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Landscapes 2025

Appendix E

Regional Land and Soils Snapshot

Appendix E: Regional land and soils snapshot

Soils and landforms are fundamental to the maintenance of agriculture, biodiversity, sustainable land use and indeed most aspects of natural resource management. Sound natural resource management requires a good understanding of the characteristics and capabilities of soils and landforms.

The major geomorphic regions which underpin the landforms and soils of the Catchment are the Darling Plateau and Swan Coastal Plain, each with a number of soil landscape zones (Figure 1, from Land Assessment, 2005).

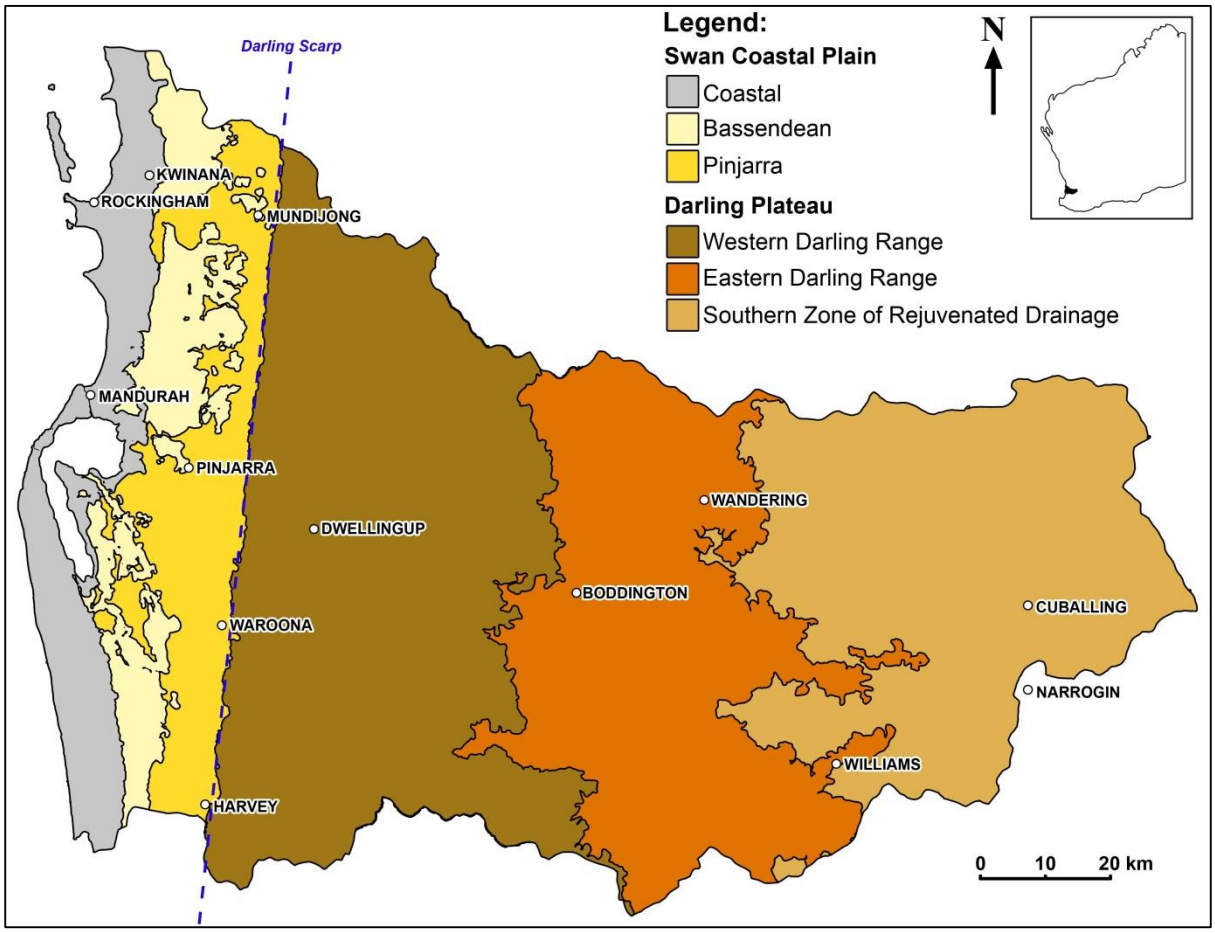

Figure 1: Geomorphic regions and soil landscape zones of the Peel-Harvey Region

Darling Plateau and Scarp

The Darling Plateau covers all of the Catchment eastward from the Darling Scarp and is described as three soil-landscape zones (Tille *et al.* 1998):

