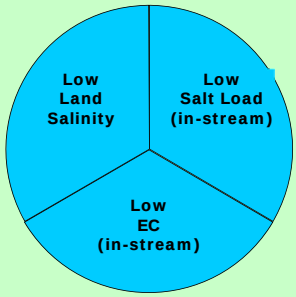
16. Namadgi Hydrogeological Landscape

LOCALITIES	**Namadgi National Park**	
MAP SHEET	**Brindabella 1:100 000** **Canberra 1:100 000** **Tantangara 1:100 000** **Michelago 1:100 000**	
CONFIDENCE LEVEL	**Moderate**	

OVERVIEW

The Namadgi Hydrogeological Landscape (HGL) extends from Gibraltar Peak in the north to the ACT border in the south (Figure 1). The HGL covers an area of 514 km^2 and receives 700 to 1500 mm of rain per annum.

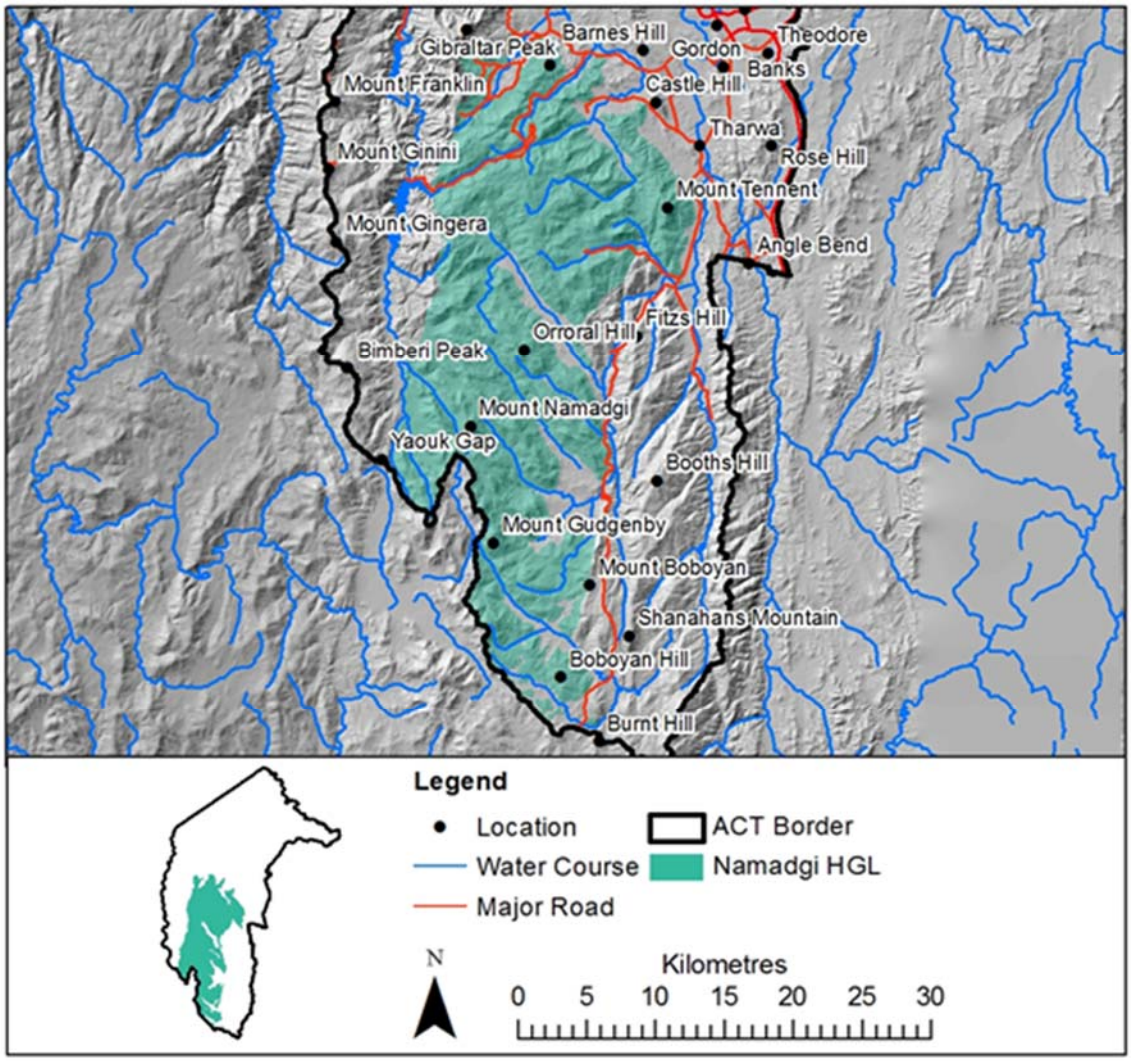


Figure 1: Namadgi HGL distribution map.

Namadgi HGL is a granitic landscape with alpine and sub alpine areas (Figure 2). There are some alpine bog and fen wetlands, but not as much peat development as Bimberi HGL. The area is mostly under national park management and contains significant biodiversity and ecological assets.

Outcrop, particularly on ridge tops, is a landscape feature. Drainage is across the landscape with some through-flow which feeds subalpine bogs and fens, as well as wet drainage lines further down the landscape. There are small drainage basins which develop into bogs and fens in both the alpine and subalpine situations.

There have been significant impacts from fire on some plant species, such as Mountain Ash, and there are a number of post-fire landslip scars evident.

The granitic Namadgi HGL is a landscape with distinctive tors in the upper landscape and some wetland areas. In contrast, Bimberi HGL has dome shaped landscapes with humic soils and peat wetlands while Clear Range HGL has shallow rocky soils with steep slopes.

