



NSW NATIONAL PARKS & WILDLIFE SERVICE

Glenrock State Conservation Area

Draft Planning Considerations



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This document is a draft for public comment. The provisions in the final plan may differ from the provisions of this draft document.

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How to use this report

This planning considerations report outlines the matters considered in preparing the *Glenrock State Conservation Area draft plan of management*, including the park's key values, management principles and management considerations. Further information, including scientific names for plants and animals, is provided in the appendices. The 'More information' section provides links to webpages referred to in this plan.

It is recommended that readers of this report also read the plan of management. The plan of management describes the desired outcomes for the park's values and actions that National Parks and Wildlife Service (NPWS) proposes to undertake to achieve these outcomes. It also sets out the recreational and commercial activities that are permitted in the park and any requirements to undertake these activities, including whether consent must be sought from NPWS.

This planning considerations report will be updated when appropriate, for example if we have new information on:

- the values of the park, for example, new threatened species
- management approaches, for example, new pest management techniques
- new programs.

Changes will only be made to this report if they are consistent with the plan of management.

Acknowledgements

Glenrock State Conservation Area is in the traditional Country of the Awabakal People.

This report was prepared by staff of NPWS.

Contact us

For more information about this plan or Glenrock State Conservation Area, contact the NPWS Lower Hunter Area Office, Nardoo Building at 1 Wetlands Place, Shortland, NSW 2307 or by email at npws.lowerhunter@environment.nsw.gov.au

Connection to Country

Glenrock State Conservation Area is part of an ancient landscape. The park's land and watercourses have traditionally been under the care of the Awabakal People. They called the Newcastle area 'Mullobinbah' and referred to themselves as the 'Biraban' or Eaglehawk Tribe. Aboriginal people have a deep spiritual and cultural connection to this Country. Their ancestors have lived here for tens of thousands of years, and form part of this living landscape. The existence and protection of cultural sites so close to the centre of Newcastle city makes the park highly significant to Aboriginal people.

Connections to Country and the significance of the park to Aboriginal peoples – past, present and future – are acknowledged and respected in this plan. The role of Aboriginal people in identifying traditional connections and custodians for this place is acknowledged and supported.



Photo 1 Water flowing over a fossilised rock platform, Flaggy Creek. John Spencer/DPE

Glenrock State Conservation Area

Glenrock State Conservation Area (referred to as ‘the park’ or ‘Glenrock SCA’ throughout this report) is located approximately 8 km from the central business district of Newcastle and covers an area of 554 ha (Figure 1). It stretches along the coastline between the residential suburbs of Dudley and Merewether and is within both the Newcastle and Lake Macquarie local government areas. The park is within the traditional country of the Awabakal People. It also falls within the area of the Awabakal Local Aboriginal Land Council.

The first sections of the park were gazetted in 1986, with additions following from a mixture of land tenures, including BHP lands, Crown lands and Hunter Water Corporation lands. About 9 ha of land, which includes 2 walking tracks, have been added to the park since 2010, creating the link between Glenrock SCA and Awabakal Nature Reserve to the south. Awabakal Nature Reserve connects to the Belmont Wetlands managed by NSW Crown Lands (within the Department of Planning and Environment) and Lake Macquarie City Council. In 2017, a further 7 ha of land, at the north-west edge of the park, parallel to Gun Club Road, was added to the park and gazetted in December 2021. Small parcels of public land may be added to the park in the future.

The declaration of Glenrock as a state recreation area in 1986 was the result of a lengthy process of community activism and urban planning. The National Trust, National Parks Association, Dudley Progress Association, Northern Parks and Playgrounds Movement, Association for Environmental Education, and Newcastle Flora and Fauna Protection Society all lobbied for the protection and preservation of Glenrock (NFFPS 1983). The park was declared a state conservation area in 2002.

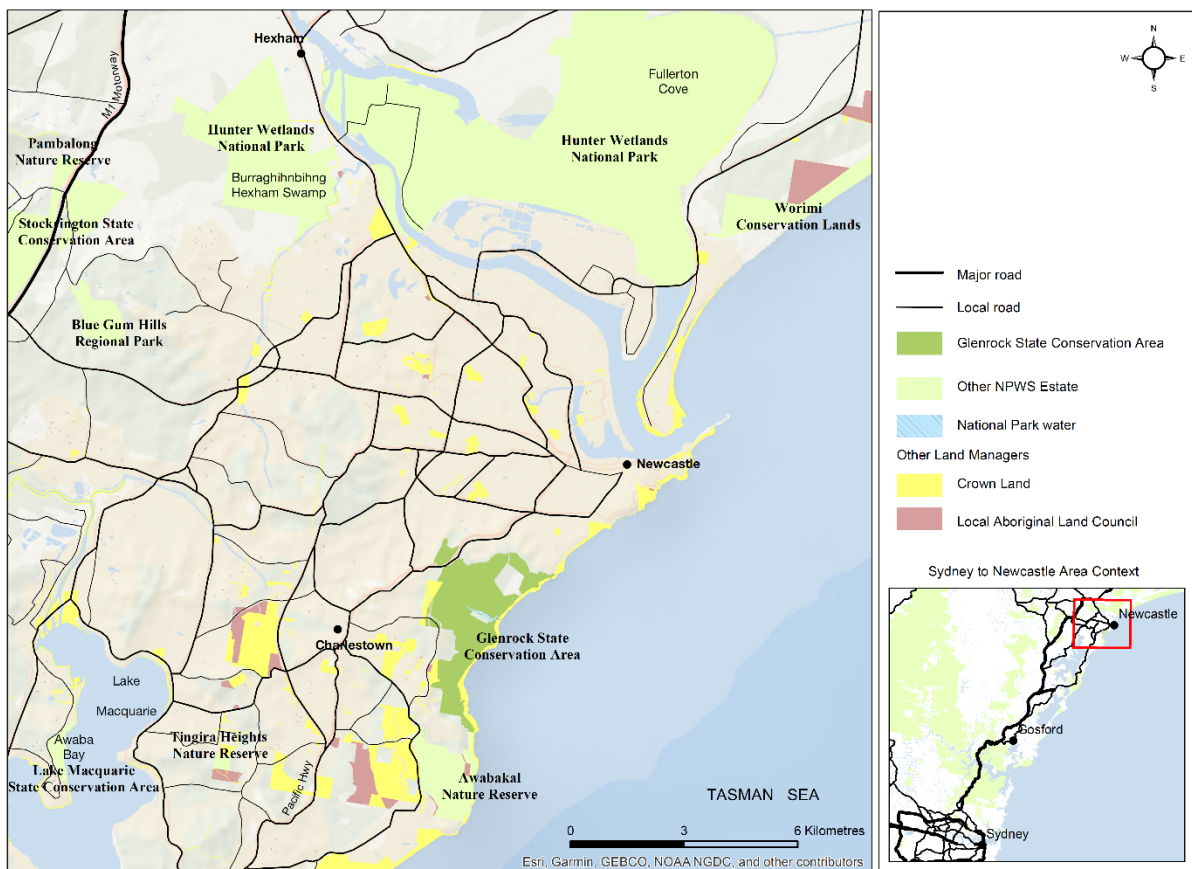


Figure 1 Glenrock State Conservation Area location

1. Protecting the natural environment

1.1 Geology, landform and hydrology

In geological terms the park is located at the northern end of the Sydney Basin, a foreland sedimentary basin system approximately 350 km long and an average 100 km wide. This basin has its centre at about Fairfield and extends from Port Stephens to Batemans Bay, and underlies the key NSW cities of Wollongong, Sydney and Newcastle.

The majority of the Sydney Basin's exposed sediments are of Triassic origin, with a geological history of 200 to 250 million years. In contrast, the park contains Permian sediments laid down 250 to 300 million years ago known as the Lower Newcastle coal measures. The oldest strata in these measures is the Lambton subgroup, followed in turn by the Adamstown, Boolaroo and the Moon Island Beach subgroups.

The Lambton subgroup is comprised of 8 separate coal seams, 7 of which outcrop in the park, including the Victoria tunnel seam, the Nobby's seam, the Dudley seam, the Yard seam and the Borehole seam. Their uplift and cross-sectional exposure by marine erosion has revealed them to spectacular effect in the ocean cliffs of the park. The sediments that separate these coal seams include fossil-bearing shales, conglomerates, sandstones and chert (tuff), the latter of which is an indication of past volcanic activity. The coal seams in the park were all mined extensively from the early 1800s to the 1970s.

Fossil deposits abound in the park and have been considered some of the richest deposits in the country since the early 1800s. It was for this reason that the colonial explorer Ludwig Leichhardt visited Glenrock Lagoon in 1842. At Dudley headland the rock platform contains fossilised tree trunks embedded in conglomerate sediments which overlie the Victoria tunnel coal seam.



Photo 2 Rock platforms near Dudley Beach. John Spencer/DPE

The Adamstown subgroup contains the Kotara formation, comprised of massive conglomerates and sandstones, and these provide the main source of parent material for soils in the park. The argillaceous conglomerates of this group (consisting of very small particles less than 0.002 mm in diameter), weather to produce highly dispersible clay soils that erode easily.

It is the tightly packed nature of the Permian sediments in a very small area of steep coastal terrain that has contributed to the large number of different vegetation communities in the park.

The geology of the area has shaped the way humans, both Aboriginal and non-Aboriginal, have interacted with the landscape. A rhyolitic tuff layer, formerly called Nobby's chert, can be found throughout the park. This was an important source of stone for tools manufactured and traded by the Awabakal People and was quarried extensively on Burwood Beach. Raw rock and stone tools from the Burwood Beach Aboriginal quarry were traded throughout the Hunter Valley. The local axe heads were highly prized and have been found as far inland as Quirindi (around 200 km to the north-west), demonstrating the Awabakal People's extensive trade and communication routes into the Country of other Aboriginal peoples.

The geomorphology of the area is also complex and adds to the natural diversity of the park. For example, Glenrock Lagoon and Murdering Gully show different stages in the ageing of coastal lagoons. Glenrock Lagoon was formed during the Quaternary period, between 2 million years ago and the present. A rise in sea level formed the lagoon, which was then closed to the sea by the accumulation of marine sand deposits at its mouth. Murdering Gully exhibits the next stage in this process, whereby a combination of windblown sands and sedimentation has reclaimed an earlier lagoon and established a terrestrial surface much younger than nearby sediments. Recent sedimentation studies of Glenrock Lagoon show that it is headed in the same direction (Peady 1991, cited in Griffin nrm 2003).

Another interesting geomorphic feature is the armouring effect of the conglomerates protecting the large rock platform 'flags' of Flaggy Creek and Little Flaggy Creek from weathering. These produce the distinctive water-worn rock pools, waterfalls and caverns which characterise these waterways.

The geology and geomorphologic processes have led to a generally hemispherical park landscape draining to the ocean that is approximately 4 km north to south, and 2.5 km east to west at its widest point. The main creek lines in the park include Flaggy and Little Flaggy creeks which feed into Glenrock Lagoon, and Murdering Gully, which drains to the ocean at Burwood Beach.

1.1.1 Management considerations and opportunities

The soils of the park are highly erodible with previously disturbed areas being particularly susceptible to erosion. Unauthorised vegetation clearing exacerbates the problem. There are numerous unauthorised and poorly designed tracks and trails throughout the park due to past land use, increasing demand for recreational activities and the presence of electricity and sewerage easements.

Erosion issues in the park contribute to sedimentation of the catchment and lagoon. Erosion and damage to the creek bed is of particular concern at the major creek crossings on Yuelarbah Management Trail and Fernleigh Loop Track.

Creek lines also receive stormwater from adjoining urban areas. This stormwater increases the volume and velocity of water entering the system and decreases water quality through an increase in sedimentation and nutrient levels.

Water quality concerns are compounded by problems with Hunter Water Corporation infrastructure in the park, which can result in surcharge during high rainfall events. Hunter

Water Corporation has an ongoing program of maintenance and upgrades to improve their infrastructure.

Management efforts will be focused on working with relevant land managers and stakeholders to discourage unauthorised track building and use of unauthorised tracks, and managing the trail and track network to minimise impacts on park values. NPWS will continue to invest in park infrastructure, including car park upgrades, track improvements, maintenance, realignment and creation of boardwalks.

Several areas of the coastline are undergoing natural erosion processes, and areas may become unsuitable for visitor use. The instability of sandy soils means that erosion is a problem in areas of heavy visitor use along coastal walking tracks in the park, particularly the Yuelarbah Track and associated tracks and trails. Upgrades may need to be undertaken on the tracks, including realignment of sections and the installation of boardwalks and other track surfaces to minimise further erosion and environmental damage. Changes in visitation use and patterns over time will require adaptive management to minimise the potential for accelerated erosion.

1.2 Native plants and animals

The park conserves over 550 ha of native vegetation, which has otherwise largely been removed or severely modified throughout the Lower Hunter region. Comparisons between vegetation surveys of the European settlement period (Leichhardt 1843) and the present demonstrate that the park is a remnant of Newcastle's pre-European vegetation. All but 3 plant species listed in 1843 are known to still occur in the park. The area conserves a mosaic of regionally and nationally significant vegetation communities and several threatened plant species.

Box 1: What is an ecological community?