- **Western Darling Range Zone**– this is the gently undulating lateritic plateau, including the Darling Scarp, on which large areas of jarrah forest are located (largely the Forest and Scarp subsystem in the Peel-Harvey Interim Regional NRM Strategy, 2014). Surface soils are duplex sandy gravels, loamy gravels and shallow gravels. Rainfall is between 800 and 1300 mm. Water erosion can be an issue where native vegetation has been removed. Zone includes districts of Jarrahdale and Dwellingup.

- **Eastern Darling Range Zone–** these are the areas of undulating to rolling terrain where large parts of the plateau have been eroded, interspersed with sizeable portions of the original plateau surface. Soils are related to topography and degree of erosion. Sandy gravels, loamy gravels and pale deep sands are found over plateau remnants while valley slopes support a range of soil types including gravels, grey deep sandy duplex soils and red deep sandy soils. The Zone generally receives between 550 and 700 mm of rainfall annually and at least 65% of the native vegetation has been cleared (Tille *et al*, 2001). The sloping terrain is subject to soil erosion if ground cover is not maintained and waterlogging and salinity problems are widespread on valley floors (Land Assessment Pty Ltd, 2005). The zone includes the districts of Marradaong, Boddington and Wandering.

- **Southern Zone of Rejuvenated Drainage** – this zone covers the easternmost parts of the catchment and consists of gently undulating rises and low hills formed through erosion of the Plateau. Small areas of lateritic remnants with breakaways also occur. Valley floors are broad with continuous stream channels. Soils are variable and include duplex sandy gravels, loamy gravels and pale deep sands. Rainfall is generally between 450 and 550 mm annually and approximately 90% of the land has been cleared (Land Assessment Pty Ltd 2005). Waterlogging is a widespread problem in sandy duplex soils with perched groundwater. Salinity is an issue in many of the valley floors due to rising groundwater levels and saline seeps are also found on hill slopes in association with geological faults and dyke. The zone includes the districts of Cuballing and Poppanyinning.

Swan Coastal Plain

The Swan Coastal Plain includes three soil-landscape zones as follows:

- **Perth Coastal Zone** – these are the soils and landforms closest to the coast and include the Quindalup Dunes, Spearwood Dunes and Vasse Estuarine Deposits. The Quindalup system is made up of deep calcareous sands and protected as coastal reserves, or developed for residential and tourist purposes. The yellow 'Spearwood sands have a relatively high phosphorus holding capacity but poor nitrogen holding capacity. They have supported annual horticulture in the past, but are now being urbanised. The Vasse deposits are largely estuarine and low-lying, and where exposed often lead to formation of Acid Sulfate Soils.

- **Bassendean Zone** – This Zone is a complex of low dunes, sandplains and wetland depressions with pale deep sands. Bassendean sands are well draining, highly leached and have a very low nutrient holding capacity. There is a high risk of nutrient export. Superficial groundwater resources beneath the Zone support a variety of uses, including public water supply and annual horticulture.

- **Pinjarra Zone** – This zone is made up of the Pinjarra Plain and the Ridge Hill Shelf. The Pinjarra Plain is a flat, poorly drained alluvial plain with a variety of soils including grey deep sandy duplex soils, brown shallow loamy duplex soils and cracking clays. The Ridge Hill Shelf, or Forrestfield System form the foothills to the Darling Scrap. It is well drained and supports sandy gravels, yellow deep sands and pale deep sands. These soils have a high capability for agriculture, but water resources are limited and there is some competition from other land uses.

Within each of the above six soil-landscape zones, there is more detailed mapping of soil-land units and soil types available from the Department of Agriculture and Food WA. This is valuable information for the planning of natural resource management projects at the local and district levels.

