Wind erosion management

A guide for Eyre Peninsula land managers on managing soils to avoid wind erosion

One of the greatest threats to land management on the Eyre Peninsula is degradation through soil erosion. Of the approximately 2.7 million hectares of cleared agricultural land on Eyre Peninsula about 2.4 million hectares (88%) are inherently susceptible to wind erosion (see map) due to sandy textured soils. Around 690,000 hectares (25%) of sloping agricultural land on Eyre Peninsula, predominately in the Koppio and Cleve Hills, is also inherently susceptible to water erosion.

Erosion of 1 mm of soil from the soil surface can equate to losses of 10-12 tonnes of soil per hectare. As well as the soil loss there can be significant loss of nutrients and organic matter which are drivers of crop and pasture productivity. Wind erosion selectively removes the fine particles and organic matter from the soil surface as dust. Additionally wind erosion can cause sandblasting of crops and form drift banks and 'blow outs' creating uneven paddocks which are difficult to manage and can reduce the aesthetic appeal of the land.

This guide provides you with information and tips for managing and preventing potential wind and water erosion on your farm.

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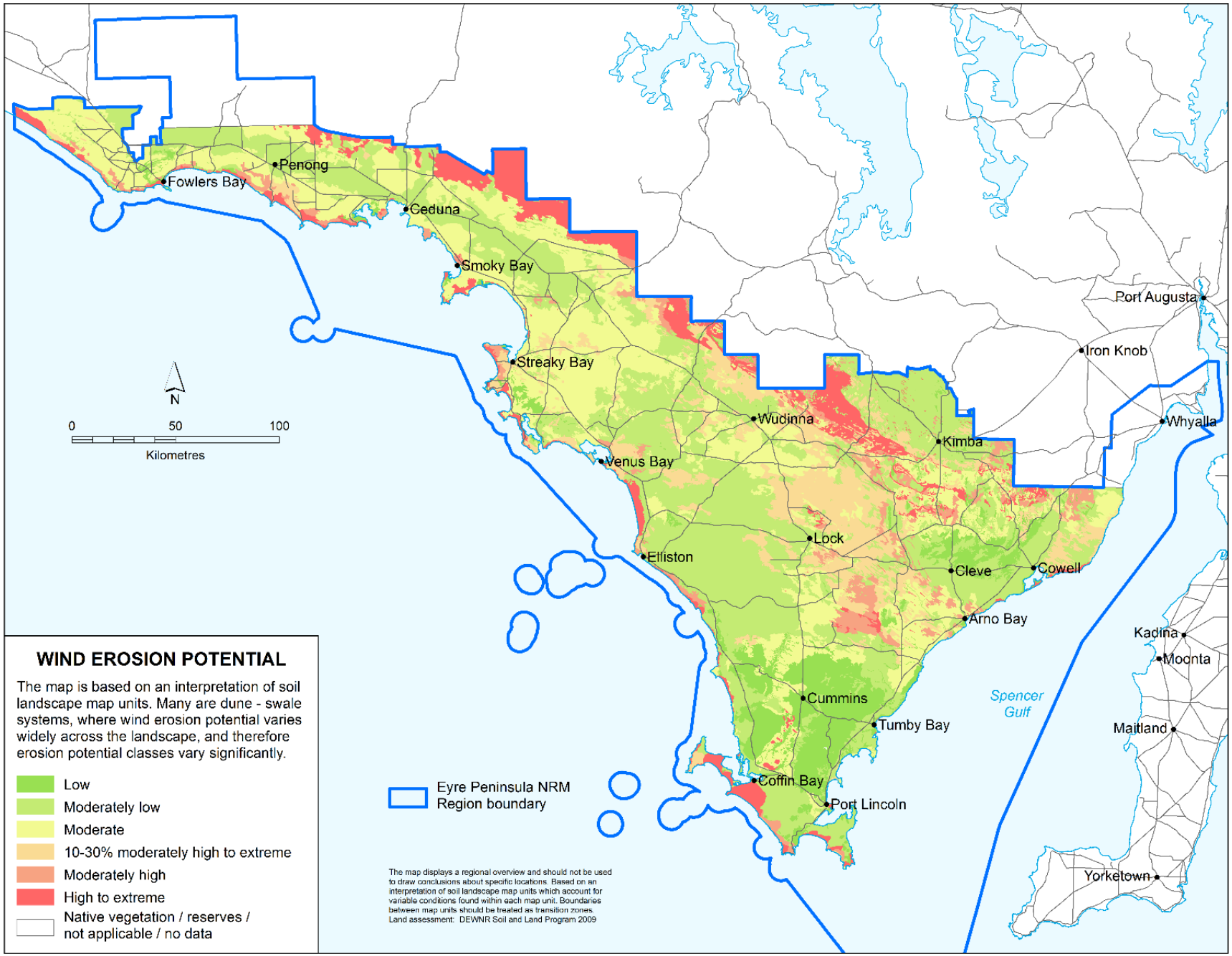
Fowlers Bay
Penong
Ceduna
Smoky Bay
Streaky Bay
Port Augusta
Iron Knob
Whyalla
Wudinna
Kimba
Venus Bay
Lock
Elliston
Cleve
Cowell
Arno Bay
Kadina
Moonta
Cummins
Tumby Bay
Maitland
Coffin Bay
Port Lincoln
Yorketown
Spencer Gulf
N
0
50
100
Kilometres
WIND EROSION POTENTIAL
The map is based on an interpretation of soil landscape map units. Many are dune - swale systems, where wind erosion potential varies widely across the landscape, and therefore erosion potential classes vary significantly.
Low
Moderately low
Moderate
10-30% moderately high to extreme
Moderately high
High to extreme
Native vegetation / reserves / not applicable / no data
Eyre Peninsula NRM Region boundary
The map displays a regional overview and should not be used to draw conclusions about specific locations. Based on an interpretation of soil landscape map units which account for variable conditions found within each map unit. Boundaries between map units should be treated as transition zones.
Land assessment: DEWNR Soil and Land Program 2009
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Why are our soils susceptible?