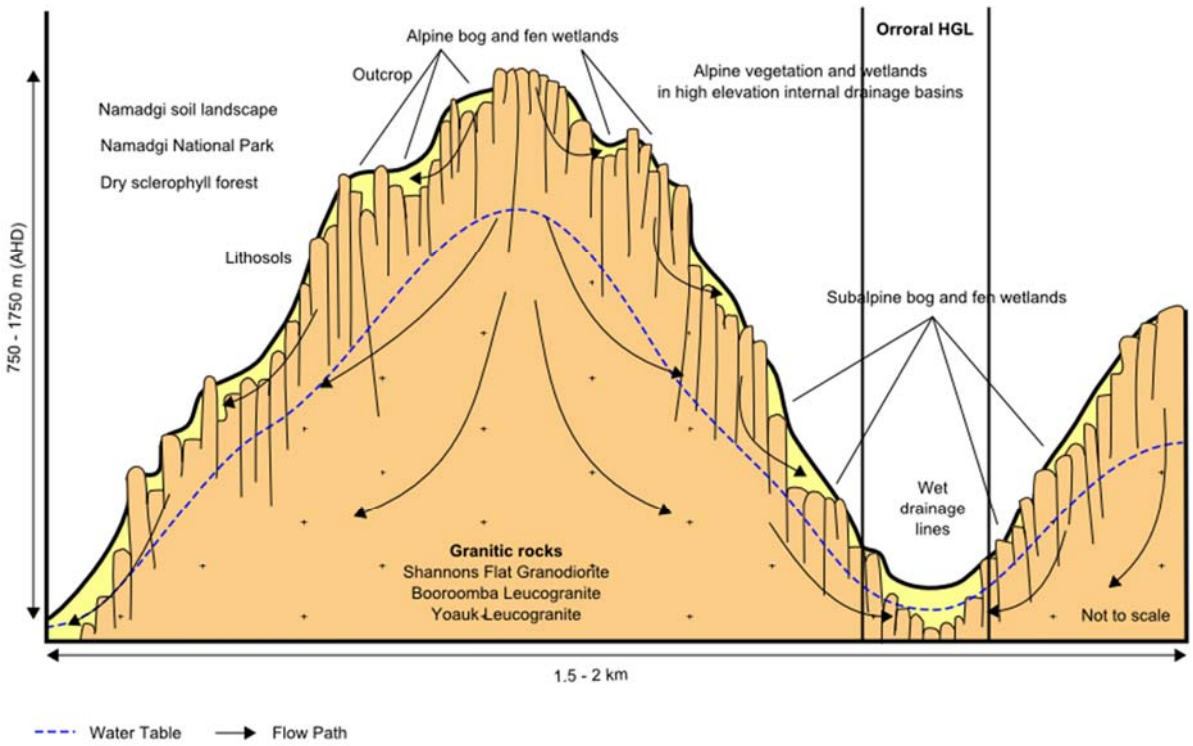


Figure 2: Conceptual cross-section for Namadgi HGL showing the distribution of regolith and landforms, salt sites if present, and flow paths of water infiltrating the system.

There is no evidence of salinity in this HGL (Table 1).

Table 1: Namadgi HGL salinity expression.

SALINITY EXPRESSION	
Land Salinity (Occurrence)	Low – no evidence of salinity
Salt Load (Export)	Low – net dilution landscape
EC (Water Quality)	Low – fresh water

Salt store refers to the amount of salt stored in soil and geology materials. Salt availability refers to how easily this salt can be moved by water. Salt stored within Namadgi HGL has low mobility. There is a low salt store that has moderate availability (Table 2).

Table 2: Namadgi HGL salt store and availability.

SALT MOBILITY			
	Low availability	**Moderate** availability	**High** availability
High salt store			
Moderate salt store			
Low salt store		**Namadgi**	

Overall salinity hazard is based on the likelihood of salinity occurring and how much impact it would have. The overall salinity hazard in Namadgi HGL is very low. This is due to the low likelihood that salinity issues will occur and that these would have potentially limited impacts (Table 3).

Table 3: Likelihood of salinity occurrence, potential impact and overall hazard of salinity for Namadgi HGL.

OVERALL SALINITY HAZARD			
	Limited potential impact	**Significant** potential impact	**Severe** potential impact
High likelihood of occurrence			
Moderate likelihood of occurrence			
Low likelihood of occurrence	**Namadgi**		

LANDSCAPE FEATURES

The following photographs illustrate landscapes and specific features observed in this HGL. Information used to define the HGL is summarised in Table 4.

Photo 1: Wet drainage line and steep surrounding slopes in Namadgi HGL (Photo: OEH / R Muller).

Photo 2: Wetland biodiverse area in the lower landscape of Namadgi HGL (Photo: OEH / W Cook).

Photo 3: Granodiorite boulder with large xenolith in Namadgi National Park (Photo: OEH / R Muller).

Photo 4: Landslip scar, post fire in Namadgi National Park (Photo: DPI / A Nicholson).

Photo 5: Typical outcrop on ridge tops of Namadgi HGL (Photo: DPI / A Nicholson).