An ecological community is a naturally occurring group of native plants, animals, fungi and other organisms living in a unique habitat. Ecological communities are threatened when they become at risk of extinction by activities that result in vegetation clearing and fragmentation. Currently, more than 100 threatened ecological communities are listed under the NSW *Biodiversity Conservation Act 2016*. Five threatened ecological communities occur in Glenrock SCA (see Table 1).

Twelve distinct vegetation communities have been recorded in the park (Bell 1998; refer to Appendix B). Of these, 8 are considered to be poorly conserved (Bell 1998). There are 5 threatened ecological communities listed under the NSW *Biodiversity Conservation Act 2016* in the park, see Table 1.

The draft plant community types (PCTs) for Glenrock SCA are also included in Appendix B. These communities are currently being refined for eastern NSW and will be progressively upgraded. The PCT classification system is considered to be scientifically robust and practical for use by conservation and resource management practitioners. NPWS will progressively update existing vegetation mapping by establishing an equivalence between existing map units and each PCT. This process may take some time, hence both vegetation mapping systems are included in Appendix B for reference.

The park has a floristic diversity index of 72.26 species per hectare which places it in the top 5 of the 20 conservation reserves in the Sydney Basin (Griffin nrm 2003). The high conservation significance of the park's vegetation is due to the restricted distribution of the Permian sediments on which they occur. The remainder of the Sydney Basin is Triassic in origin.

Very few conservation reserves contain Permian geology, with Newcastle and Lake Macquarie being the only areas where such sediments outcrop in a coastal location (Bell 1998).

Table 1 Threatened ecological communities in the park

Threatened ecological community	BC Act status	EPBC Act status
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregions	E	N/A
Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions	E	CE
Lowland rainforest in the NSW North Coast and Sydney Basin bioregions	E	CE
Swamp oak floodplain forest of the New South Wales North Coast, Sydney Basin and South East Corner bioregions	E	E
Freshwater wetlands on coastal floodplains of the New South Wales North Coast, Sydney Basin and South East Corner bioregions	E	N/A

BC Act = NSW *Biodiversity Conservation Act 2016*.

EPBC Act = Cth *Environment Protection and Biodiversity Conservation Act 1999*.

E = endangered ecological community; CE = critically endangered; N/A = not applicable (not listed).

Source: NSW BioNet (13/1/2022).



Photo 3 Banksia, Leggy Loop Track. John Spencer/DPE

In addition to the 5 threatened ecological communities, 7 threatened plant species listed under the Biodiversity Conservation Act are known to occur in the park (see Table 2), 5 of which are also listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

Table 2 Threatened plants in the park

Common name	Scientific name	BC Act status	EPBC Act status
Black-eyed Susan	<i>Tetradlea juncea</i>	V	V
Coastal headland pea	<i>Pultenaea maritima</i>	V	n/a
Heath wrinklewort	<i>Rutidosia heterogama</i>	V	V
Native guava	<i>Rhodomyrtus psidioides</i>	CE	n/a
Scrub turpentine	<i>Rhodamnia rubescens</i>	CE	CE
Rough doubletail	<i>Diuris praecox</i>	V	V
White-flowered wax plant	<i>Cynanchum elegans</i>	E	V

BC Act = *Biodiversity Conservation Act 2016*.

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*.

V = vulnerable; E = endangered; CE = critically endangered; n/a = not applicable (not listed).

Source: NSW BioNet (13/1/2022).

Whilst no systematic fauna survey has been undertaken in the park, 140 species of birds have been recorded in or nearby. Ten threatened animals have been recorded in the park, including the vulnerable squirrel glider (*Petaurus norfolcensis*) (Table 3). Mammals such as the short-beaked echidna (*Tachyglossus aculeatus*), sugar glider (*Petaurus breviceps*), feathertail glider (*Acrobates pygmaeus*), and the common dunnart (*Sminthopsis murina*) can also be found in the park. Glenrock also protects many common native plants and animals, some of which have importance to Aboriginal people as totemic species and bush tucker.

Table 3 Threatened animals in the park

Common name	Scientific name	BC Act status	EPBC Act status
Common bent-wing bat	<i>Miniopterus schreibersii</i>	V	n/a
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	V	V
Little bent-wing bat	<i>Miniopterus australis</i>	V	n/a
Little lorikeet	<i>Glossopsitta pusilla</i>	V	n/a
Masked owl	<i>Tyto novaehollandiae</i>	V	n/a
Powerful owl	<i>Ninox strenua</i>	V	n/a
Sooty oystercatcher	<i>Haematopus fuliginosus</i>	V	n/a
Sooty owl	<i>Tyto tenebricosa</i>	V	n/a
Squirrel glider	<i>Petaurus norfolcensis</i>	V	n/a
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	V	n/a

BC Act = *Biodiversity Conservation Act 2016*.

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*.

V = vulnerable; N/A = not applicable (not listed).

Source: NSW BioNet (13/1/2022).

Box 2: Threatened species in focus – squirrel glider

The park provides important habitat for the squirrel glider, a threatened species listed under the Biodiversity Conservation Act. This species is commonly found in woodland and heath in the park, and is known to use the corridor linking the park in the south to the Awabakal Nature Reserve. The gliders feed on the nectar and pollen collected from banksias, eucalypts and bottlebrushes, and shelter in tree hollows.

Threats to this species include habitat loss or degradation caused by fragmentation, high-frequency fires and removal of hollow-bearing trees. The species is also threatened by road mortality and predation by foxes (*Vulpes vulpes*), cats (*Felis catus*) and black rats (*Rattus rattus*).

Conservation strategies in the park include canopy restoration projects and restoring the tree cover in disturbed parts of the park to strengthen movement corridors.



Squirrel glider (*Petaurus norfolcensis*). Pavel German/DPE

Although many of the species in the park are common on a regional scale, their occurrence and resilience in a small, isolated and fragmented bushland remnant surrounded by urban infrastructure is significant. Native animal and plant populations in the park are under increasing pressure as the park's linkages with surrounding bushland are limited. The only significant bushland corridor to the park is through Belmont Wetlands State Park in the south via Awabakal Nature Reserve.

Conservation strategies in the park include canopy restoration projects to restore the tree cover in disturbed parts of the park to strengthen movement corridors.

Box 3: Ecological health monitoring

The NSW national park estate makes up 9.3% of the state, encompassing various desert, alpine and coastal ecosystems. Around 800 of the approximately 900 threatened species in New South Wales are found in the national park estate. Our parks also protect native plants, animals and ecosystems that are not threatened and some of which have great significance to Aboriginal people as totemic species and bush tucker.

NPWS staff are committed, from planning to operations, to maintaining and where possible improving the natural environment of our parks and adopting a zero extinction target. Ecological health monitoring allows park managers to test the effectiveness of their management. Each park has a unique set of values, threats and environmental indicators which can guide priority programs and management activities. Tracking and reporting on changes in ecosystems are fundamental aspects of an adaptive management program and allow for the effective use of limited resources to achieve conservation outcomes.

Potential development of environmental indicators in future to monitor the health of the natural environment in Glenrock SCA may assist in providing a measure of the required balance between conservation and visitor recreational opportunities. Environmental indicators can also guide and be linked to the investment in management actions for the park, delivering effective conservation into the future. An ecological health monitoring program is not currently planned for Glenrock but is a potential future opportunity.

1.2.1 Management considerations and opportunities

Past land-use activities, including European settlement, mining and associated activities, utility development and recreational activities have resulted in the removal of significant areas of the park's native vegetation and fragmentation of the remaining vegetation, particularly in the north of the park.

Vegetation removal associated with the proliferation of unauthorised tracks throughout Glenrock SCA is an ongoing concern, with increasing demand for recreational activities and a growing urban population on the fringe of the park. Unplanned, inappropriately located and poorly designed tracks further fragment vegetation and animal habitats, and exacerbate soil erosion.

The compaction and erosion of tracks favours the establishment of weeds over native species. In addition, vehicles, bikes, horses and people using tracks and trails are known to spread weeds. Stormwater and urban runoff are also major factors in the distribution and establishment of weeds in the park.

Opportunities to develop further linkages from the park to surrounding bushland is improbable due to the surrounding urban areas. As such, maintaining and, where possible, strengthening the southern link from the park to Awabakal Nature Reserve, as well preserving existing priority remnants across the park will be important to the long-term viability of the native plants and animals.

The *Glenrock State Conservation Area draft mountain biking plan* (NPWS 2022b) has been prepared to improve the current track network and discourage further construction of unauthorised tracks. Ongoing user education and compliance is required for all recreational activities in the park to strengthen the understanding of the balance required between conservation and recreation, the cultural significance of the park and to foster a mutual respect for limited facilities.

Strategies for the conservation of threatened species, populations and ecological communities have been set out in a statewide Biodiversity Conservation Program. Actions listed in each of these strategies are prioritised and implemented through the Saving our Species program, or where assets of intergenerational significance occur, conservation action plans are developed. These programs and plans aim to maximise the number of threatened species that are secured in the wild in New South Wales for 100 years.

Many recovery plans for NSW threatened species have previously been prepared and may provide useful information, however, they no longer determine the legislative actions required for the conservation of threatened species in NSW. The Australian Government prepares recovery plans for nationally listed threatened species under the Environment Protection and Biodiversity Conservation Act, and these plans apply to nationally listed threatened species occurring in the park.

Restoration of habitats and degraded areas in the park is typically prioritised through Saving our Species programs, NPWS branch pest management strategies and other relevant park management programs. Volunteer bush regeneration programs are aligned to these priorities and, at times where there is a community interest and funding available, may also be reactive. Future ecological health monitoring in the park may also be a tool used to assist in guiding a program of adaptive management actions in the park (see Box 3).

The primary objectives of NPWS fire management are to protect life, property, community assets and cultural heritage from the adverse impacts of fire, while also managing fire regimes in parks to maintain and enhance biodiversity (see Box 4). A fire management program has been prepared for Glenrock SCA and is reviewed annually to assess risks. The program considers fuel and biodiversity thresholds for key vegetation communities to show appropriate periods of time between burns and maximum fire exclusion to maintain biodiversity.

Management actions to improve habitat and biodiversity in the park include the revegetation of cleared areas, closure and rehabilitation of unauthorised tracks and trails, appropriate fire regimes, and managing priority weeds and pest animals.



Photo 4 Rough doubletail orchid. Lachlan Copeland/DPE

Box 4: Fire in the park

Fire has been an important influence in the Australian landscape for many thousands of years. Aboriginal people used fire as a tool for hunting and for managing food resources.

Fire is a natural feature of many environments and is essential in maintaining the diversity of native plants and animals. In fire-adapted communities some plants respond to fire by flowering or releasing seed, while for others, heat activates seeds and smoke triggers germination. However, inappropriate fire regimes can also lead to loss of some plant and animal species and communities. In Glenrock SCA, littoral rainforest is threatened by fire incursion, particularly along remnant boundaries. Fire has often been suggested as a management tool for Themeda grasslands. However, studies being conducted suggest that frequent fire is likely to reduce diversity within *Themeda*-assemblages (Hunter 2020).

High-frequency fire resulting in the disruption of life cycle processes in plants and animals, and loss of vegetation structure and composition, has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b).

The recorded fire history of the park dates back to 1984. Glenrock's fire history is dominated by numerous small patchy burns due to the combination of arson and lightning strikes. Fires have not been widespread in the park due to available access for suppression, proximity to emergency services, the prevalence of wetter vegetation and the fire-suppressing effects of weeds such as bitou bush (*Chrysanthemoides moniflora* subsp. *rotundata*) and lantana (*Lantana camara*). The last major wildfire was recorded in 2013–14 to the north of Glenrock Lagoon.

Considering the high distribution of weed species within the park, it is important that fire management planning addresses the issue of weeds. Prescribed burning has been used as a tool in the primary treatment of weed infestations. Follow-up weed control after fires should continue wherever biodiversity thresholds and resources allow.

Fire management programs in Glenrock SCA are implemented cooperatively and in coordination with other fire authorities, neighbours and the community. NPWS is an active member of the Newcastle and Central Coast bush fire management committees.

Fuel suppression is prioritised in asset protection zones and strategic fire advantage zones to protect assets on the park–urban interface.

1.3 Feral animals and other pest species

Pest species are plants, animals and pathogens that negatively impact the environment, economy and society. The impacts are most commonly caused by introduced species. Pests can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values, with several listed as key threatening processes.

Weed proliferation in the park is extensive and provides competition for native plant species. Appendix C provides a summary of the priority weeds in the park.

Feral and pest animals – such as rabbits (*Oryctolagus cuniculus*), hares (*Lepus capensis*), red foxes (*Vulpes vulpes*), wild dogs (*Canis lupus familiaris*), feral cats (*Felis catus*) and black rats (*Rattus rattus*) – are found in the park and can have a detrimental effect through competition and/or predation on native animal species as well as impacts on native vegetation.

Together with foxes, feral cats are known to have caused the decline of many native species, including extinctions of mammals. Predation by feral cats has been listed as a key threatening process under Biodiversity Conservation Act (NSW SC 2000c) and Environment Protection and Biodiversity Conservation Act (DCCEEW n.d.). Feral cat control remains difficult and NPWS will continue to seek effective methods of control.

1.3.1 Management considerations and opportunities

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and pest animals. These requirements apply equally to public and private lands. Under this framework, NSW Local Land Services has prepared regional strategic weed management plans and regional strategic pest animal management plans for each of its 11 regions, including the Hunter region (Hunter LLS 2017; Hunter LLS 2018). These plans identify priority weeds and pest animals in the region, plus the appropriate management response for the region (that is, prevention/alert, eradication, containment or asset protection).