Surface soil texture is key in determining the inherent potential for soils to erode. Sandy soils are inherently more prone to wind erosion as their low electrochemical charge and generally low organic carbon contents make it difficult to aggregate individual particles into larger soil clods that would be more resistant to detachment and transport by wind. Eyre Peninsula has large areas with sandy textured surface soils, particularly in the dune-swale landscapes predominant throughout central and eastern Eyre Peninsula and the grey calcareous soils on western Eyre Peninsula. Whilst soil texture influences inherent soil erodibility, the risk of erosion is significantly increased by soil disturbance and poor surface cover. Removal of vegetation by cultivation, herbicide applications, stubble burning, low rainfall and overgrazing compound contributing to loss of surface cover.

Impacts and cost

Wind erosion effects are frequently seen in the forms of drifting sands along fence lines, 'blow outs' on sand dunes, depletion of sandy topsoils on the flats exposing a clayier subsoil or bedrock layer, and furrows filled with sand forming smooth soil surfaces in cultivated paddocks. Wind erosion can have both immediate and long term impacts.

Immediate impacts include:

- Loss of production in affected areas
- Loss of topsoil and nutrients
- Sandblasting of crops
- Contamination of wool from sand
- Costs and labour to resow paddocks to establish cover.

Three processes in wind erosion

1. Detachment – loosening of soil particles at the soil surface.

2. Transportation - soil particles are picked up and moved by the wind. This may take the form of;

Surface Creep - large particles that roll along the surface (>0.5mm diameter)

Saltation – skipping of particles across the soil surface (0.1-0.5mm)

Suspension – particles that are carried larger distances in the wind (smaller than 0.5mm)

3. Deposition – When the wind energy falls to a level that can no longer move the soil particle.

Sand deposited on a crop on the Eyre Peninsula

Drift banks form along fence lines where wind erosion has occurred due to low paddock surface cover.