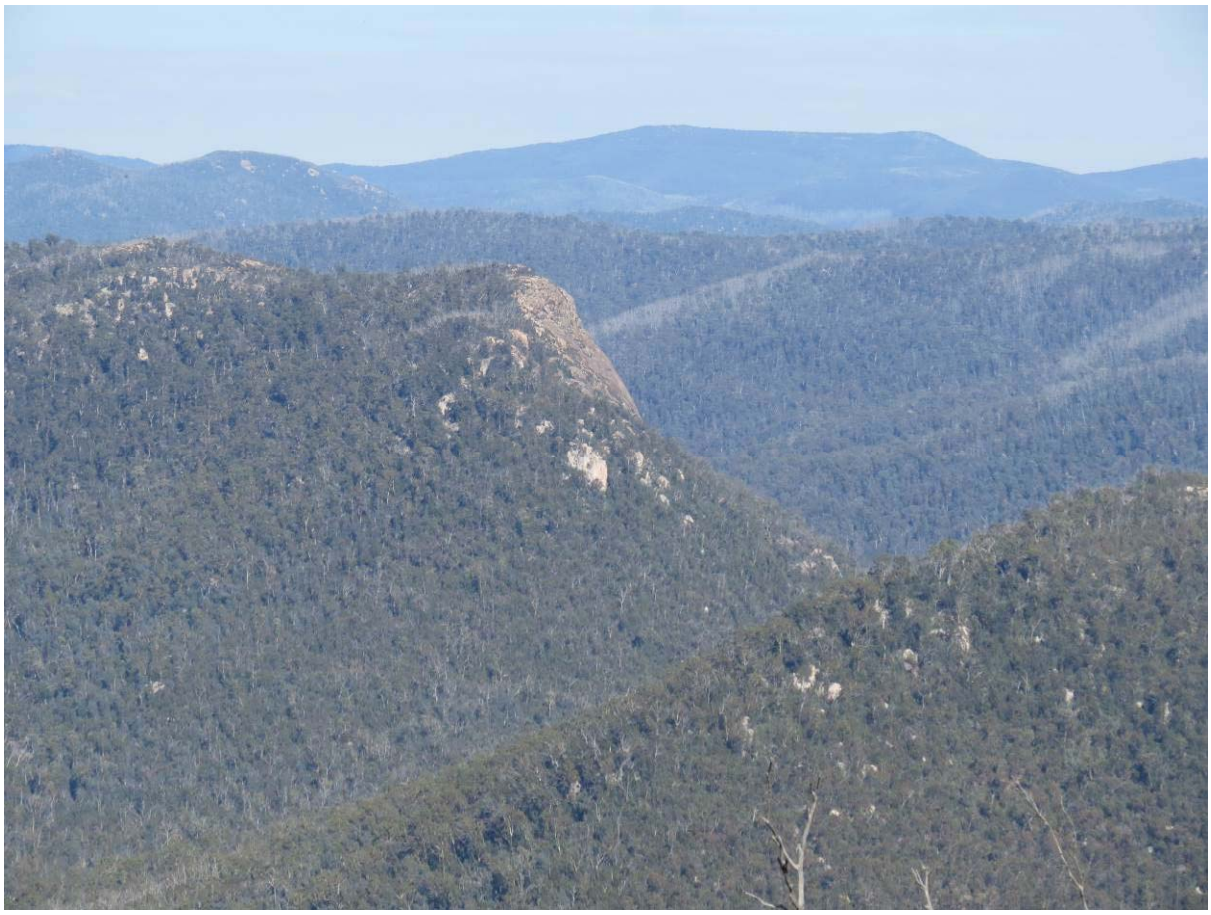


Photo 6: Landscape view over ridge tops tops of Namadgi HGL (Photo: DPI / A Nicholson).

Table 4: Summary of information used to define Namadgi HGL.

Lithology *(Raymond et al. 2007; Geoscience Australia 2015)*	This HGL comprises granitic rocks. Key lithologies include: • Shannons Flat Granodiorite • Booroomba Leucogranite • Yaouk Leucogranite
Annual Rainfall	700–1500mm
Regolith and Landforms	Soil generally <0.5 m deep with deeper pockets associated with areas of saprolite along fractures and in flow lines. Less weathered rocks occur as tors and subcrop. The combination of sandy soil and saprolite provides low potential for salt store. Slopes generally 10–32%; 32–56% in higher areas; 0–10% on some flatter mountain tops and associated wetlands Elevation Range is 750–1750 m
Soil Landscapes *(Jenkins 1993; Jenkins 2000; Cook & Jenkins in prep)*	The following soil landscapes are dominant in this HGL: • Namadgi • Empodisma Fen (isolated) • Sphagnum Bog (isolated) Tenosols (Alpine Humus Soils) and transitional Alpine Humus soils occupy the highest elevations. The high level of humus means the soil can hold and release a large amount of water. This water tends to be fresh, with low levels of salinity. Organosols (Peats) occur in the numerous but generally small bogs and swamps. They are an important water store and habitat. Soils on the slopes of this HGL tend to be sandy with the degree of development of a clay subsoil the determining factor in soil type. Rudosols (Lithosols, Siliceous Sands) and Tenosols (Lithosols and Earthy Sands) are common on steeper slopes. Where subsoils have developed Red Kandosols (Red Earths) and Red Chromosols (Red Podzolic Soils) are common. Soils in this HGL tend to be deeper and weathering of bedrock is greater and extends to a greater depth than in Clear Range HGL.
Land and Soil Capability	Class 7
Land Use	• national park and native forest
Key Land Degradation Issues	• landslip and mass movement • water erosion and fire induced erosion. • shallow soils

