Westonia Common Conservation Management Plan

2016 – 2021

Prepared for
Shire of Westonia

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Abbreviations

Abbreviation	Description
AVW	Avon Wheatbelt IBRA bioregion
AVW01	Avon Wheatbelt 1 IBRA subregion
AVW02	Avon Wheatbelt 2 IBRA subregion
BAM Act	*Biosecurity and Agriculture Management Act* 2007
BoM	Bureau of Meteorology
CMP	Conservation Management Plan
DAFWA	Department of Agriculture and Food Western Australia
DoE	Department of the Environment
ELA	Eco Logical Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GWA	Government of Western Australia
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre
KPIs	Key performance indicators
NEWROC	North Eastern Wheatbelt Regional Organisation of Councils
Parks and Wildlife	Department of Parks and Wildlife
RCC	Roadside Conservation Committee
the Shire	Shire of Westonia
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
WA	Western Australia
WAH	Western Australian Herbarium
WC Act	Wildlife Conservation Act 1950
WWF	World Wide Fund for Nature

1 Introduction

Surrounding the town of Westonia are a number of remnant vegetation reserves collectively known as the Westonia Common (the Common; **Figure** 1). The Common is located approximately 316 km east of Perth and 306 km west of Kalgoorlie, in the eastern Wheatbelt of Western Australia (WA), and covers an area of approximately 2,500 ha.

The Common is subject to numerous threats including (but not limited to) invasive flora and fauna species, inappropriate recreational use, abandoned mine shafts and a drying climate. There is also a lack of baseline information on the overall vegetation communities and condition, complete fauna assemblages, feral animal densities and weed distribution. As a result, the Shire of Westonia (the Shire) commissioned Eco Logical Australia (ELA) to develop a Conservation Management Plan (CMP) which incorporates best practice approaches to facilitate maintenance of the unique natural heritage for future generations.

1.1 Aim and objectives

The objectives of this CMP are to:

- Summarise and highlight the management issues, priorities, and impacts relevant to the Common
- Provide options for the management of the Common to maintain and enhance its condition, with particular respect to its biodiversity values, tourism potential, and sustainability
- Identify gaps in current knowledge and available information regarding conservation management issues, priorities, and impacts in the Common and recommend appropriate remedial actions
- Produce a list of potential projects for the Shire to ensure appropriate management and enhancement of the Common.

1.2 Adaptive management framework and life of plan

The complexity of natural systems, combined with a lack or absence of relevant research, often results in uncertainty regarding the response of a natural system to management approaches. Therefore, having a rigid environmental management approach can often result in failure to meet desired objectives.

With an adaptive management framework, the risk of failure can be mitigated through a more flexible approach. More specifically, the effectiveness of management strategies can be reviewed and opportunities for improvement identified and implemented. Furthermore, information about the system and its response to management strategies can be accrued throughout the process, which can further inform improvements in future management.

Implementation of this process in management projects in the Common should be considered as it can facilitate realistic achievement of management goals. The following steps are an example of how projects incorporating an adaptive management framework can be organised (Conservation Measures Partnership 2013):

- Step 1 - Conceptualise the project vision and context
- Step 2 - Plan actions and monitoring
- Step 3 - Implement actions and monitoring
- Step 4 - Analyse data, use the results, and adapt accordingly
- Step 5 - Capture and share learning.

The life of this conservation management plan is expected to be five years, from 2016 until 2021, at which time it should then be reviewed and updated. Upon review, any learnings from management practices over the life of the initial plan should be included in the review and subsequent management decisions.

Figure 1: Westonia Common location and regional context

2 Background

2.1 Site location and tenure

The Common is comprised of 15 remnant vegetation reserves which surround the town of Westonia, located approximately 316 km east of Perth (**Figure 1**). The reserves together cover approximately 2,500 ha and comprise of mostly Crown Reserves and some Unallocated Crown Land vested in the Shire. The vested land use purpose of the reserves includes commonage, old racetrack conservation/timber, gravel/sand, airstrip and watering places (cancelled).

2.2 Geology and soils

The Common lies in the centre of the Yilgarn Craton, an expanse of granite that forms outcrops across its range between Perth and the Goldfields. The area also contains metamorphosed sedimentary and igneous deposits including greenstone, some of which contain significant amounts of gold (McLellan 2008).

Landforms in the Yilgarn Craton include extensive undulating plains with gently undulating plateaus, wide divides, long gentle side slopes and broad valley floors which have been in-filled by alluvium and colluvium (Moore 2001). Salt lakes on the valley floors receive drainage and are remnants of an ancient drainage system (Moore 2001).

Soils in the Yilgarn Craton predominantly comprise yellow deep sands and sandy gravels on catchment divides (Moore 2001). Grey shallow and deep sandy duplex soils are present on the valley slopes and calcareous loamy earths and alkaline shallow duplex soils occur on the valley floors (Moore 2001).