To complement knowledge of soil types in the Catchment, information is available on specific soil characteristics of relevance to NRM, namely soil acidity, water repellency, compaction, salinity and phosphorus retention index (PRI). Most of this data has been gathered and made available by the Department of Agriculture in the Report card on sustainable natural resource use in agriculture (DAFWA, 2013). The status and trend of some of these soil characteristics for soils in the Hotham-Williams and Coastal Plain subsystems is summarised in Table 1.

Soil Acidity levels (pH)

Soil pH is a key factor influencing cropping yields as pH affects the bioavailability of nutrients (i.e. how effectively a crop can make use of the nutrients present in the soil. Mapping of soil acidity levels (pH) for the top 0 – 10 cm, 10-20 cm and 20 – 30 cm at the district-scale has been prepared for the for the South West Agricultural Zone, including Peel-Harvey Region, and has been published in the Report card on sustainable natural resource use in agriculture (DAFWA, 2013).

Soil acidity levels for both the Hotham-Williams Catchment and Coastal Plain, the two primary agricultural zones in the Region, is generally poor to very poor and likely to deteriorate further (Table 1). Whilst the *Report card* soil acidity data is low resolution, and may not apply to the paddock-scale, the data is of assistance in determining the general extent and severity of soil acidity in different parts of the Region and planning management strategies accordingly. Access to the data by the PHCC is still to be negotiated.

Water repellence

Water repellency is a widespread problem in the WA Wheatbelt, including the Hotham-Williams catchments, mostly affecting soils with low clay content or high organic matter levels in the topsoil (DAFWA, 2014). The general status of water repellency in the Hotham-Williams is classed as poor and likely to deteriorate further (DAFWA, 2013). The expression of water repellence may be increasing due to an increase in cropping frequency, drier and earlier sowing, minimum tillage and reduced break of season rainfall.

Mapping of water repellence risk is provided in Figure 2 (DAFWA, 2013).

Dryland salinity

Dryland salinity refers to all soils in non-irrigated areas that have become saline since being cleared for agriculture (DAFWA, 2013). In the Peel-Harvey Region, dryland salinity is most apparent in the Hotham-Williams Catchments. Dryland salinity is caused by an altered water balance due to the clearing of native vegetation. Eventually, a new water balance equilibrium is achieved and the area of land affected by salinity ceases to expand.

Mapping of salt-affected land in the Peel-Harvey Region is shown in Figure 3. This data has been generated by the Land Monitor Project using Landsat TM (DAFWA, 2013). The figure

also shows the area at risk of developing high water tables, and therefore at risk of becoming saline. Figure 3 shows that extent of salt-affected land in the eastern parts of Hotham-William catchments is not insignificant, with some potential for new areas in these catchments to become saline in the future.

Compaction

Compaction is where the soil physically degrades resulting in densification and distortion (DAFWA, 2013). The level of biological activity and permeability of the soil is reduced as a result and this leads to poor crop root growth and waterlogging and reduced productivity.

Generally, the soils of the Hotham-Williams Catchments are at moderate risk of becoming compacted, and those of the Coastal Plain are at low risk (DAFWA, 2013). District scale mapping of the risk of soils in the Peel-Harvey Region becoming compacted is shown in Figure 4.

Phosphorus Retention Index (PRI)

PRI is a measure of how well or poorly a soil can retain phosphorus that is applied (Figure 5. PRI is of significant relevance to NRM in the Peel-Harvey, especially the Coastal Plain, given the excessive levels of nutrients entering the Region's rivers and estuary. Many of the soils of the Coastal Plain have a PRI of less than 10 (Figure 5) which indicates a very low capacity to bind phosphorus to soil particles. The greater the PRI the greater the phosphorus-holding capacity. A soil's PRI can be increased with the application of amendments, such as natural clay or the treated by-products of some mining processes.

