their original positions minimal to no erosion has taken place and the bank is relatively stable
- It is a good idea to monitor the pegs soon after any significant rain events to see how susceptible the sites are to water erosion
- You may also choose to visit the peg sites after periods of significant winds to assess the susceptibility of the sites to wind erosion

## Monitoring pest animals on peri-urban horse keeping properties

### MONITORING PROCEDURE

For the purpose of this document, the monitoring of pest animal species on peri-urban horse keeping properties involves monitoring the presence of rabbits and foxes on properties where these animals are thought to be present.

To monitor the presence and intensity of these two species, you will use three monitoring methods to assist you to determine where these animals are present.

These methods include the identification of scats (animal excrement/faecal matter), tracks and rabbit warrens and/or fox dens.

#### Instructions:

- The first step of monitoring pest animal species on your property is to conduct a random walk-through survey of your property to ascertain whether or not you believe rabbits and/or foxes are indeed present.
- Whilst conducting your random walk-through survey, keep an eye out for the presence of these pest animal species by looking for their scats, their tracks, and any presence of warrens and/or dens (see Figure 1 for a photograph of fox scats; Figure 2 for a photograph of rabbit scats).
- Once you have established that foxes and/or rabbits are present on your property, it is necessary to implement a pest control program for your property (refer to the *Horses, Land and Water: Management Guidelines* for information on how to achieve this).
- Keep records of the sites where you have documented the presence of these species as well as the locations of any warrens and/or dens so that these areas can be revisited for further assessment.
- After your pest control program has been implemented, monitor the warrens, dens and areas where you have detected the presence of these pests to ascertain whether there are fresh indications that these pests are still active on your property.
- Active rabbit warrens and fox dens will generally have the presence of fresh scats in the vicinity of the entrances.
- Continue to monitor these sites for fresh scats until such time as you believe that they are no longer active.
- Where destruction of rabbit warrens and/or fox dens is part of your pest control program, monitor your property for signs of newly-established structures.
- In addition to this, continue to search your property for the presence of fresh rabbit or fox tracks as their warrens/dens may be located off your property.
- A walk-through survey of your property to monitor the signs of the presence of these pest species should be

conducted on a monthly basis until such time as you believe they are no longer present.

- After this time it will be sufficient to conduct a walk through survey of your property on a six-monthly basis.

**Figure 1:** Rabbit scats outside an active burrow



Photo by Michael Cowin

## Monitoring soil health and fertility on peri-urban horse keeping properties

Maintaining healthy and fertile soils is important for maintaining healthy pastures on peri-urban horse keeping properties, as well as providing property owners with the best chance of maintaining a high level of groundcover throughout their paddocks.

Monitoring the elements of soil that determine the health and fertility of soils is beyond the scope of most property owners.

Therefore, taking soil samples and sending them off to be tested in a specialist laboratory is an effective solution that allows property owners to gain an understanding of the health and fertility of the soils located on their property.

The South Australian Soil and Plant Analysis Service (SASPAS) provides soil kits that give instructions to property owners on how to take soil samples throughout their properties as well as providing soil sample bags and paddock information forms for conducting soil surveys.

There are a range of soil analysis options that can be chosen, however for property owners to gain the best understanding of their soils, it is recommended that option D is chosen. Option D includes analysis of the following soil features:

- pH (in water and CaCl<sub>2</sub>)
- extractable phosphorous
- extractable potassium
- extractable sulphur
- organic carbon
- salinity (electrical conductivity)
- free lime
- texture
- nitrate
- chloride
- exchangeable cations
  - calcium
  - magnesium
  - sodium
  - potassium
  - aluminium
- EDTA extractable
  - copper
  - zinc
  - manganese
  - iron
- extractable boron
- extractable aluminium

Furthermore, it is recommended that a soil survey and analysis be performed on peri-urban horse keeping properties on a three-yearly basis. At present, the total cost of the soil analyses performed in option D of the SASPAS soil kit is \$115. This works out to be less than \$40 per year to have an understanding of soil health and fertility on one's property.

For property owners who are attempting to change the characteristics of their soils, the soil test can be performed on a more regular basis.

To attain a copy of the SASPAS soil kit, contact Rural Solutions SA:

ACML/SASPAS  
RURAL SOLUTIONS SA  
Loxton Centre PIRSA  
Bookpurnong Road (PO Box 411)  
Loxton SA 5333

Phone: (08) 8595 9125  
Fax: (08) 8595 9107  
ABN 53 763 159 658