Native Vegetation *(Keith 2004; Gellie 2005; Dept. of Environment 2012)*	This HGL is situated within the IBRA7 South Eastern Highlands (Murrumbidgee subregion, north and east, and Bondo subregion, west) and Australian Alps (central and south) Uncleared vegetation formations comprise Wet and Dry Sclerophyll Forest with Grassy Woodlands as the elevation increases. Freshwater Wetlands are common features with minor areas of alpine complex vegetation at the highest elevations. Local vegetation is described by Gellie (2005)

HYDROGEOLOGY

Typical values for the hydrogeological parameters of this HGL are summarised in Table 5.

Table 5: Summary of values for typical hydrogeological parameters of Namadgi HGL.

Aquifer Type	Unconfined in fractured rock and saprolite Lateral flow through unconsolidated colluvial sediments on slopes
Hydraulic Conductivity	Moderate Range: 10^{-2}–10 m/day
Aquifer Transmissivity	Moderate Range: 2–100 m^2/day
Specific Yield	Moderate Range: 5–15%
Hydraulic Gradient	Moderate Range: 10–30%
Groundwater Salinity	Fresh Range: <800 µS/cm
Depth to Watertable	Deep (locally shallow in bogs and fens) Range: >8 m
Typical Sub-Catchment Size	Medium (100–1000 ha)
Scale (Flow Length)	Local to intermediate Flow length: <10 km (intermediate)
Recharge Estimate	High
Residence Time	Short to medium (months to years)
Responsiveness to Change	Fast to medium (months to years)

MANAGEMENT OPTIONS

Overarching salinity management strategies have specific biophysical outcomes. These are achieved by implementing a series of targeted land management actions that take into account the opportunities and constraints of the particular HGL. The actions recognise the need for diffuse and specific activities within the landscape to impact on salinity. Further explanation of land management functions, strategies and actions can be found in Wooldridge *et al.* (2015).

Salinity is driven by interactions between water-use capacity of vegetation, physical soil properties and hydrogeological processes within the HGL.

Actions that influence the way water is used by vegetation or stored in the soil profile will have impacts on recharge. The influence of both continual and episodic recharge and the impacts of extreme weather events should be considered when deciding on appropriate management actions. Short and long-term climate cycles also should be considered as they have a bearing on salinity processes, particularly salt load and land salinity.

Landscape Functions – Namadgi HGL

Functions this landscape provides within a catchment scale salinity context:

- **A.** The landscape provides fresh water runoff as an **important water source.**
- **B.** The landscape provides fresh water runoff as an **important dilution flow source.**

Landscape Management Strategies – Namadgi HGL

Appropriate strategies pertinent to this landscape:

- **Maintain or maximise runoff (10)**
- **Maintain current hydrology (11)**

Key Management Focus – Namadgi HGL

Managing water within a national park for both water quality and water quantity is a major focus. Fire, feral animal control and access tracks all form part of natural resource management plans.

There are areas of high value and unique situations that should be maintained, especially where there is a lack of disturbance.

Specific Land Management Opportunities

Specific opportunities for this HGL:

- public land – national park
- intact vegetation communities
- high biodiversity and ecological function
- wetland areas in alpine and subalpine locations
- hydrology is mainly intact.

Specific Land Management Constraints

Constraints on land management in this HGL include:

- fire regime will have a large impact on the hydrology of this HGL
- access and topography limit land management options
- track construction, location and maintenance is of high importance
- it is difficult to limit the access of feral animals to sensitive areas – wetlands.

Specific Targeted Actions

Management areas for this HGL are illustrated in Figures 3 and 4. The specific management actions for these areas are described in Table 6.