Pest management programs in Glenrock SCA are undertaken in accordance with the relevant regional pest management strategies outlined above, ensuring compliance with legislative responsibilities. Pest animal management in the park is typically reactive and undertaken as required. Where possible NPWS collaborates with other land managers in its response. The park's proximity to urban areas limits pest animal management programs, such as 1080 baiting, due to park visitor safety risks and potential impacts to straying domestic pets. Potential ecological health monitoring and new control techniques and methodologies may assist pest animal management actions in the future.

Weed management in Glenrock SCA focuses on high-priority weed species, where prevention, eradication and containment are realistic (refer to Appendix C). Resources are guided by the NPWS pest management strategy for the park and are directed at maintaining intact core areas of the park, and areas of threatened species and threatened ecological communities. These programs are prioritised according to their purpose, impact and significance. Prioritisation categories include critical, high, medium and low in line with the Hunter LLS strategic plan (Hunter LLS 2017). Reactive programs may also be undertaken in cooperation with neighbouring land managers and in response to emerging invasions.

Some pest plant and animal species are also considered key threatening processes under the Biodiversity Conservation Act. A threat may be listed as a key threatening process under the Act if it adversely affects threatened species or ecological communities or could cause species or ecological communities to become threatened. Key threatening processes are managed through strategies developed under the Saving our Species program.

Management actions to address the effects of habitat loss and fragmentation include the closure and rehabilitation of unauthorised tracks and management of stormwater. It is anticipated that addressing these impacts will reduce the costs associated with weed control over the longer term. Ecological health monitoring may assist in identifying management priorities for the park and enable adaptive management into the future.

Box 5: Climate change

Human-induced climate change is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000a), and habitat loss caused by human-induced greenhouse gas emissions is listed under the Environment Protection and Biodiversity Conservation Act (TSSC 2001). The following is a snapshot of the predicted changes to climate for the Hunter region, which includes the Glenrock SCA (Adapt NSW n.d.):

- Maximum temperatures are projected to **increase** in the near future (2020 to 2039) by 0.7°C.
- Maximum temperatures are projected to **increase** in the far future (2060 to 2079) by 2.0°C.
- Minimum temperatures are projected to **increase** in the near future by 0.7°C.
- Minimum temperatures are projected to **increase** in the far future by 2.1°C.
- The number of hot days (i.e. >35°C) will **increase**.
- The number of cold nights (i.e. <2°C) will **decrease**.
- Rainfall is projected to **decrease** in spring and winter in the near future.
- Rainfall is projected to **increase** in autumn in the near and far future.
- Severe and average fire weather is projected to **increase** in summer and spring.

The projected increases in temperature, number of hot days and severe fire weather days are likely to influence bushfire frequency and intensity across the region and the fire season is likely to be extended. Higher rainfall in autumn will lead to more frequent flooding of low-lying areas and increased erosion and sediment shedding from the hinterland (DECCW 2010).

Climate change may significantly affect biodiversity by changing the size of populations and the distribution of species and altering the geographical extent, vegetation structure and species composition of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates.

The potential impact of climate change on the park is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from invasive species. Low-lying coastal ecosystems and fragmented ecosystems are at highest risk, and sea level rise and coastal erosion pose risks of damage to infrastructure in low-lying coastal areas, such as Burwood Beach.

Monitoring, maintaining and where possible improving existing areas of intact vegetation and habitat in Glenrock SCA will be important as the effects of climate change evolve. The limited area of connectivity to Awabakal Nature Reserve to the south of the park will be increasingly significant in strengthening the resilience of the plants and animals in the park and maintaining biodiversity in the region.

NPWS will continue to manage threats to the parks' values from climate change in a collaborative way with other land managers and park neighbours. Programs to monitor and reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires and pollution, will assist in the understanding and help reduce the severity of the effects of climate change.

2. Looking after our culture and heritage

Australia has one of the oldest continuous cultures dating back 60,000 years. Many places today have particular significance to Aboriginal people. Other places hold significant history to both Aboriginal and non-Aboriginal people, and very often, this history is a shared one.

Shared heritage refers to history and heritage after 1788, when Europeans first settled in Australia. This heritage is shared by all Australians and includes places and items that may have historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. Shared heritage in the park is made up of living stories as well as connections to the past, including natural resources, objects and traditions that need to be conserved for current and future generations.

2.1 Aboriginal culture and heritage

Glenrock SCA is part of Awabakal Country and falls within the area of the Awabakal Local Aboriginal Land Council. The Country of the Awabakal People includes what is now Newcastle, Lake Macquarie, the Central Coast, the coalfields area and the Watagan Mountains to Wollombi. The Newcastle area 'Mullobinbah' is Country of the 'Biraban' or Eaglehawk Tribe (Maynard n.d.).

Box 6: What is 'Country'?

To Aboriginal people, the landscape is made up of many features that are interrelated. These include land, water, plants and animals, places and stories, historical and current uses, and people and their interactions with each other and place. These features are central to Aboriginal spirituality and contribute to Aboriginal identity. They are inseparable and make up what is known as 'Country'.

Aboriginal sites are places with evidence of Aboriginal occupation or places that are related to other aspects of Aboriginal culture. They are important as evidence of Aboriginal history and as part of the culture of local Aboriginal people.

Evidence suggests that the Newcastle area has been lived in since the Pleistocene period. Because of fluctuating sea levels since the last Ice Age 12,000 years ago, the earliest coastal archaeological sites would now be buried under estuarine sediments or submerged beneath the sea. As the climate warmed and ice caps melted around the world, the ocean rose to where it is today about 6,000 years ago. The Awabakal would have witnessed and adapted to the rising sea levels by moving further inland. As a result, the majority of sites on today's coastline date from the Holocene period (5,000 years ago) through to today (Kamma 2003, in Griffin nrm 2003).

Many Aboriginal sites have been destroyed or covered over by development of the city of Newcastle. Glenrock SCA preserves many Aboriginal sites. The existence and protection of sites so close to the centre of the city makes the park highly significant to Aboriginal people.

A variety of Aboriginal site types are known to occur in Glenrock: shell middens, stone artefact scatters, axe grinding grooves, Aboriginal resource and gathering sites, Aboriginal ceremony and dreaming sites, ochre and stone quarry sites and a traditional Aboriginal pathway. Rock shelters with shallow earth floors may have been used for camping by Aboriginal people and it is probable that some of these may contain artefacts. Landscape sensitivity mapping and modelling for tangible Aboriginal heritage was completed in 2021–22. New sites were identified and added to the Aboriginal Heritage Information System (AHIMS) during this assessment, and it is likely that other sites exist throughout the park.

The Awabakal community, Awabakal Traditional Owners and the Awabakal Local Aboriginal Land Council are concerned that Aboriginal sites may be subject to acts of vandalism, and therefore prefer the location of most sites not be disclosed. They have given permission for a number of representative sites to be interpreted, including the Burwood Beach quarry site, a traditional Aboriginal pathway, and the open camp site and midden at the mouth of Glenrock Lagoon.

The cliffs and coastline of the park with their exposed layers of tuff, coal and ochre have been a manufacturing and export centre for thousands of years. The Awabakal particularly prized the many layers of rhyolitic tuff, a stone which is rich in silica, hard, smooth and fine grained. It is the hardest form of this rock that was used in tool manufacture. The Awabakal used this stone to make sharp-edged tools such as chisels, scrapers, graters and rasps which were then used to manufacture wooden implements such as boomerangs, clubs, spear throwers, shields, coolamons, dillybags, canoes and paddles. An outcrop of this rock that could be easily quarried, like that found in the headlands from Merewether to Glenrock Lagoon, was an extremely valuable resource.



Photo 5 The cliffs and coastline of Glenrock were an important resource for the Awabakal People. John Spencer/DPE

Raw rock and stone tools from the Burwood Beach Aboriginal quarry were traded throughout the Hunter Valley. The local axe heads were highly prized and have been found as far inland as Quirindi (about 200 km to the north-west), demonstrating that the Awabakal had extensive trade and communication routes into the Countries of other Aboriginal peoples (Kamma 2003, in Griffin nrm 2003).

One of the most important areas in the park for the Awabakal was the coastal strip at the mouth of Glenrock Lagoon where they had easy access to resources from the ocean, lagoon and surrounding hills. An Awabakal camp site was present in this location at the time of European settlement, and an extensive midden can still be found there. Middens are accumulations of shell material with other food remains, such as fish, bird and mammal bones, artefacts such as flakes, grinding stones and axe heads as well as evidence of hearths. Middens can also contain burial sites. Middens such as this are often the only physical indicators left of past Aboriginal use of an area before European settlement, and are therefore very important to Aboriginal people today. The midden at the mouth of Glenrock Lagoon requires stabilisation and site management to keep people off it, and to minimise the impacts of coastal erosion to protect its significance.

Glenrock and its Aboriginal sites also have a detailed historical record relating to the Awabakal and their life in the area at the time of European settlement (referred to as shared history). After the Newcastle convict settlement was established in 1804, the Awabakal and Europeans mingled freely, and relations between the 2 groups were considered friendly (Maynard n.d). The Awabakal supplied food to the convict settlement and often joined free men on hunting and fishing expeditions. Lt William Sacheverell Coke, second-in-command at the convict station in 1827, described his adventures around Newcastle and Glenrock in his diary. He was joined in his recreational activities of fishing, shooting and stuffing specimens by several Aboriginal men whose company he obviously enjoyed. Desmond and Birabahn often gave him oysters, lobster, shark, mullet, tailor and snapper. Lt Coke in turn loaned them his gun and gave them tobacco and clothes.

The Awabakal contributed to the 1813 Skottowe Manuscript, commissioned by the then convict settlement's commandant, providing both their words and the specimens depicted. The convict artist, Lycet, was also based at the convict settlement between 1815 and 1817 (Rowan and Miller 1990), and many of the scenes in his paintings depict the Awabakal way of life. It is believed that the earliest pictorial representation of Glenrock is in a painting of Lycet's entitled *Red Head*. At the time Lycet undertook this painting, the only Red Head in existence in the historical record was what we now know as Little Red Head – the bluff sitting above and to the south of the Glenrock Lagoon (Tonks 2004).

In 1825 the missionary Rev Lancelot Threlkeld recorded some of the names of significant Awabakal places now in the park, illustrating its importance to the Awabakal and his own association with the place. According to Threlkeld the camp site at the mouth of the lagoon was called Koi-y-ong by the Awabakal. The lagoon was called Pillapay-kullitaran, and the sand spit separating the lagoon from the ocean was called puntei.

The Awabakal man, Birabahn, was a pivotal figure in the shared history of the area. He came from Lake Macquarie but spent time as an officer's servant in Sydney and as a bush constable in Port Macquarie. He spoke fluent English and bridged the 2 cultures easily. Birabahn is probably responsible for much of the information Rev Threlkeld collected on the Awabakal People, and he assisted Threlkeld in establishing the mission at Lake Macquarie in 1825. Together they translated St Luke's Gospel into the Awabakal language, making it the first Aboriginal language to be recorded and published. Birabahn escorted many government officers and colonists through, or to, the Glenrock area, including the explorer Ludwig Leichhardt, Lt Coke, Threlkeld and Lycet along a traditional Aboriginal pathway.

The modern-day Yuelarbah Track, where it traverses Burwood Beach, is believed to have been part of this Aboriginal pathway which was a major trading route stretching from Lake Macquarie to Newcastle (Griffin nrm 2003). The Awabakal name Yuelarbah, when loosely

translated, means 'place of the footstep/track' (literally 'yulo' means footstep/track and 'bah' means place). This pathway later became the European industrial transport route of the coastal railway around the 1860s. The original pathway was along Burwood Beach and around Little Red Head, but in 1825 Threlkeld cut a track overland west of the lagoon, possibly on what is now Burwood Road. Aboriginal pathways such as this were used to gather resources, to maintain connections with Country and to communicate with other groups. They were remembered and passed on through stories and songs.

By the late 1830s to early 1840s European attitudes towards the Awabakal in Newcastle had changed from that which Lt Coke and Birabahn had experienced. Whilst there is no evidence the Awabakal were subject to the massacres which occurred elsewhere in New South Wales, the European demand for land meant that they were denied access to their hunting grounds and progressively marginalised as settlement expanded. European diseases took a heavy toll and women and girls were brutalised. Between 1820 and 1830 the Aboriginal population of New South Wales was reduced to a tenth of its original number. Threlkeld was one of the few Europeans to publicly speak out against the terrible treatment of Aboriginal people. As a result, he was ridiculed and ignored. The extent of the change in public opinion towards the Awabakal is evidenced by Leichhardt's derision of Birabahn in 1842, only 15 years after Lt Coke had written so highly of him. By that time the Glenrock area had transferred to private ownership, and the Awabakal had to seek approval to visit.

Today the Awabakal and other local Aboriginal people are still involved in looking after the area and telling stories of their relationship with this landscape in cultural tours. To the Awabakal the park is much more than a collection of useful resources. The word 'Country' involves the rocks, hills, sea, sky, creeks, plants, animals and people, all connected together in a complex web of creation, belief and kinship. Aboriginal people remember, maintain and recreate these spiritual connections through ceremony, story, song and other practices. Places in the landscape have special meaning and people have responsibilities towards Country to care for it and look after it. There is the potential for the park to be used for cultural camps so that the Awabakal can continue their association with Country.