2.3 Climate

Westonia is located in the Wheatbelt of West Australia. Based on the climate data from the Bureau of Meteorology (BoM), the Wheatbelt generally experiences hot dry summers and mild winters. Westonia's average monthly rainfall in summer ranges between 14.1 mm and 15.3 mm and in winter ranges between 38.9 mm and 50.6 mm (station number 012083, BoM 2015). Westonia's annual average rainfall is 331.4 mm. There are no temperature records for Westonia. Merredin's (42.1 km from Westonia) average maximum temperature in summer is approximately 32°C and in winter is approximately 17°C (station number 010092, BoM 2015). On average, the hottest month is January and the coolest month is July. Merredin's annual average rainfall is 326.2 mm (**Figure 2**).

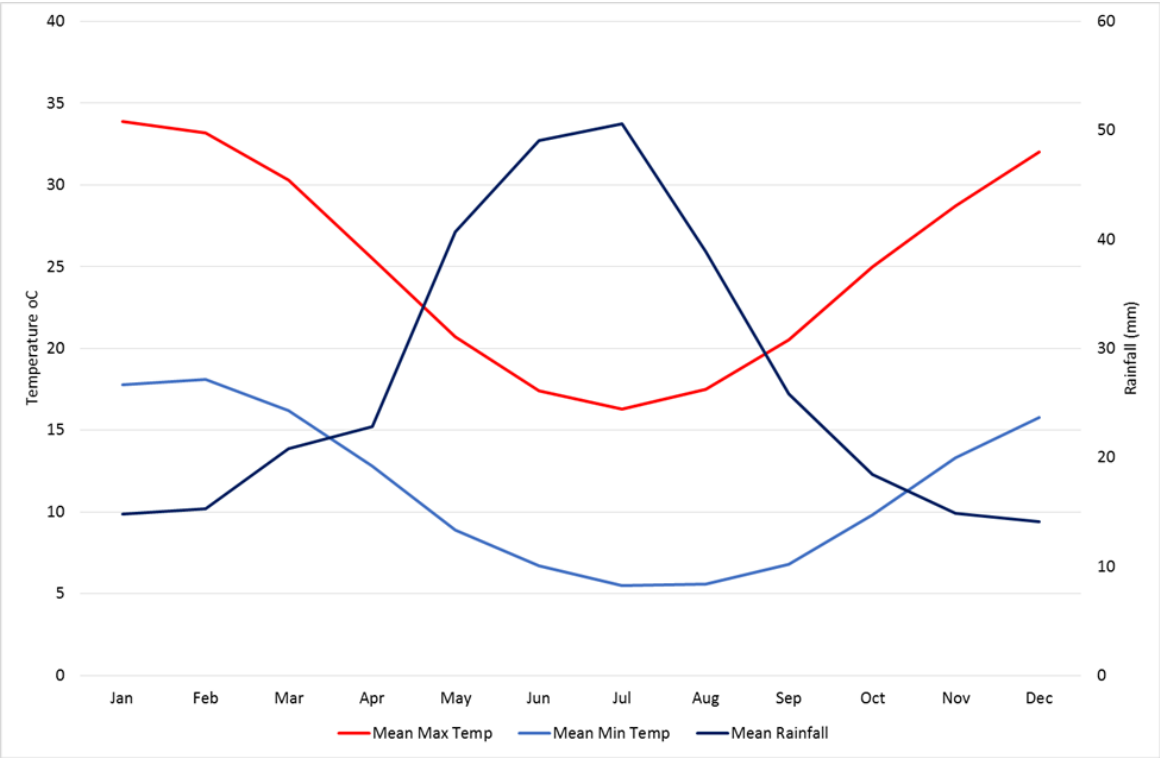

Figure 2 Average monthly temperature for Merredin (42.1 km from Westonia; station no. 010092; BoM 2015) and average monthly rainfall for Westonia (station number 012083; BoM 2015)

2.4 Biodiversity values and risks

2.4.1 Flora and vegetation

The Common is located in the Avon Wheatbelt bioregion (AVW) as defined by the Interim Biogeographic Regionalisation for Australia (IBRA; Department of the Environment [DoE] 2015a). The AVW has been further subdivided into two subregions and the Common falls within the Merredin subregion, which is described by Beecham (2001) as:

> "Gently undulating landscape of low relief. Proteaceous scrub heaths, rich in endemics, on residual lateritic uplands and derived sandplains; mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands on Quaternary alluvial and eluvial soils. There is no connected drainage; salt lake chains occur as remnants of ancient drainage systems that now only function in very wet years. Lateritic uplands are dominated by yellow sandplains."