Overgrazing by stock leading to soil at risk from wind erosion. Images Brett Masters, Primary Industries and Regions SA.

Long term costs associated with managing larger sand drifts include:

- Cost to repair/replace fences
- Cost of machinery/contractors to level/reshape land
- Revegetation costs
- Costs to undertake soil modification activities such as clay spreading or delving
- Cost to clear sand drifts from roads.

In addition there is potential for unmanaged soil erosion to cause other problems including:

- Increase groundwater recharge due to poor water use on eroding areas
- Human and livestock health issues
- Disputes with neighbours
- Loss of aesthetic and property value.

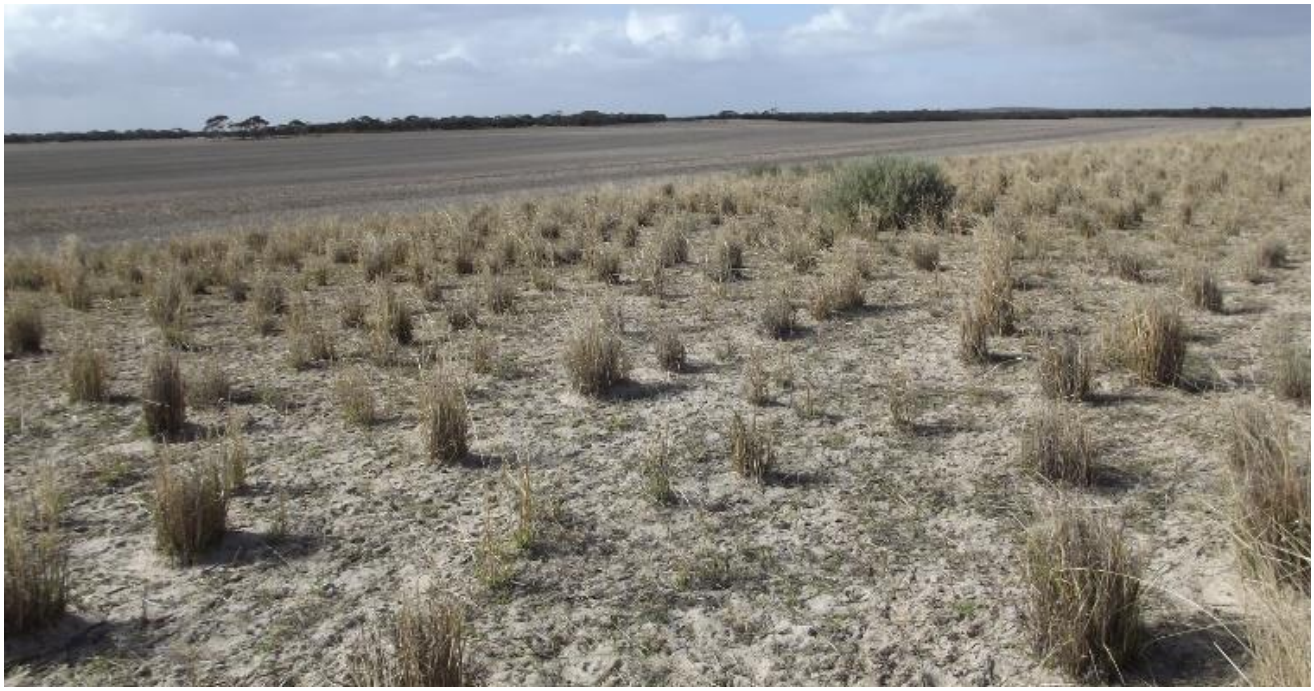
Soil erosion management

Active soil erosion is hard to control and paddocks should be managed to reduce the risk of erosion by maintaining adequate surface cover. Surface cover (including stubbles, actively growing crops, pastures and weeds, rocks and soil clods) protect soil from the erosive force of the wind by slowing or deflecting wind away from the soil surface and can help trap soil particles.