2.1.1 Management considerations and opportunities

Although the NSW Government has legal responsibility for the protection of Aboriginal sites and places, NPWS acknowledges the right of Aboriginal people to make decisions about their own heritage. Aboriginal communities will be consulted and involved in the management of Aboriginal sites, places and related issues, and in the promotion and presentation of Aboriginal culture and history. NPWS will continue to work with and involve Aboriginal communities in the management of Glenrock SCA.

Landscape sensitivity mapping and modelling for Aboriginal heritage was completed in the park in 2021–22. This work will be used to inform and finalise an Aboriginal cultural heritage assessment for the park. In addition to an existing Hickson Street Walking Track Aboriginal heritage impact permit, a park-wide Aboriginal heritage impact permit will be developed and used to guide maintenance or proposed infrastructure activities in the park. Due diligence for potential cultural sites will precede all works involving ground disturbance undertaken in the park.

The *Glenrock Lagoon cultural landscape: conservation management and cultural tourism plan* (Griffin nrm 2003, referred to as the 'conservation management plan'), prepared in consultation with the Awabakal community and Awabakal Local Aboriginal Land Council, also outlines strategies for the management of Aboriginal sites and cultural landscapes in line with the *National Parks and Wildlife Act 1974* and the community's expectations.

2.2 Historic heritage

The first European visitors to Glenrock may have been the escaped convicts Mary and William Bryant, their 2 children and 9 others who stole the Governor's boat in Sydney and rowed to Timor in 1791. They recorded stopping by a lagoon where coal was exposed on a beach. There is much speculation about the exact location of this beach, however, Glenrock Lagoon and its opening to the sea fit their description. Soon afterwards coal was 'officially' discovered, and a penal colony established in Newcastle. Glenrock was then regularly visited by Europeans on hunting expeditions and was also on a transport route to Lake Macquarie.

In 1835, Sydney doctor and businessman James Mitchell purchased about 900 acres (approx. 365 ha) of coastal land extending from the far side of Merewether Ridge to Glenrock Lagoon, encompassing what is now the park. He named the property the Burwood Estate, after his wife's family home in London and later extended it to 1,834 acres (approx. 740 ha). For a full account of the historical events on the Burwood Estate refer to Shoebridge (2006) and Tonks (2004).

In 1842 Ludwig Leichhardt visited the Burwood Estate and drew up the stratigraphy of the coastline. Leichhardt may also have established the extent of the coal seams under Mitchell's property, as it was not long after Leichhardt's visit that Mitchell commissioned a tram/road tunnel through Burwood Ridge (now Merewether Ridge). Known as 'Mitchell's tunnel', the historical events surrounding its construction make it one of the most significant sites in New South Wales. It was partly due to its construction that coalmining in Australia was opened up to independent mining, which in turn led to the Hunter area's establishment as a coalmining centre. It was also the first tunnel of its type to be constructed in Australia.

Mitchell also established a copper smelter in 1851 in the dunes behind Burwood Beach (known as Smelters Beach for obvious reasons). The smelter was never a success and operated intermittently for 21 years using coal from the estate and copper ore from South Australia, Goulburn and Queensland. The smelter closed in 1872, although some of the cottages remained occupied well into the 1890s. The remaining buildings were finally dismantled in 1913 and the materials sold. Salvaged bricks were used to cap some of the old mines elsewhere in the estate. The smelter site is still marked by copper slag and brick foundations.

Mitchell floated the Newcastle Coal and Copper Company in 1854 and concentrated on coal and coke production, buying up the Burwood Ridge mining leases and introducing the latest technology by replacing the wooden tramroads with iron railways and the horses with steam locomotives.

Box 7: State Heritage Register – Glenrock early coalmining sites

Almost all of Glenrock SCA is included in the heritage curtilage for the State Heritage Register listing recognising the importance of the cultural landscape surrounding individual historic sites. Glenrock's cultural landscape is of state, regional and local significance because of its rich combination of attributes of historical, archaeological, social and natural significance. Areas not included in the listing are lands that were added to the park estate after the heritage listing was created.

Glenrock contains more than 145 recorded historic sites, including the remains of Australia's first road/tram tunnel (Mitchell's tunnel), New South Wales's first railway tunnels, Australia's first commissioned copper smelter, a unique coastal railway on Burwood Beach, and one of the oldest and best-preserved remains of a 19th century coal mine in the Hunter (the 'old' Burwood Colliery) (see Figure 2). The historical events associated with their construction are directly related to the development of the modern resource extraction industry, and the building of the nation of Australia. It is the combination of these features, together with the natural and social values associated with them that make Glenrock a major cultural landscape (Griffin nrm 2003).

Works within the State Heritage Register curtilage are subject to the legislative provisions associated within this listing. All items listed on the register are included in the *Glenrock Lagoon cultural landscape: conservation management and cultural tourism plan* (Griffin nrm 2003) and are to be maintained in accordance with best practice management principles and relevant planning documents.

In 1865 Mitchell went into partnership with Charles Wolfskehl. After Mitchell's death in 1869 his family discovered that he had left everything to Wolfskehl. The family disputed the new will on the grounds of mental incapacity and undue influence. The resulting lawsuit in the Supreme Court aroused considerable public interest throughout the colony of Australia and was known as the 'Great Will Case'. Judgement was in favour of the Mitchell family and Wolfskehl was exposed as a charlatan, fraud and swindler. Mitchell's properties reverted to his widow Augusta Maria. After Augusta Mitchell died in 1872 the Burwood Estate passed to her daughter and was managed by her husband, Edward C Merewether.

Merewether was an administrator and had been an *aide de campe* to 3 governors, Commissioner of Crown Lands and Clerk of the Executive Council. When he took control of the property it was encumbered with debt. The family did not have the resources to undertake further exploration for viable coal seams nor the infrastructure to reach them. Merewether therefore sought other interested parties to undertake these ventures. By the end of 1884 he had negotiated mining leases with several companies who were permitted to mine coal beneath his estate paying a fixed rent, a royalty and in some cases a wayleave.

Merewether also leased out land for residential and business purposes until 1910 when tenants were allowed to purchase their holdings. This was the start of the suburb of Merewether. The last commercial land sale by the Merewether Estate took place in 1969.

In 1932 BHP acquired the old Burwood Colliery. It then became a major supplier to BHP's steelworks at Port Waratah up until the company donated the land to become part of the park in 1986. At its peak the Burwood Colliery was the fourth largest mine in the district. Today the remains of the 'old' Burwood Colliery may still be seen adjacent to Glenrock Lagoon and the nearby scout camp. It is now one of the oldest and best-preserved remains of a 19th century coalmine in the Hunter, which has contributed to its listing on the State Heritage Register (see Box 7). In contrast, the 'new' Burwood Colliery at Whitebridge was redeveloped into a housing estate known as the Dudley Beach Estate.

Other state heritage listed sites occur along Flaggy Creek and the Yuelarbah Track, including winding engine foundations at Leichhardts Lookout, brick-lined air shafts, a dry-stone rock wall, railway relics and the 'ziggy track' – a cutting through solid rock created by miners. Numerous open shafts and tunnels occur throughout the park. Many of these have been capped, however, others are still to be identified and could pose a risk to people straying off formed tracks. Mine subsidence is also an issue. Open mine tunnels and shafts are the responsibility of the Department of Primary Industries, and mine subsidence is the responsibility of Subsidence Advisory NSW.

Another locally important group of features are the relics of orcharding operations in the southern and northern ends of the park. In 1856 Walter Bailey developed a 120-acre (approx. 48 ha) orchard and market garden in the valley above the southern end of Dudley Beach. The farm was called Mount Pleasant and produced a variety of vegetables and fruit. After the death of Walter and his wife the property was divided among their 8 children. Two of the children, Arthur and Charles Bailey, bought more land at the northern end of the park from the old Burwood/Merewether Estate, and also set up orchards. This property is now part of the park and is referred to as Baileys precinct. The precinct includes Baileys Cottage, a fruit packing shed and Jacaranda Cottage, dating from the early 20th century (see Figure 2). Baileys precinct is not included in the Glenrock Lagoon cultural landscape conservation management plan, but forms a significant aspect of the historic resources of Glenrock SCA and is recognised for its short-term holiday accommodation and its sweeping ocean vistas.

The scouting movement acquired a 99-year lease adjacent to Glenrock Lagoon in 1932 and established the Glenrock War Memorial Scout Training Camp (now known as Glenrock Scout Camp). They obtained freehold title to the property in 1971. The Burwood Colliery under-manager's house, known as the Overman's Cottage (1887), is situated on their land, along with various mining relics. For the duration of the Second World War, the area and buildings were used by the Defence Corps which built machine gun nests, gun emplacements and trenches in the area. This area has a special connection to the park.



Photo 6 Baileys Cottage. John Spencer/DPE

2.2.1 Management considerations and opportunities

NPWS is committed to identifying, conserving and sharing the rich history and shared heritage of the park. Some of the heritage items or historic sites in the park have not been formally assessed for significance and condition.

In order to determine the most appropriate management for the state heritage listed Glenrock early coalmining sites, a conservation management plan was prepared in 2003 (Griffin nrm 2003).

Works have been undertaken to remove weeds from the 'old' Burwood Colliery as they were impacting on the site. The area is currently not safe for visitors and any visitation may damage heritage values. Future works are required to protect the site and improve access and safety.

Baileys Cottage has been updated and is now a popular destination for visitors as short-term holiday accommodation. It may also provide opportunities to be adapted for other purposes. Adaptive reuse may mean a simple change in use or it may mean alterations or additions to the buildings or structures to give them new purpose and to preserve their heritage significance.

Relevant planning documents will be prepared for all historic sites, non-Indigenous archaeological sites and places and cultural landscapes in Glenrock SCA. Together, these plans provide a framework to facilitate decision-making and the development of management actions for the conservation and presentation of the park's significant historic heritage.

Heritage sites are managed consistent with statutory requirements, including the *Heritage Act 1997* and the National Parks and Wildlife Act, and relevant conservation management plans and heritage impact statements.

3. Providing for visitor use and enjoyment

The NSW national park estate provides a range of opportunities for recreation and tourism, including opportunities for relaxation and renewal as well as appropriate active pursuits. The park provides opportunities for visitor activities in a natural and undeveloped setting. NPWS aims to ensure that visitors enjoy, experience and appreciate the park at the same time as conserving and protecting park values.

Glenrock SCA is one of 2 remaining significant bushland areas in Newcastle. It plays an important role in providing nature-based recreational opportunities for the local and regional community. The NSW Government's *NSW Visitor economy strategy 2030* (Destination NSW n.d.) includes a commitment to develop and promote accessible tourism, products, experiences and visitor precincts. NPWS aims to improve access within Glenrock SCA where possible.

Ongoing improvements to visitor facilities provide considerable opportunities to encourage broader visitor use with benefits to health and the local and regional economy. There are estimated to be over one million visits to the park each year, and visitor numbers and the range of recreational activities have both increased in Glenrock SCA over the last 10 years. Careful planning is required, in collaboration with other land managers within and adjoining the park, to ensure the environmental, cultural and historic heritage values of Glenrock SCA are conserved into the future.

3.1 Visitor capacity

The park provides opportunities for a diverse range of recreational activities, including bushwalking, surfing, beach fishing, gliding, horse riding, cycling/mountain biking, educational tours, birdwatching, cultural tours, scouting activities and photography. Other recreational activities, including rock climbing, abseiling, geocaching, orienteering and trail running are becoming increasingly popular and will need to be considered in future management of the park.

The population of the Lower Hunter region continues to increase, particularly in the major urban centres of Newcastle, Charlestown and Glendale/Cardiff (DP 2006). The location of the park in a highly urbanised area means that the number of local park visitors is high and expected to increase. Large numbers of visitors can negatively impact the park's natural and cultural values. Recent events, such as the 2020 to 2022 COVID-19 pandemic, have highlighted the importance of natural areas to local communities.

Box 8: What is carrying capacity?

This term describes 'the number of visitors an area can sustain without degrading the natural resources and visitor experiences' (Prato 2001). This is determined by considering the biophysical characteristics of an area, heritage and cultural values, social factors as well as management policies.

The carrying capacity of a precinct or park can then be used to establish the maximum number of visitors permissible at one time, or over the course of a day. Methods to manage visitor numbers, including booking systems, can be implemented to ensure that the number of visitors to a particular track, precinct or region does not exceed the carrying capacity. The management of visitor numbers requires an adaptive management approach, allowing policies to vary over time.

3.1.1 Management considerations and opportunities

Strategies are needed to actively manage increasing visitor numbers and support a range of appropriate visitor experiences in the parks while protecting the environmental and cultural values of the park. Strategies may include improvements to visitor facilities, including site hardening and the provision of built facilities such as raised boardwalks, and limits on the number of commercial licences for particular activities or locations. NPWS will seek to better understand the types and numbers of visitors to Glenrock SCA through visitor surveys and data collection. A visitor management zoning scheme has been developed to guide management of the park (see Box 9 and Figure 2).

Box 9: Draft plan of management visitor management zones

Zoning systems are used in national parks around the world to clearly delineate the activities that may or may not occur within a particular geographic area. Zones generally define the acceptable uses and infrastructure development within specific boundaries and prioritise management objectives such as protection of key habitats. Zones can help eliminate user conflicts, improve the quality of recreational activities and aid in conservation management efforts.