Table 1: Status and condition trend of soils of the Coastal Plain and Hotham-Williams Systems (DAFWA, 2013)

	Coastal Plain		**Hotham-Williams Catchments**	
Soil asset characteristic	**Status/risk**	**Trend**	**Status/risk**	**Trend**
Soil acidity	Very poor	Likely deterioration	Poor	Likely deterioration
Wind erosion	Not assessed		Moderate risk	Variable
Water erosion	Low risk	Stable	Moderate risk	Stable
Soil organic carbon levels	Good – very good	Measures not available	Moderate	Measures not available
Soil compaction	Low risk	Stable	Moderate risk	Stable
Water repellence	Very poor	Stable	Poor	Likely deterioration
Dryland salinity	Low risk	Stable	Moderate risk	Stable
Nutrient status (phosphorus)	Excess	Stable	Well in excess	Stable
Nutrient export	Very high	Variable (mostly moderate to very high)	Not assessed	

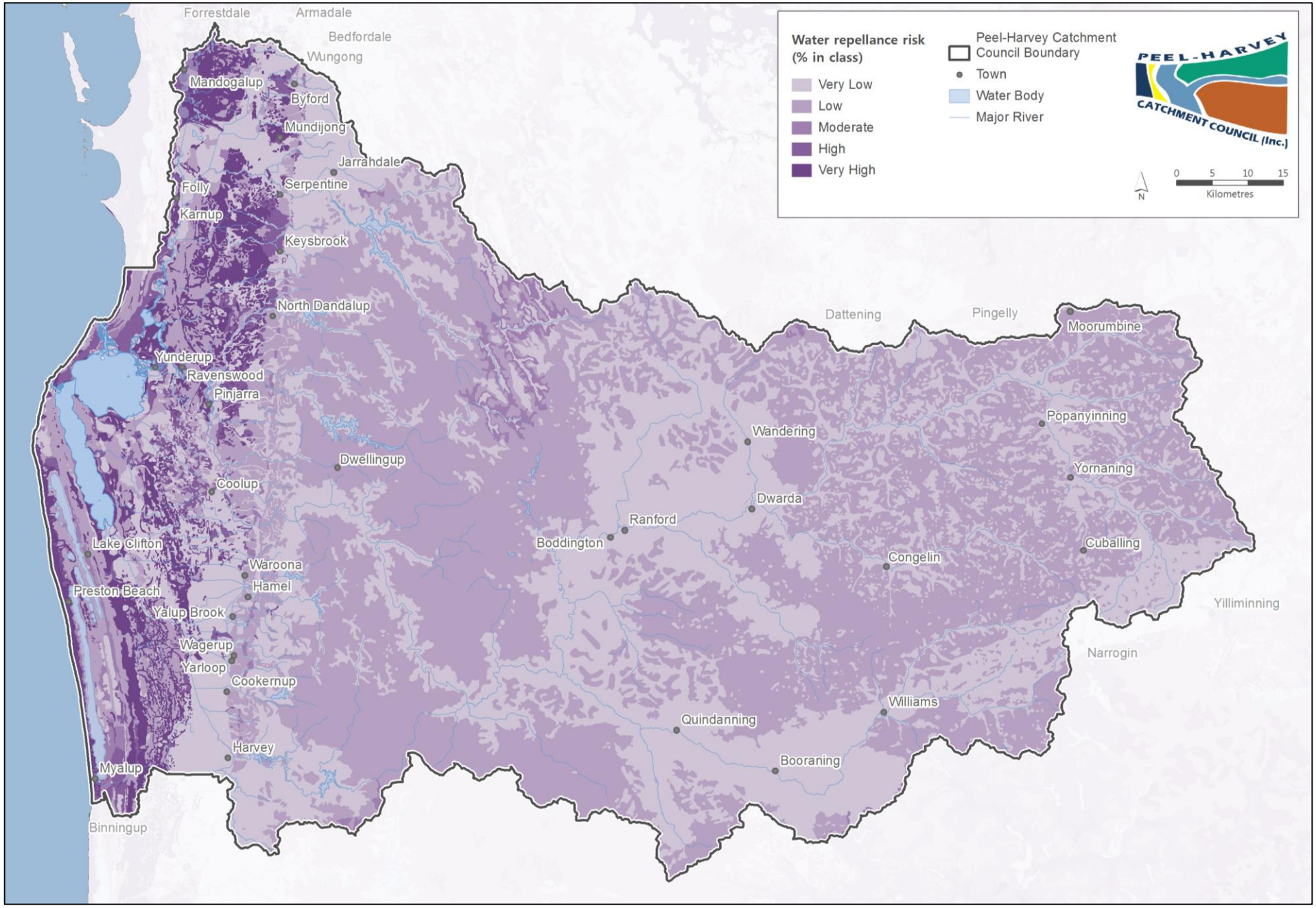

Figure 2: Water repellence risk (DAFWA, 2013)