	Minimum cover		**Desirable cover**	
Soil type	%	t/ha	%	t/ha
Loam	15	0.5	35	1.0
Sandy Loam	20	0.6	50	1.5
Sands	50	1.5	70	2.5

Surface cover to reduce the risk of wind erosion (DWLBC 2008).

Note; whilst these figures provide a guide to minimum surface cover for reduced risk of wind erosion, this may not be sufficient to completely stop erosion in high winds. Additionally there can be as much as 20 to 50% loss of stubble cover by natural breakdown over summer which should be



Establishing permanent cover on deep sands can prevent erosion.

considered when assessing how much cover is left following harvest.

Cover should be well anchored and upright for best protection against wind erosion (on water erosion prone sites the stubble should be flattened, to covering as much area of the soil surface as possible). Results from the Mid North of South Australia showed a consistent relationship between stubble height and wind speed close to the soil surface in moderate to high density stubbles. When stubble was cut close the ground the wind speed 20cm above the ground was still 66% of the wind speed at 2m above the ground. However retaining 35cm of well anchored stubble reduced the 20cm wind speed to just 20% of that 2m above the ground (Mudge 2011).

Managing contributing factors

There are a number of ways to manage the causes of low surface cover, which include:

- Appropriate herbicide use (avoid overuse)
- Planning appropriate cropping, pasture species and grazing activities given the land capability and forecast climatic conditions
- Using no-till and stubble retention practices
- Reducing livestock numbers in years where paddock biomass levels are low
- Fencing vulnerable areas to allow livestock to be excluded when soils are at risk
- Removing livestock from vulnerable areas into confinement feeding areas whilst there is still sufficient surface cover to protect soils from erosion, including allowing for natural residue breakdown until the break of the season
- Moving gates, watering and feeding points to areas less prone to erosion i.e. heavier ground
- Controlling pest animals and plants.

Managing erosion once it has occurred

Where soil erosion has taken place there are a few things that should be considered before deciding on what action to take. These include;

- Minimise machinery and livestock traffic on exposed areas.
- Inspect the area which has been subject to erosion - Sandy soils can develop an 'armoured' surface following wind erosion and if the crowns of the plants are still intact or the surface is crusted tillage might destroy soil aggregates doing more damage than good.
- 'Doing nothing' is an option if; a surface crust has developed, windy weather has abated, and it is likely that sufficient rains to stimulate plant growth will fall within a few weeks.
- Levelling or reshaping the site, it is important to remove the edges off blow outs and flatten or reshape the site to avoid the wind cutting deeper into the sands in the case of blow outs.
- Erosion might have resulted in loss of nutrition and organic matter, which is important for soil nutrient cycling. It is worth taking a soil test to confirm the nutritional status of the area and plan to increase fertiliser and seed rates at seeding to ensure good crop establishment.
- On sandy soils, particularly non-wetting sands, double sowing at offset angles can help to improve crop establishment and surface cover where there is not residual stubbles providing protection from erosion.
- If possible sow across the direction of the most damaging winds.
- Modification of sandy soils by clay spreading, delving and spading helps to reduce soil erodibility. Together with incorporation of amendments where appropriate, these practices can be useful to overcome some of the constraints on sandy soils which limit surface cover and production including non-wetting and low soil fertility.

Reshaping land mechanically can be quite costly, but with larger drifts it can be your best option. Image Brett Masters, Primary Industries and Regions SA.

References

Eyre Peninsula Natural Resources Management Board (2009) State of our resources recognising the state of Natural Resource of the Eyre Peninsula.

DWLBC (2008) Surface Cover protection against wind and water erosion.

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For more information

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