A zoning system for Glenrock SCA, based on park values and their sensitivity to visitor activities, is proposed in the draft plan of management to guide the future development of visitor facilities, regulate visitor activities and guide management effort. The draft plan of management proposed the establishment of the following zones:

Zone 1 (to mean high water mark) includes areas where conservation is prioritised and lower intensity recreational activities, such as walking and trail running, are permitted. This zone covers the eastern area of the park encompassing swimming beaches and walking tracks. Cycling is proposed to be allowed on roads and management trails in this zone.

Zone 2 is predominately in the western areas of the park where moderate to higher intensity recreational activities are provided for, with walking tracks and designated mountain bike tracks.

Zone 3a: Baileys visitor precinct. This area provides existing short-term accommodation in Baileys Cottage.

Zone 3b Visitor nodes cater for moderate to high intensity recreation and provide visitor facilities (such as viewing platforms, walkways and tables), and provide beach access. These areas include **Hickson Street, Gun Club Road, Yuelarbah, Angophora, Leggy Loop, and Dudley Beach.**

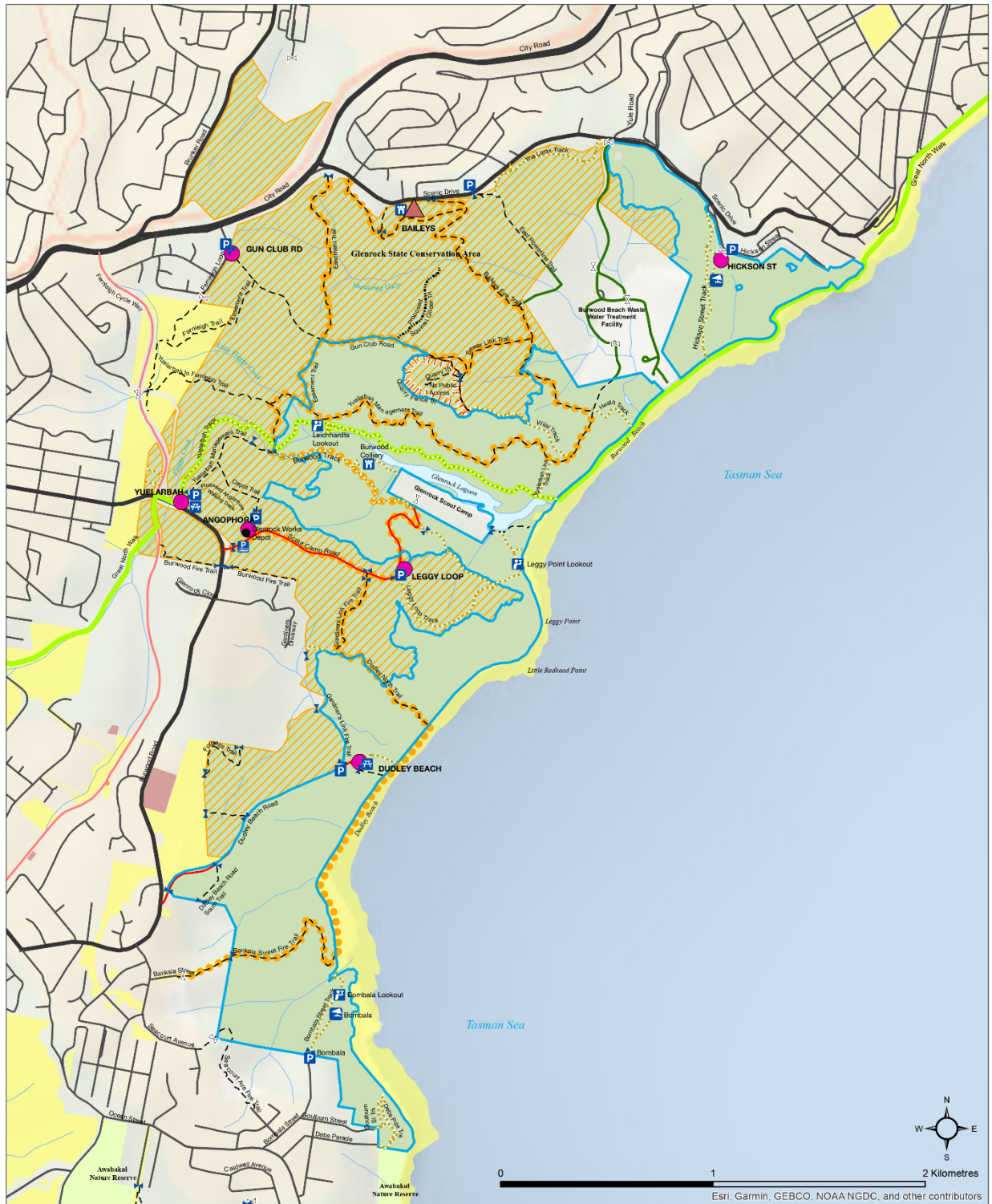
Refer to draft plan of management and draft mountain biking plan for more information.

Wherever possible, NPWS works with other land managers (councils, neighbouring property owners, other state agencies) to coordinate planning and management of recreational activities in the park. This is particularly important for the provision of longer distance cycling, trail running and horse riding opportunities. Visitor nodes with appropriate facilities may be provided at locations where the park's track network links with off-park facilities and connecting routes, such as the Fernleigh Track and Bathers Way walk.



Photo 7 Uninterrupted coastal views are a key visitor attraction of Glenrock SCA. John Spencer/DPE

Glenrock State Conservation Area draft planning considerations



Visitor Management Zones		Day Use Area	Major road	Fernleigh cycleway
Zone 1	Lookout	Public road sealed	Horse Riding Route	Quarry (no public access)
Zone 2	Carpark	Park road sealed	Management Trail	NPWS Estate
Zone 3a: Visitor precinct	Carpark - Bus/large vehicles	Proposed Trail	Easement benefiting NPWS	NPWS Estate Other
Zone 3b: Visitor node	Glider Pad	Walking Track	Other Land Managers	Local Aboriginal Land Council
	Historic Site	Proposed Walking Track	Local Aboriginal Land Council	Crown Land
	Gate - existing	Great North Walk		
	Gate - non NPWS			

Figure 2 Draft plan of management visitor management zones

3.2 Bushwalking

The park provides a popular network of walking tracks for recreational activities. The tracks provide a variety of experiences from the highly developed Yuelarbah Track with raised boardwalks and partial disabled access through to natural bush tracks.

Walking track grades identify a track's suitability for different user groups as follows (refer to the NPWS *Walking tracks policy*):

- Grade 1 – No bushwalking experience required. Flat, even surface with no steps or steep sections. Suitable for wheelchair users who have someone to assist them.
- Grade 2 – No bushwalking experience required. The track is a hardened or compacted surface and may have a gentle hill section or sections and occasional steps.
- Grade 3 – Suitable for most ages and fitness levels. Some bushwalking experience recommended. Tracks may have short steep sections, a rough surface and many steps.
- Grade 4 – Bushwalking experience recommended. Tracks may be long, rough and very steep. Directional signage may be limited.

Table 4 Walking tracks in Glenrock SCA

Track name	Location	Distance	Current grade#	Comment / Track type
Yuelarbah Track	Starting at Yuelarbah car park off Burwood Road	4.9 km return	Grade 1–3	Part of the Great North Walk
Yuelarbah Link	Links Yuelarbah Track and Yuelarbah Management Trail	193 m	Grade 4	Track needs upgrading to a minimum of Grade 3
Wilai Track	Provides pedestrian access to the beach from Gun Club Road	623 m	Grade 4	Track needs upgrading to a minimum of Grade 3
Angophora Track	Links Angophora car park with Angophora Track head	400 m	Grade 3	Proposed new walking track
Leggy Loop Track	Starting at Leggy Loop car park on Scout Camp Road. Includes an additional beach access track (300 m)	2 km loop	Grade 3	Popular beach access track with coastal views
Heath Track	North of Glenrock Lagoon along Burwood Beach before the wastewater treatment facility	200 m	Grade 4	Track needs upgrading to a minimum of Grade 3
Burwood Track	Opposite the water tank on Scout Camp Road	850 m	Grade 3	Multi-use track suitable for walkers and horses
Bombala Street Track	Off Bombala Street	608 m	Grade 3	Provides access to the southern end of Dudley Beach and a side track to Bombala Street gliding pad

Track name	Location	Distance	Current grade#	Comment / Track type
Hickson Street Track	Off Hickson Street	1 km return	Grade 3	Provides access to Hickson Street gliding pad and a boardwalk with coastal views down to Burwood Beach
Debs Parade and Goulburn Street Tracks	Off Debs Parade and Goulburn Street at the southern end of the park	453 m 250 m	Grade 4	Provide access to the southern end of Dudley Beach
The Lorax	Off Scenic Drive	580 m	Grade 3	Signposting track to separate cycling and walking, includes small sections for multi-use

Tracks are graded using the Australian Walking Track Grading System, which is based on the Australian Standard for walking track construction.

* Naming of individual tracks, management trails and facilities within the park will be developed and may change through consultation with the Aboriginal community and user groups and in some instances a co-naming system may be suitable.

3.2.1 Management considerations and opportunities

Park visitors may use signposted mountain bike single tracks (see Section 3.4) for bushwalking and trail running. While these uses are permitted, mountain biking is the preferred use for these tracks.

A small number of the mountain bikes tracks are single use and not available for walking or other activities; these designated tracks are signposted for cycling only. The proposed mountain bike track network is detailed in the *Glenrock State Conservation Area draft mountain biking plan* (NPWS 2022b). The park management trail and road networks provide shared-use recreational opportunities throughout the park.

Track improvements were undertaken in 2020 to 2022 on walking tracks throughout Glenrock, and further improvement works will be undertaken as funding allows. These may include site hardening and the provision of built facilities, such as raised boardwalks, to address environmental and safety issues. In some instances, this may result in an improvement (easier) to the track grade.

The provision of any new walking tracks is limited by the potential impact on the park's environmental and cultural values. New sections of tracks and trails may however, be required to address user conflict and improve safety or to manage impacts from coastal erosion.

3.3 Cycling

Cycling is a term used to refer to all forms of cycling, including power-assisted pedal cycles (also known as e-bikes) and mountain bike riding. In accordance with the NPWS *Cycling policy* and the *Cycling strategy* (NPWS 2021) cycling is permitted on park roads and management trails throughout the parks and on designated and signposted multi-use tracks in limited areas in the parks. Cycling and mountain biking are not permitted on designated walking tracks or off track.

Whilst cycling has been a long-term recreational use of the park, the past 10 years has seen a rapid and continuing expansion in the use of the park by more specialised mountain bike riders. The park is immediately accessible to the large urban population of Newcastle, and currently provides the most significant off-road cycling opportunity in the Lower Hunter region.

Mountain biking has expanded in an unplanned and uncontrolled fashion in the park, resulting in the proliferation of unauthorised tracks. This has negatively impacted the park's environmental and cultural values, and has created conflict among users and visitor safety concerns.

The network of mountain bike tracks identified in the previous Glenrock plan of management (NPSW 2010) is proposed to be enhanced with a new network design that seeks to balance the needs of mountain bike users alongside the protection of Glenrock's conservation and heritage values. The *Glenrock State Conservation Area draft mountain biking plan* (NPWS 2022b) is being exhibited for public comment alongside this draft plan of management.

The draft mountain biking plan is designed to manage continued growth in the demand for mountain biking in the park and has been developed in accordance with the NPWS *Cycling strategy* (NPWS 2021). The draft Glenrock mountain biking plan allows for realignment and enhancement of some existing tracks as well as the creation of new tracks. The success of the newly proposed network will require the closure and rehabilitation of inappropriately located, unauthorised tracks and associated structures. The draft plan builds on work previously completed, including the *Glenrock State Conservation Area mountain bike trail concept plan* (World Trail 2016), the draft *Glenrock SCA mountain bike trail concept plan* (Glenrock Trail Alliance 2019) and the *Glenrock MTB trails concept plan* (Dirt Art 2020).

3.3.1 Management considerations and opportunities

The network detailed in the draft Glenrock mountain biking plan has been designed to protect cultural and environmental values of the parks. The network of tracks will be implemented subject to environmental impact assessment and available resources. The network must also comply with any additional requirements identified in any NPWS policies and strategies related to cycling and mountain biking.

Individual tracks in the draft mountain biking plan are assessed and scored using a multi-criteria analysis tool that considers environmental, cultural and user experience criteria. The analysis informs decisions regarding which tracks are retained and those nominated for closure in the mountain biking plan. Construction of the mountain bike tracks will be subject to environmental assessment in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979*. Following public exhibition, the mountain bike plan may be adjusted to meet environmental impact assessment outcomes, consultation and local design issues, however, it must still meet the principles and requirements set out in the Glenrock SCA plan of management.

New or upgraded facilities may be required in the visitor nodes to support mountain biking in the park, including new car parks, track head and associated facilities. These upgrades may also assist with emergency service responses.

NPWS works with the City of Newcastle and Lake Macquarie City councils as well as other land managers to develop suitable facilities, providing cyclists with links to off-park riding opportunities (see Figure 2). Information and orientation signage will be provided at these locations to inform and educate. Refer to the NPWS *Cycling policy*.