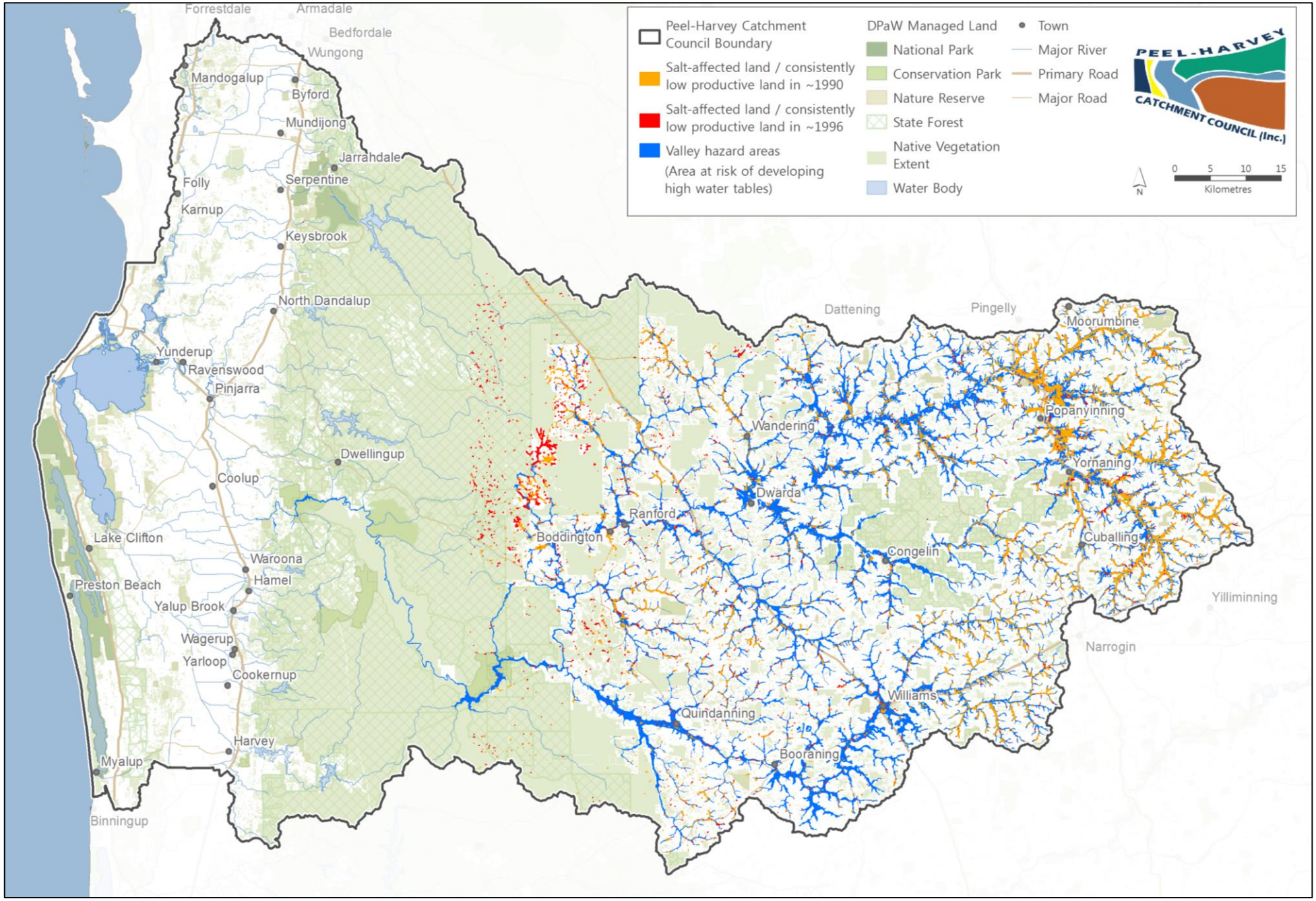

Figure 3: Salt affected land and areas at risk of developing high water tables (Source: Landmonitor)