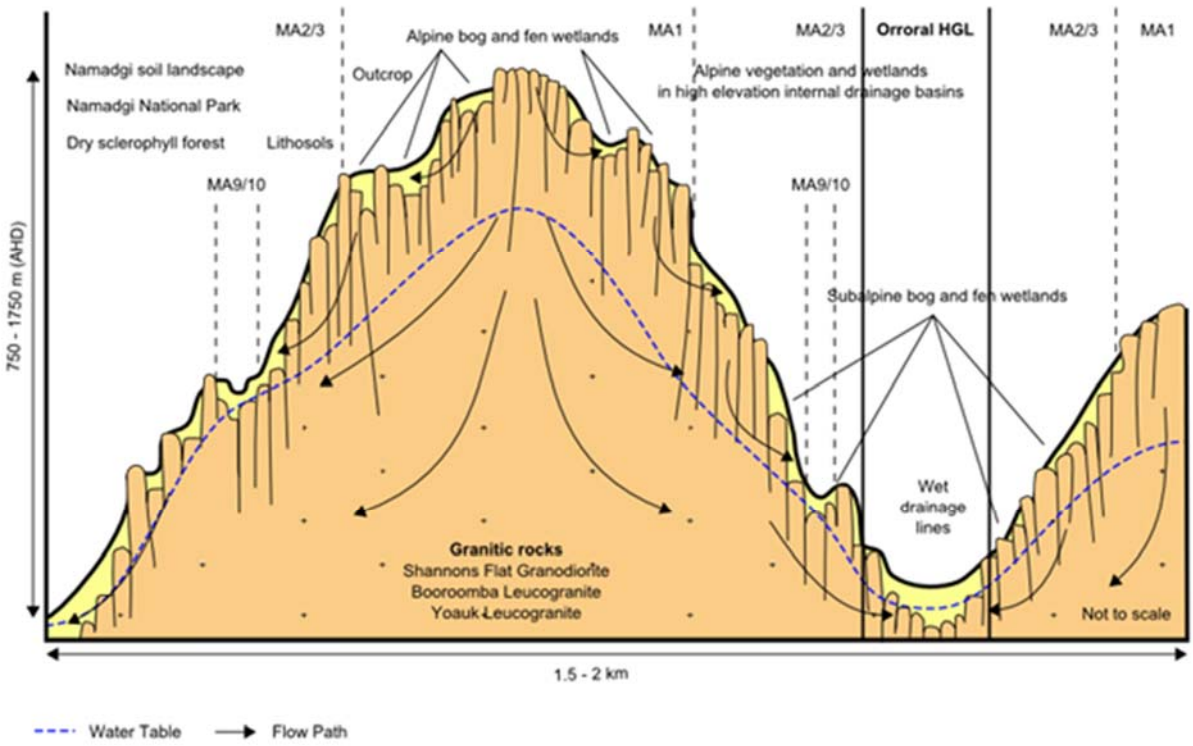


Figure 3: Management cross-section for Namadgi HGL showing defined management areas.