3.4 Day use facilities and accommodation

Picnic tables are provided at Yuelarbah visitor node, at various locations along Yuelarbah Track and Dudley Beach visitor node (see Figure 2). Beach viewing platforms are provided at Dudley Beach. No barbecue or toilet facilities are provided in the park for day visitors.

Baileys Cottage provides short-term accommodation and can be booked online.

Camping and staying overnight in vehicles are not permitted in the park.

3.4.1 Management considerations and opportunities

Improvements to visitor amenities and supporting infrastructure at Gun Club Road, Yuelarbah and Leggy Loop visitor nodes are proposed to enhance visitor experience, improve safety and manage impacts on the environment. It is not proposed to expand day use facilities outside of the identified visitor nodes or Baileys visitor precinct. NPWS works with surrounding land managers to provide facilities that support Glenrock where appropriate.

3.5 Horse riding

Horse riding is a popular recreational activity. The number of horse riders in the park has historically been low. The NPWS *Strategic directions for horse riding in NSW national parks* (OEH 2012) provides a framework to improve riding opportunities in 8 priority regions in New South Wales, including the Hunter Central Coast Region.

Existing horse riding opportunities are highly valued by local horse owners. Horse riding is permitted on a network of management trails and roads across all zones, and also on Dudley Beach (Figure 2).

3.5.1 Management considerations and opportunities

As Dudley Beach is a highly popular public beach, horse riding access to the beach is limited to a short period in the morning between 5 am to 9.30 am. An annual registration process applies and outlines the horse riding code of practice, riding location map and any other local conditions that apply.

A 'No sign – no ride' policy applies for horse riding in the park. If a trail is not marked as allowing horse riding then it is not permitted. Parking for horse floats is available near the Glenrock works depot at the start of Scout Camp Road. Refer to the NPWS *Horse riding policy*.

3.6 Water-based activities

Swimming, fishing and surfing are popular recreational activities at Dudley and Burwood beaches. The park offers a relatively isolated and natural beach setting which is lacking at other nearby beaches. Neither Dudley Beach nor Burwood Beach are patrolled, and swimming at these locations can be dangerous. Nearby patrolled beaches include Merewether Beach and Redhead Beach to the north and south of the park.

Dudley Beach is one of the most popular beaches in Newcastle. Pedestrian access is provided from the Dudley Beach visitor node. Alternative pedestrian access to the southern end of Dudley Beach is provided by walking tracks, including Bombala Street Track (see Table 5: Walking tracks).

Burwood Beach has pedestrian access around the headland from Merewether or via the Hickson, Yuelarbah or Leggy Loop walking tracks. The Leggy Loop Track is accessed from the car park on Scout Camp Road. The scout camp land is privately owned and does not permit public access to the beach.

3.6.1 Management considerations and opportunities

All fishing activities in NSW waters are regulated under the *Fisheries Management Act 1994*. Commercial and recreational fishing must be in accordance with licence conditions specified by the Department of Primary Industries. Gazettal of the park to the mean high water mark does not change this authority, and fishing operations will continue to be managed by the Department of Primary Industries. This includes land-based activities (e.g. hauling of nets by hand), whether the fisherperson is situated below or above the mean high water mark.

3.7 Gliding

Two gliding pads occur in the park, one on the Hickson Street Track and one off Bombala Street Track (see Figure 2). The use of gliders is subject to a Civil Aviation Order, which specifies the conditions to be complied with by glider pilots. There are very specific topographical and wind requirements that enable hang-gliding and paragliding to take place. These activities are limited to places that have either been cleared of high growing vegetation or provide a landing platform. Refer to the NPWS *Hang-gliding and paragliding in parks policy*. Consent is required for use of the gliding pads.

Hickson Street Track gliding pad

This is an artificial grass pad providing for both take-off and landing in south to south-east wind conditions. Access is via the Hickson Street Track. This heavily used pad is used for training of new pilots. NPWS works with gliding representative groups to maintain the site. Commercial use is subject to NPWS licensing arrangements.

The pad is accessed through land managed by City of Newcastle and Hunter Water Corporation.

Bombala Street Track gliding pad

This is an artificial grass pad that has been fenced to restrict access by park visitors. This pad is for experienced pilots in east to north-east wind conditions. Access is via the Bombala Street Track at Dudley.

3.7.1 Management considerations and opportunities

For safety reasons, access to gliding pads is restricted to gliders only when the pad is identified as being in use. Competition between different user groups for access to gliding pads has increased as they have become popular destinations for other activities, including weddings and wedding photos.

Site management plans may be developed and reviewed for gliding pad sites in consultation with stakeholders.

3.8 Rock climbing and abseiling

The park is used for rock climbing and abseiling. NPWS may also impose restrictions, exclusions or closures to manage environmental, visitor experience and safety issues associated with the activities. It is not appropriate for NPWS to install or certify rock bolts. Participants in these activities will need to ensure the safety of fixed anchor points prior to use.

3.8.1 Management considerations and opportunities

Site management plans may be developed and reviewed for rock climbing sites in consultation with stakeholders. The impacts of rock climbing are monitored in fragile areas and climbers are encouraged to abide a recognised code of conduct.

NPWS seeks to minimise the proliferation of bolts in the park and, in consultation with climbing representative groups.

3.9 Other recreational activities

Glenrock SCA is popular for a range of other recreational activities including trail running, orienteering, rogaining and geocaching.

Trail running has grown in popularity over the last 10 years. Trail runners can access all management trails, roads and walking tracks across the park. A trail running code of conduct and trail running strategy will be developed to minimise user conflict on the mountain bike and walking track networks. NPWS will continue to work with stakeholders to develop a suitable experience. Similar to horse riding and mountain bike riding, signage identifies cycling tracks suitable for running and a 'no sign – no run' policy will be developed.

Newcastle and the broader Hunter region have an active **orienteering** movement who use the park. All orienteering activities require written consent, and permissibility will be assessed against the likelihood of unacceptable impacts on the park's natural and cultural values, other park users and infrastructure. Mountain bike orienteering activities are restricted to the authorised mountain bike track network as set out in the finalised Glenrock mountain biking plan. Orienteering must be organised to an acceptable standard and in accordance with the NPWS *Orienteering and rogaining policy*.

Geocaching and virtual geocaching occasionally occur in some areas of the park. Geocaching is a game where participants use a global position satellite (GPS) to find the location of the cache. Geocachers must obtain written consent from NPWS to place a physical cache in the park, refer to the NPWS *Geocaching policy*.

There has been some increased interest in the use of recreational **drones** in the park. Drones are considered a type of aircraft and are therefore subject to the Commonwealth *Civil Aviation Act 1988* and the Civil Aviation Safety Regulations 1998. Flying drones in parks can annoy visitors and disturb animals. Drones can also dangerously interfere with bushfire fighting and other management activities in the park. For these reasons, and in accordance with the NPWS *Drones in parks policy*, their use in parks is restricted and subject to consent by local NPWS management. There are drone exclusion areas in the park (see Section 3.10.9 below).

Dog walking is not permitted in state conservation areas. Domestic pets are a threat to native animals and can disrupt other people's enjoyment of parks. Assistance animals are allowed in the park, subject to certain conditions outlined in the NPWS *Pets in parks policy*.

3.9.1 Management considerations and opportunities

The diversity of recreational activities in Glenrock SCA provides opportunities to foster visitor appreciation for the park. Interpretative signage opportunities throughout the park will enhance user experiences. Regulative signage to identify where activities can and can not be undertaken will improve visitor safety and reduce user conflict and impacts on the park's environmental and cultural values. For activities such as trail running, mountain biking and horse riding, a 'no sign – no ride/run' policy will apply to some tracks.

Park policies for recreational activities apply, and NPWS will continue to engage with user groups to develop codes of conduct and balance the recreational interests of users with an improved understanding of the park's environmental and cultural values and sustainable carrying capacity.

Drone exclusion areas apply in this park across the entire northern end of the park from Dudley Beach, which includes the Westpac Lifesaver Helicopter Base and the John Hunter Hospital and Port of Newcastle flight paths. Consent is required for this activity.

NPWS communicates regulations about dogs in parks through signs and undertakes education and/or compliance action as required. NPWS will require community support to implement park regulations, including prohibiting dog walking in the park.

3.10 Group and commercial activities and events

Group activities can provide opportunities for people who would otherwise not be able to experience the park and can promote environmental understanding and support for conservation. Large groups can, however, have an environmental impact and can restrict opportunities for independent visitors.

Non-commercial, large-scale organised group activities, for example, family or social gatherings and school tours, require consent under the National Parks and Wildlife Regulation 2019. Organised group activities of a commercial nature require licensing under the regulation. All activities must be consistent with the management principles of the park and be compatible with the natural and cultural heritage values of the park. Applications are assessed in accordance with relevant NPWS policies and procedures.

Commercial tourism increases the opportunity for public participation in nature-based activities and provides opportunities for professional instruction in the safety and minimal impact aspects of various recreational pursuits. Commercial activities require approval, irrespective of group size. There are commercial tourism operators licensed to operate in the park.

3.10.1 Management considerations and opportunities

Opportunities for commercial activities in the park are considered on a case-by-case basis and in the context of the sustainability of cumulative activities across the park. To ensure sustainable park visitor numbers into the future, the number of commercial licences for an activity or location may be limited based on the site's environmental and cultural values and sustainable carrying capacity and to ensure visitor safety, protect cultural and natural values and enhance visitor experiences.

3.11 Educational activities and scientific research

Educational activities

The park is one of the last remaining natural areas in Newcastle, containing nationally significant vegetation communities, threatened ecological communities and threatened species. Given its proximity to the growing population of Newcastle and other regional growth areas such as Charlestown and Glendale/Cardiff, the park has an important role in promoting an awareness of the cultural resources, landscapes and plant and animal communities of the Hunter region.

Educational Discovery walks, talks and tours provide an enjoyable learning experience for schools, community groups and individuals. Educational programs also provide an opportunity to encourage and support the involvement of recreational user groups in sustainable recreation management of the park. Voluntary involvement helps to foster a culture of self-regulation and stewardship. Refer to the NPWS education webpage.

Scientific research

Scientific study in the park provides an opportunity to improve understanding of its natural and cultural heritage values and the processes which affect them. Research by other organisations and students may provide valuable information for management. All research and monitoring projects within the park require consent from the local NPWS Area office.

3.11.1 Management considerations and opportunities

Provision and support of educational programs are a priority for the park. NPWS encourages research and monitoring where it assists park management, provides better outcomes for the protection of park values and provides an educational prospect for researchers.



Photo 8 NPWS-run school excursion. Adam Hollingworth/DPE

4. Park infrastructure and services

4.1 Infrastructure in the park

There are a number of park management facilities situated within the park, including a works depot, a quarry, sealed park roads, management trails and gates.

The works depot, located on Scout Camp Road, is the base for field activities and maintenance in Glenrock SCA and other national parks in the Newcastle and Lake Macquarie area.

A gravel quarry is located at the end of Gun Club Road. The quarry is managed in accordance with a quarry safety management plan to ensure compliance with the *Mine Inspection Act 1901* and regulations. The quarry is important for providing a local source of gravel for walking track and management trail maintenance in the park.

Other infrastructure in the park includes a network of walking and mountain bike tracks (see Section 3.3 and 3.4).

Building assets

The historic Baileys precinct shown on Figure 2 has been identified as suitable for leasing for use or modification for adaptive reuse (see Section 2.2.1). The precinct includes Baileys Cottage, which is currently available for short-term accommodation. The site includes a number of other historic buildings and sites, including a weatherboard miner's cottage, garages, packing shed and terraces and grassed clearings.

Vehicle access and car parking

The park is readily accessible from public roads maintained by the City of Newcastle council in the north and Lake Macquarie City Council in the south. Park roads are managed by NPWS and are open to public vehicular use, including Scout Camp Road in the north and Dudley Beach Road in the south (see Figure 2). Public vehicle use is only permitted on public roads and park roads.

Car parking is provided on a mixture of tenures at the majority of visitor nodes and Baileys precinct. Parking areas managed by NPWS are provided on Scout Camp Road (Leggy Loop), Dudley Beach Road (Dudley Beach) and at the start of the Yuelarbah Track.

Parking areas managed by local government are provided off Bombala Street (Lake Macquarie City Council), Fernleigh Loop, Gun Club Road and Hickson Street (City of Newcastle). Planning and partnerships with councils for off-park infrastructure, including car parking, is required to support increased visitation to the park and address emerging safety issues.

A network of management trails throughout the park is used for fire and weed control and other management purposes. Management trails are subject to restricted vehicle access. They may also be used for non-vehicular recreational purposes. Some of the management trails exist on or cross into other land tenures adjacent to the park.

4.1.1 Management considerations and opportunities

A range of uses for the historic buildings and structures at Baileys precinct will be considered, provided any proposed modification and use is consistent with the conservation

of the natural and cultural values of the land, relevant statutory requirements, the heritage action statement (NPWS 2022a) and NPWS policies.

Licences may be issued to sell food in the park at appropriate locations.

Scout Camp Road and Dudley Beach Road are high-use, sealed park roads and will continue to be managed for public vehicle access. They are closed at night to minimise antisocial behaviour, vandalism and other criminal activities in the park.

The park contains a management trail network for firefighting and management purposes and to provide access to utilities managed by Ausgrid and Hunter Water Corporation. There is a proposal to build a new management trail (Squirrel Glider Trail, see Figure 2) to provide access for the regeneration of a heavily disturbed environment. These management trails are not open to public vehicle access.