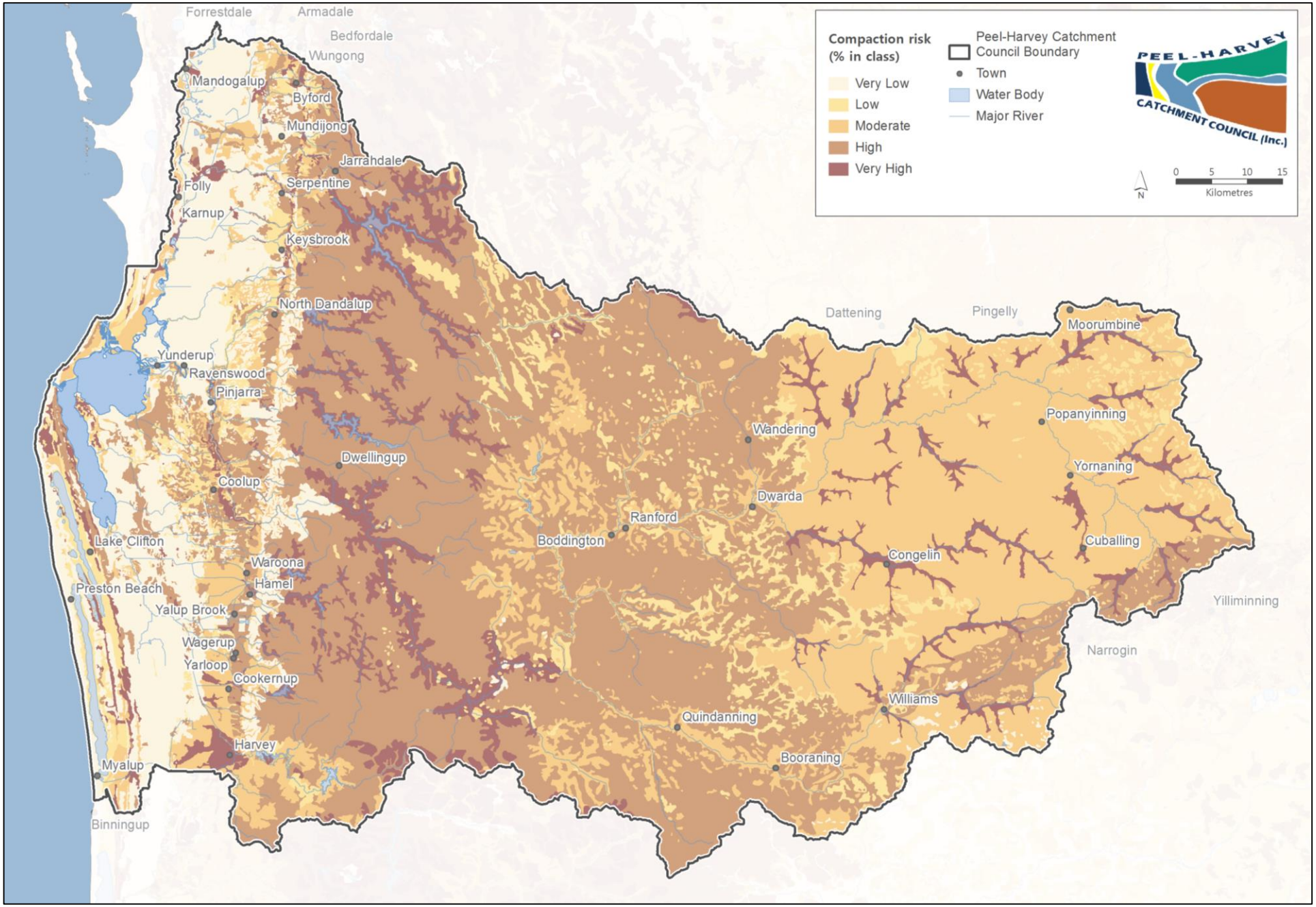

Figure 4 Soil compaction hazard (DAFWA, 2013)