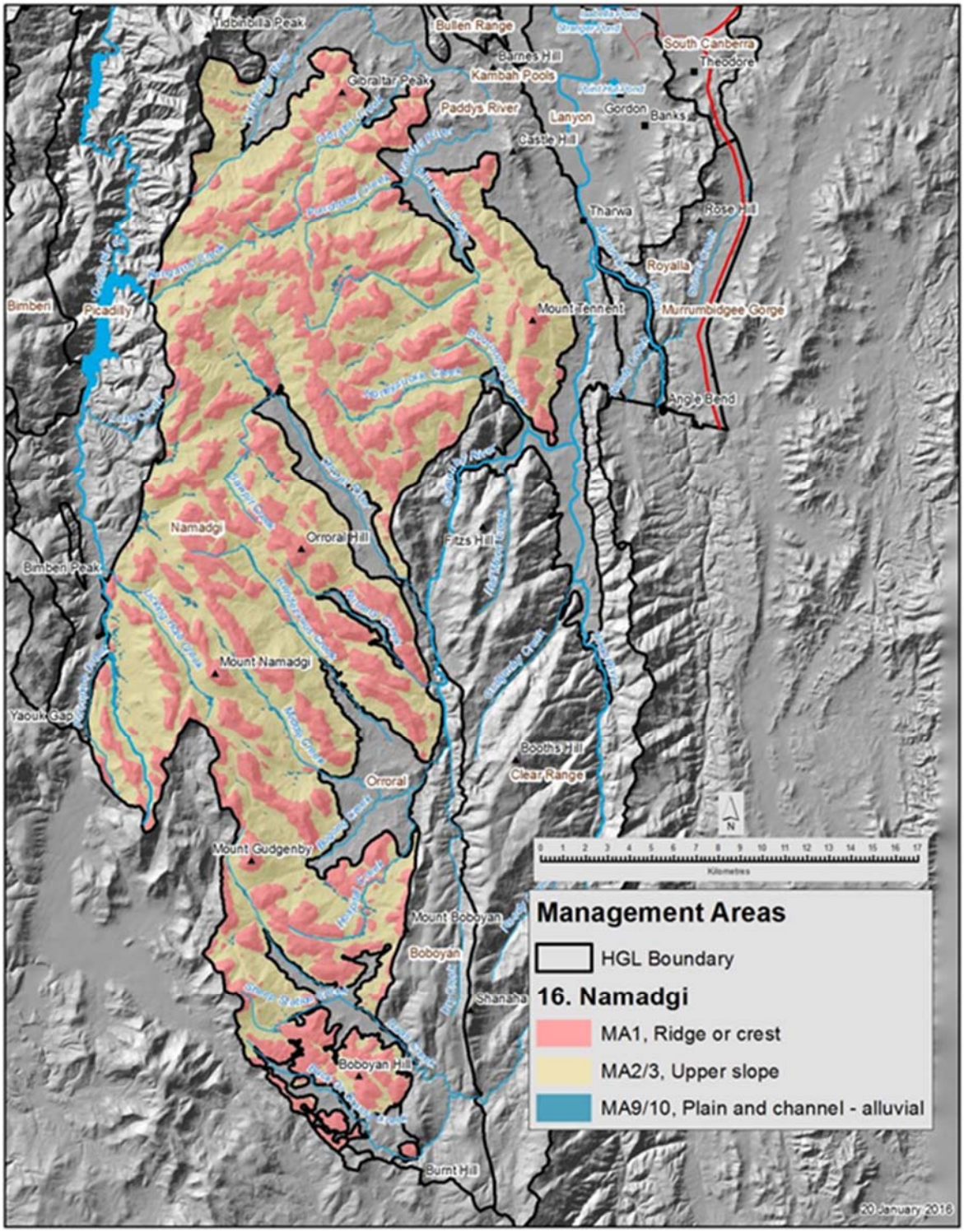


Figure 4: Spatial distribution of management areas for Namadgi HGL.

Table 6: Specific management actions for management areas within Namadgi HGL.

Management Area (MA)	Action
MA 1 (RIDGES)	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)** Manage animal impact on sensitive areas for hydrology outcomes **(VE10)**
MA 2/3 (UPPER SLOPES)	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)** Manage animal impact on sensitive areas for hydrology outcomes **(VE10)**
MA 9/10 (PLAINS AND CHANNEL – ALLUVIAL)	**Vegetation for ecosystem function** Maintain and improve riparian native vegetation to reduce discharge to streams **(VE4)** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)** Manage animal impact on sensitive areas for hydrology outcomes **(VE10)**
NAMADGI WETLANDS	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)** Manage animal impact on sensitive areas for hydrology outcomes **(VE10)** Exclude feral animals (pigs and horses) Fire management Appropriate location of infrastructure

High Hazard Land Use

There are some management actions that should be discouraged in this HGL as they will have negative impacts on salinity (Table 7).

Table 7: Management actions having negative salinity impacts in Namadgi HGL.

At Risk Management Areas	Action
MA 1, 2/3, 9/10	Clearing and poor management of native vegetation **(DLU4)** Reducing runoff from fresh surface water catchments **(DLU 6)** Hard hoofed animals in wetlands – feral animal control Inappropriate burning regime – fire regime management Access track construction

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