Small-scale expanded parking, subject to detailed design, is proposed by NPWS adjacent to the NPWS depot in Angophora visitor node, and in the Leggy Loop and Gun Club Road visitor nodes. NPWS may also explore potential partnerships and opportunities with councils to develop on-park and off-park facilities, including car parks, to support increased visitation and address emerging safety issues.

The park has infrastructure and assets that are at risk from foreshore erosion and sea level rise associated with climate change, including sections of the Yuelarbah Track and associated tracks and trails. These may be realigned to manage impacts from coastal erosion.

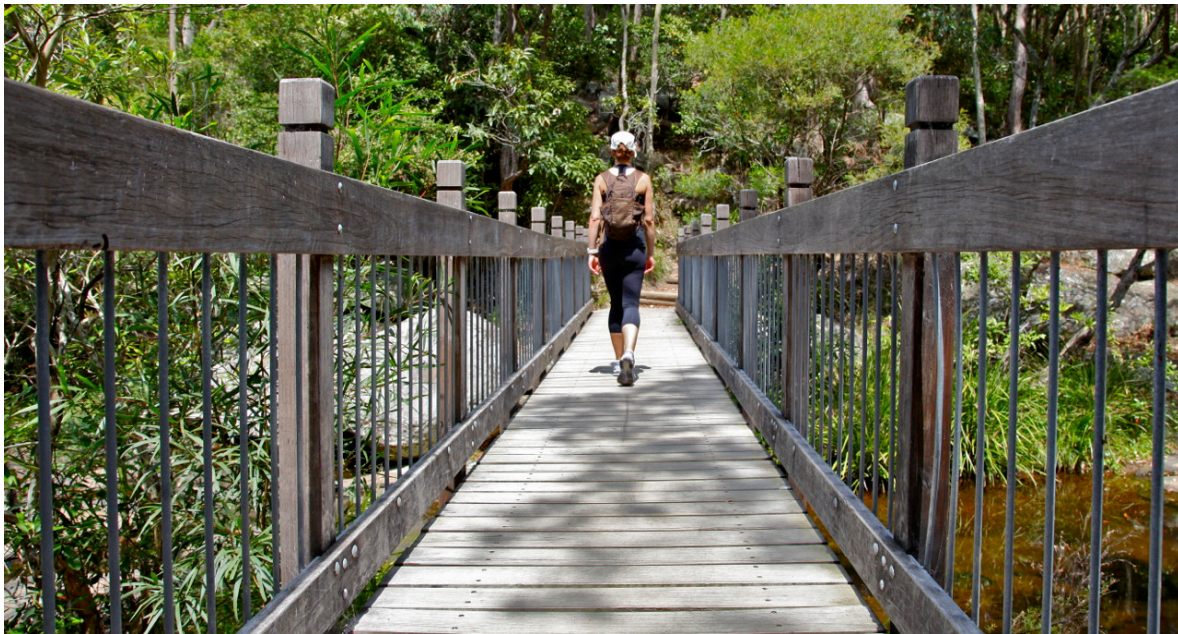


Photo 9 Yuelarbah walking track. Shaun Sursok/DPE

5. Non-park infrastructure and services

5.1 Non-NPWS infrastructure

The park contains public utilities such as electricity easements, sewerage pipes, underground telephone lines and water connections. This infrastructure and related access tracks are predominantly in the northern end of the park.

Hunter Water Corporation

The Burwood Beach Wastewater Treatment Works is located on Hunter Water Corporation land behind Burwood Beach. This facility has a significant visual impact on the park. There is a history of disturbance associated with the infrastructure. The majority of the existing sewer mains were constructed prior to the park's gazettal and constitute existing interests under section 47H of the National Parks and Wildlife Act.

The Charlestown sewer main follows Flaggy Creek from Charlestown to Burwood Road in the south, and then traverses the park to the treatment facility at Burwood Beach.

Transmission lines

The majority of the existing power supply infrastructure present in the park existed prior to its gazettal and constitutes an existing interest under section 47H of the National Parks and Wildlife Act. Ausgrid has 2 high voltage electricity transmission lines traversing the park: one from Highfields Parade to Gun Club Road (crossing Little Flaggy Creek), and another from Burwood Road in the south to Scenic Drive in the north (crossing both Flaggy and Little Flaggy creeks). Four other 'feeder lines' also occur on easements supplying electricity to the wastewater treatment facility and the scout camp.

NPWS and Ausgrid have an agreed protocol that details the processes for the undertaking of routine inspection, maintenance and emergency works on Ausgrid infrastructure within national park estate. The protocol has been developed to provide a consistent approach across the state and to streamline administrative processes for both organisations. A consent under the *National Parks and Wildlife Regulation 2019* accompanies the protocol and allows Ausgrid's activities to be undertaken in accordance with the protocol without the need for a specific statutory approval to be granted each time works are undertaken. In addition, NPWS has a roadside and easement management plan for rough doubletail orchid (*Diuris praecox*) within Glenrock SCA (EERES 2017).

5.1.1 Management considerations and opportunities

NPWS will facilitate access across NPWS lands in accordance with Part 12 of the National Parks and Wildlife Act and in accordance with the park's reserve access strategy.

Reciprocal easement agreements need to be developed with the relevant authorities to formalise access arrangements and to encourage management that is compatible with the conservation significance of the park and facilitate recreational opportunities in the park. Opportunities to strengthen partnerships and joint programs addressing a range of environmental issues continue to be pursued with these organisations.

Sections of a number of key management trails traverse the Hunter Water Corporation lands and provide essential management and public access opportunities. NPWS is negotiating with Hunter Water Corporation to develop an easement agreement for park management activities and recreational pedestrian and cycling access. Opportunities exist to establish

mutually beneficial environmental programs on the land that is outside the treatment works compound but still owned by Hunter Water Corporation, which are compatible with the conservation significance of the surrounding park. Such programs could include the closure and rehabilitation of the non-operational access tracks, rehabilitation of the hind dunes and screen planting of the treatment works with appropriate, locally sourced native species.

5.2 Non-NPWS uses

Mining and exploration

Exploration and mining of minerals and petroleum (including gas) are permissible uses within the park under its current reserve status as a state conservation area. All mineral leases for the Glenrock SCA are now expired. In future, and subject to the agreement of the Minister administering the *Mining Act 1992*, Glenrock SCA may be recategorised as a national park, which would not allow for any further exploration. The provisions of the replacement *Glenrock State Conservation Area plan of management* (once adopted) will still apply even if the state conservation area is reclassified.

Glenrock Scout Camp

The Glenrock Scout Camp (formerly called the Glenrock War Memorial Scout Training Camp) is located behind Burwood Beach in an inholding in the middle of the park. Vehicle access to the scout camp is via Scout Camp Road. The scout camp was donated to the Newcastle Scout Association (Scouts) by BHP in the 1970s. The Burwood Colliery under-manager's house (1887) remains within the grounds. This is the oldest house in the Lake Macquarie Local Government Area and is part of Glenrock's coalmining remains as listed on the State Heritage Register. Scouts NSW has completed an extensive native planting program within their grounds, improving the scout camp's environmental compatibility with the park.

An underground telephone line and water pipes connect the scout camp to town supplies on Burwood Road. The location of this infrastructure is unknown and no formal easement agreement is in place for these utilities.

NPWS and Scouts NSW have established a mutually beneficial but informal arrangement for the provision of the NPWS Discovery for Schools program and park management access. NPWS will seek to strengthen links or enter into formal arrangements with Scouts NSW to ensure ongoing cooperation and compatible environmental use continues. All activities associated with the camp must be in accordance with the park use policies.

5.2.1 Management considerations

The Glenrock Scout Camp land is private property owned by Scouts NSW. Informal community access through the scout camp may conflict with Scouts NSW's management objectives, including not complying with their terms of entry which include a working with children check. The creation of unauthorised tracks leading through the camp also creates environmental issues. The limited capacity of Scout Camp Road due to the width and switchback nature of the road results in traffic congestion, informal parking and encroachment into the road verge. These constraints cause safety risks for park visitors and scout camp users. Traffic management strategies will need to be adopted to address vehicle movements on Scout Camp Road from the Leggy Loop car park to the scout camp, including improvements to the road and traffic management infrastructure. The existing car park at Leggy Loop visitor node will be upgraded.



Photo 10 School excursion in Glenrock SCA. Adam Hollingsworth/DPE

Appendices

Appendix A Legislation

The following laws and policies apply to how we manage our parks (this is not a complete list):

NSW legislation

- National Parks and Wildlife Act 1974 and National Parks and Wildlife Regulation
- Environmental Planning and Assessment Act 1979
- Heritage Act 1977
- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- Companion Animals Act 1998
- Fisheries Management Act 1994
- Local Land Services Act 2013

Other NSW laws may also apply to park management:

- Work Health and Safety Act 2011

Commonwealth legislation and policy

- Environment Protection and Biodiversity Conservation Act 1999
- Disability Discrimination Act 1992
- Building Code of Australia

Other laws, policies and strategies may also apply. Please see 'More information' section or contact NPWS for advice.

Appendix B Vegetation communities in the park

Table 5 Bell (1998) vegetation mapping in Glenrock SCA (refer to Figure 3 below)

Vegetation community	Equivalent threatened ecological community	Occurrence in park
Littoral Rainforest*#	Littoral Rainforest in the NSW, North Coast, Sydney Basin and South East Corner Bioregions **	Five out of the 7 pockets known to occur in Lower Hunter
Permian Coastal Clay Grassland*	Themeda grasslands on seacliffs and coastal headlands' in NSW North coast, Sydney Basin and South East Corner Bioregions *	Two areas behind Burwood Beach
Permian Coastal Gully Rainforest**	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions **	Along creek lines
Permian Sheltered Bluegum Forest		Little Flaggy Creek
Permian Sheltered Dry Forest		Upper reaches of Flaggy Creek
Permian Macquarie Paperbark Gully Forest		Murdering Gully
Permian Macquarie Shrubby Forest		Gun Club Road and Flaggy Creek
Permian Macquarie Grassy Forest		Common throughout the park
Permian Exposed Coastal Scrub		Coastal headlands
Permian Coastal Clay Melaleuca Scrub		Behind dunes
Coastal Fore-dune Acacia Scrub		Burwood Beach
Permian Coastal Laterite Heath		Common in dunes
Estuarine Rushland*	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions *	Lagoon

* Endangered ecological community listed under the *Biodiversity Conservation Act 2016*.

Critically endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999*.

Source: Bell (1998).

Table 6 Draft plant community type (PCT) mapping in Glenrock SCA (refer to Figure 4 below)

NSW Vegetation class	NSW Vegetation formation	PCT ID	NSW PCT name
Northern Warm Temperate Rainforests	Rainforests	3039	Sydney Coastal Lilly Pilly-Palm Gallery Rainforest
North Coast Wet Sclerophyll Forest	Wet Sclerophyll Forests (shrubby sub-formation)	3084	Lower North Choricarpia Wet Forest
Littoral Rainforests	Rainforests	3133	Sydney Coast Tuckeroo Littoral Rainforest
North Coast Wet Sclerophyll Forest	Wet Sclerophyll Forests (shrubby sub-formation)	3150	Hunter Coast Ranges Turpentine Wet Forest
Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (grassy sub-formation)	3234	Hunter Coast Lowland Spotted Gum Moist Forest
Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (grassy sub-formation)	3242	Lower North Ranges Turpentine Moist Forest
Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (grassy sub-formation)	3250	Northern Foothills Blackbutt Grassy Forest
Maritime Grasslands	Grasslands	3410	Spinifex Strandline Grassland
Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrub/grass sub-formation)	3432	Hunter Coast Foothills Apple-Ironbark Grassy Forest
Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrub/grass sub-formation)	3434	Hunter Coast White Mahogany Low Forest
Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrub/grass sub-formation)	3437	Hunter Coast Lowland Spotted Gum Dry Forest
Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3544	Coastal Sands Apple-Blackbutt Forest
Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3545	Coastal Sands Bloodwood Low Forest
Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3546	Coastal Sands Littoral Scrub-Forest

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NSW Vegetation class	NSW Vegetation formation	PCT ID	NSW PCT name
Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3581	Hunter Coast Foothills Apple Forest
Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3582	Hunter Coast Lowland Apple-Bloodwood Forest
Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3583	Hunter Coast Lowland Scribbly Gum Forest
Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (shrubby sub-formation)	3596	Sydney Coastal Sandstone Riparian Forest
Coastal Headland Heaths	Heathlands	3788	Coastal Foredune Wattle Scrub
Coastal Headland Heaths	Heathlands	3793	Hunter Coast Headland Clay Heath
Coastal Headland Heaths	Heathlands	3794	Lower North Coast Headland Clay Heath
Wallum Sand Heaths	Heathlands	3800	Bouddi Headland Wallum Heath
Wallum Sand Heaths	Heathlands	3802	Lower North Sandplain Wallum Heath
Wallum Sand Heaths	Heathlands	3805	Southern Sandplain Heath
Coastal Heath Swamps	Freshwater Wetlands	3922	Sydney Coastal Sand Swamp Scrub
Coastal Freshwater Lagoons	Freshwater Wetlands	3961	Coast Sands Lepironia Sedgeland
Coastal Freshwater Lagoons	Freshwater Wetlands	3962	Coastal Floodplain Phragmites Reedland
Coastal Freshwater Lagoons	Freshwater Wetlands	3975	Southern Lower Floodplain Freshwater Wetland
Coastal Swamp Forests	Forested Wetlands	3986	Coastal Sands Swamp Mahogany Rush Forest
Coastal Swamp Forests	Forested Wetlands	3995	Hunter Coast Paperbark-Swamp Mahogany Forest
Coastal Swamp Forests	Forested Wetlands	3996	Coastal Sand Swamp Mahogany Dry Forest
Coastal Swamp Forests	Forested Wetlands	4006	Northern Paperbark-Swamp Mahogany Saw-sedge Forest