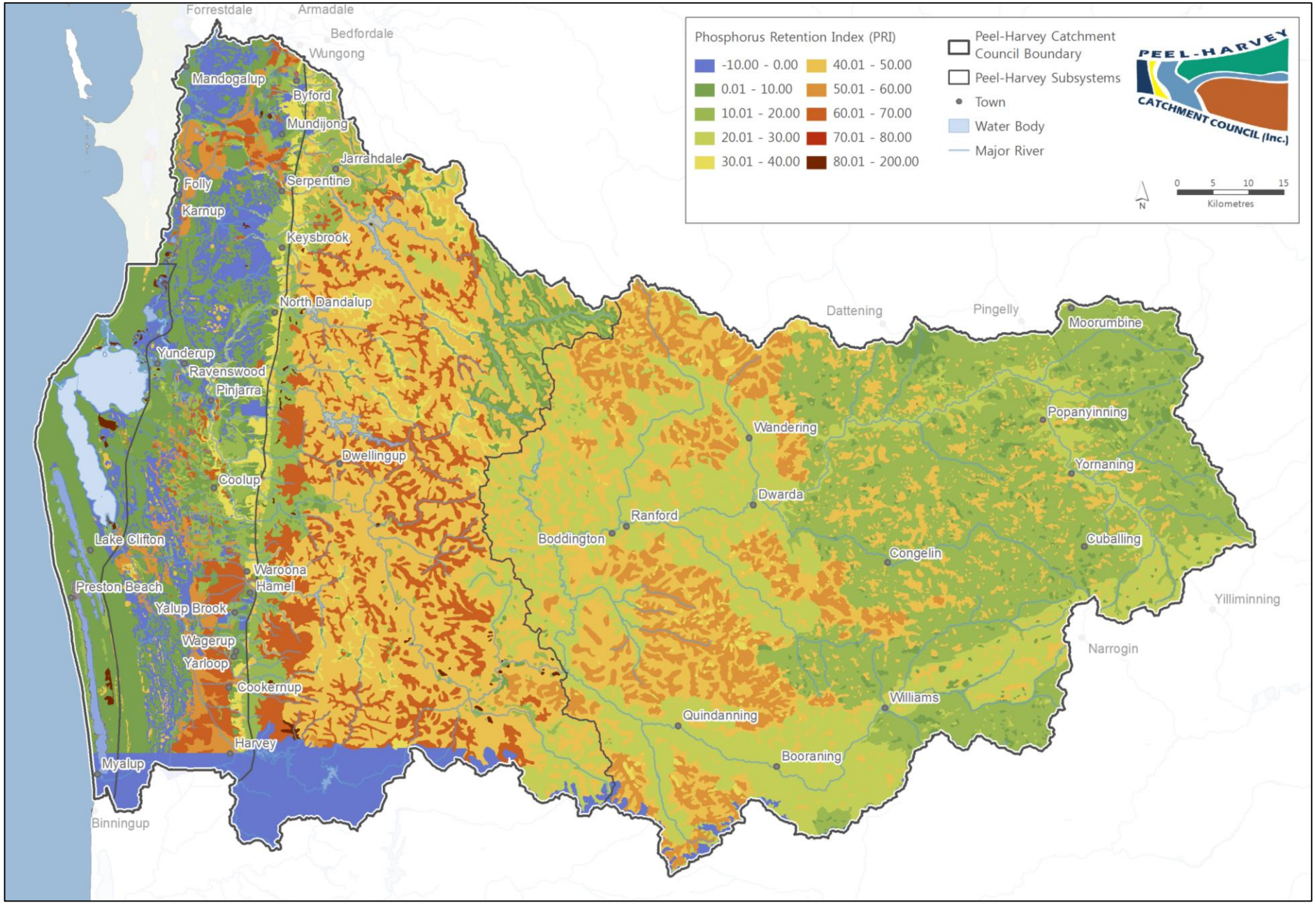

Figure 5: Phosphorus retention index

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