Glenrock State Conservation Area draft planning considerations

NSW Vegetation class	NSW Vegetation formation	PCT ID	NSW PCT name
Coastal Floodplain Wetlands	Forested Wetlands	4044	Northern Creekflat Eucalypt-Paperbark Mesic Swamp Forest
Coastal Freshwater Lagoons	Freshwater Wetlands	4137	Coastal Sand Couch Wetland

Source: SVTM Eastern NSW PCT v1.10 (draft March 2022)

Glenrock State Conservation Area draft planning considerations

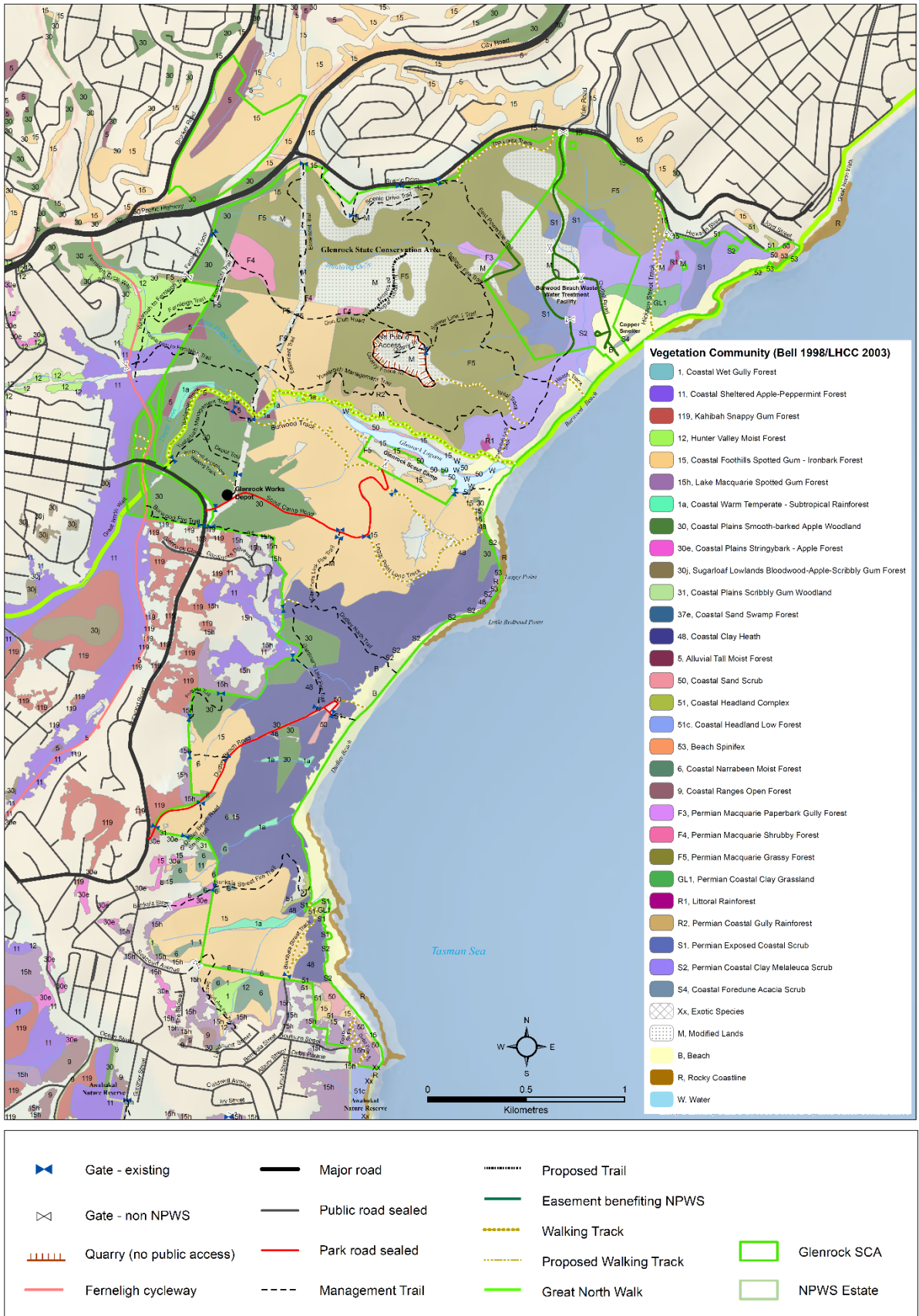


Figure 3 Bell (1998) vegetation mapping

Glenrock State Conservation Area draft planning considerations

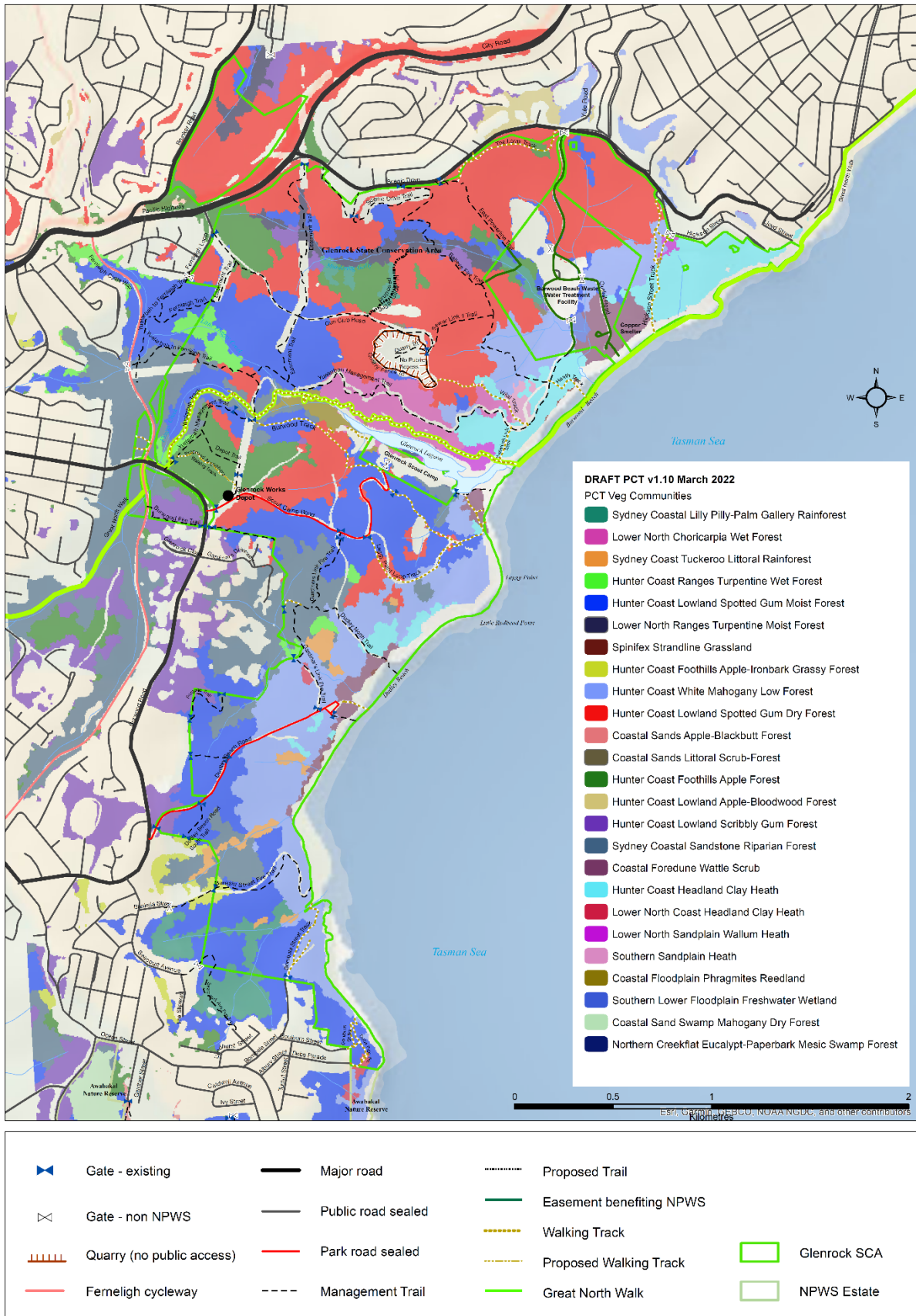
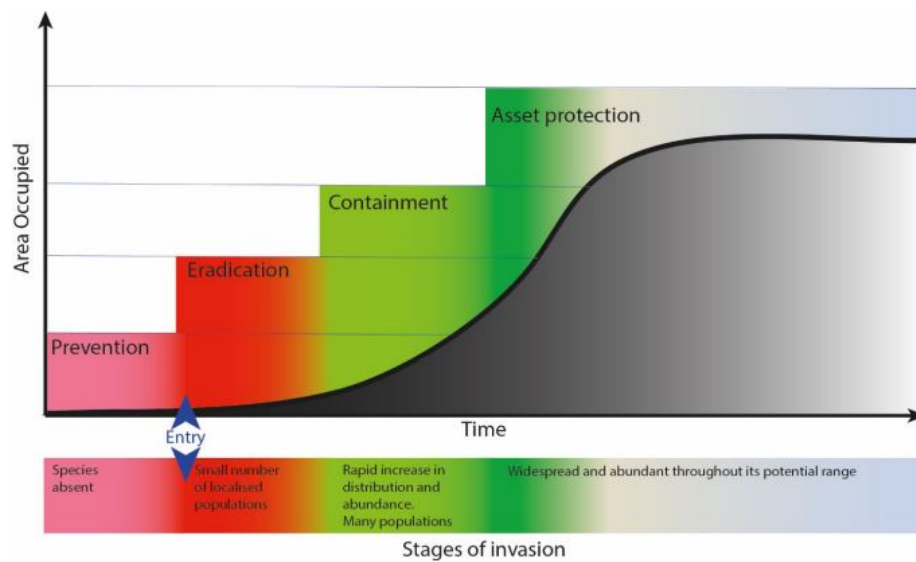


Figure 4 Draft (v1.10 March 2022) plant community type (PCT) mapping

Appendix C Priority weeds in the park

Table 8 summarises the state and regional weed management objectives for priority weeds in the park at the time of publication of this plan, based on the *Hunter regional strategic weed management plan 2017–2022* (Hunter LLS 2017). These management objectives are required to meet the general biosecurity duty under the *Biosecurity Act 2015*.

Weed prioritisation is guided by the principle that managing weeds earlier rather than later is more cost-effective. Weed management objectives support this principle and prioritise outcomes which can be achieved in the early stages of the invasion process as depicted in Figure 5 below (Hunter LLS 2017).



Source: Hunter regional strategic weed management plan 2017–2022 (Hunter LLS 2017).

Figure 5 Weed management objectives over time and stage of invasion

Table 7 Priority weeds in Glenrock SCA

Common name	Scientific name	KTP	State/Regional priority objective
Asparagus fern	<i>Asparagus scandens</i>	n/a	RP containment
Bitou bush	<i>Chrysanthemoides moniflora</i> subsp. <i>rotundata</i>	Y	SP containment
Blackberry	<i>Rubus fruticosus</i> agg.	n/a	SP & RP asset protection
Chinese knotweed	<i>Persicaria chinensis</i>	n/a	RP eradication
Kidney leaf mud plantain	<i>Heteranthera reniformis</i>	n/a	RP eradication
Lantana	<i>Lantana camara</i>	Y	SP asset protection
Ludwigia	<i>Ludwigia peruviana</i>	n/a	RP containment
Pampas grass	<i>Cortaderia</i> sp.	n/a	RP asset protection

SP = state priority; RP = regional priority; KTP = key threatening process listed under the Biodiversity Conservation Act and/or Environment Protection and Biodiversity Conservation Act; n/a = not applicable (not listed).

Source: *Hunter regional strategic weed management plan 2017–2022*, Appendix 3: Weed look-up table.

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More information

- [Australian Heritage Database](#)
- [Australian Walking Track Grading System](#)
- [Bailey's Cottage accommodation online bookings](#)
- [Biodiversity Conservation Program – Department of Planning and Environment webpage](#)
- [NSW Key Threatening Processes](#)
- [NPWS Code of practice for horse riding in parks](#)
- [NPWS commercial activities in parks webpage](#)
- [NPWS education webpage](#)
- [NPWS fire management strategies](#)
- [NPWS park policies – Department of Planning and Environment webpage](#)
- [NPWS Property leasing guidelines](#)
- [NPWS regional pest management strategies](#)
- [NSW BioNet website – Department of Planning and Environment webpage](#)
- [NSW legislation – NSW Government webpage](#)

- [NSW Plant community type classification – Department of Planning and Environment webpage](#)
- [Saving our Species program – Department of Planning and Environment webpage](#)
- [State Heritage Inventory – Heritage NSW webpage](#)

Other laws, policies and strategies may also apply. Please contact NPWS for advice.