The total extent of native vegetation remaining in the Shire is approximately 130,985 ha which is approximately 39.5% of the pre-European extent (Government of WA [GWA] 2014).

The vegetation of the Common has been broadly described by Beard (1975) as comprising three mapping units (**Table 1**).

Table 1: Beard (1975) mapping units, Shepherd et al. (2002) vegetation association equivalents, and extent remaining (GWA 2014)

Beard (1975) mapping unit	Shepherd et al. (2002) vegetation association	Description (Shepherd et al. 2002)	Pre-European extent remaining across AVW
e9,35Mi	536	Medium woodland; Morrell & Rough-fruited Mallee (*Eucalyptus corrugata*)	36%
acSc	36	Shrublands; thicket, *Acacia-Casuarina* alliance	24%
acmSc	1413	Shrublands; *Acacia, Casuarina* and *Melaleuca* thicket	32%

The vegetation has also been described in more detail from four reserves within the Common, through a floristic survey undertaken by World Wide Fund for Nature (WWF) Australia (WA Herbarium [WAH] 2015b):

- Woodland over tall shrubs with *Eucalyptus longicornis* (Red Morrel), *E. sheathiana* (Ribbon-barked Gum), *Melaleuca pauperiflora* (Boree)
- Woodland over medium density shrubs with *Eucalyptus salmonophloia* (Salmon Gum)*, E. salubris* (Gimlet)*, Acacia merrallii, Scaevola spinescens* (Currant Bush)
- Low forest over open shrubs with *Eucalyptus longicornis, E. salmonophloia, Acacia nyssophylla* and *Melaleuca lanceolata* (Rottnest Teatree)*.*

An average of 35 species were recorded per quadrat across these four reserves (highest number of species was 45 and the lowest was 25; WAH 2015b). It was noted that the quadrat located in the *Eucaluptus salmonophloia* woodlands was one of the highest number of taxa per quadrat recorded across the AVW (WWF 2005).

In 2007, WWF also conducted a 'BioBlitz' survey in the Common in which the dominant vegetation was described as woodlands dominated by *Eucalyptus salmonophloia*, *E. longicornis* and *E. salubris*, with an understorey dominated by either low chenopod shrubs (salt- and blue-bushes), or A*cacia*, *Melaleuca*, *Eremophila*, or *Senna* shrubs (McLellan 2008). During the BioBlitz study, 225 flora species and 18 fungi and lichen species were recorded (McLellan 2008). At the time of this survey, this number of species was considered to be one of the highest recorded out of all BioBlitz surveys conducted in the Wheatbelt (McLellan 2008).

The Shire is also home to 64 conservation significant flora species (including 11 Threatened and 53 Priority taxa). Within the Common, there are occurrences of *Eremophila resinosa* (Threatened; Collins 2009). There is limited information available on the occurrence and distribution of other conservation significant flora species within the Common.

The Common is considered important in a regional, national and global context as it "contains one of the largest 'reserved' red morrel (*Eucalyptus longicornis*) woodlands within the Intensive Land Use Zone (ILUZ) in Southwest Australia. Red morrel woodlands have largely been cleared within this region, and no formal nature reserves have ever been established specifically to protect this unique vegetation association" (McLellan 2008, p. 5).

In addition, the recently listed Critically Endangered Threatened Ecological Community (TEC) 'Eucalypt Woodlands of the Western Australian Wheatbelt' occurs in the Common. This TEC is described as

woodlands dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition (Threatened Species Scientific Committee [TSSC] 2015). This TEC occupies a transitional zone between the wetter forests associated with the Darling Range and the southwest coast, and the low woodlands, mallee and shrublands of the semi-arid to arid interior (DoE 2015b). The vegetation that occurs east of the agricultural clearing line, primarily in the Coolgardie and Eastern Mallee bioregions, is generally known as the Great Western Woodlands. The Great Western Woodlands are not part of the WA Wheatbelt Woodlands ecological community except the westernmost extent that overlaps into the bioregional boundaries (DoE 2015b). The TEC mostly encompasses three IBRA2 subregions; Avon Wheatbelt subregion 1 (AVW01), Avon Wheatbelt subregion 2 (AVW02) and Mallee subregion (MAL02) Western Mallee (DoE 2015b). Some outlying patches of the ecological community may extend into adjacent areas south and east of the primary wheatbelt bioregions, in the easternmost parts of the Jarrah Forest bioregion (DoE 2015b).

Its size, good condition and high biological diversity, along with the presence of the Critically Endangered 'Eucalypt Woodlands of the Western Australian Wheatbelt' TEC, make the Common biologically significant and extremely valuable for conservation (McLellan 2008).

2.4.2 Environmental weeds

The BioBlitz conducted in 2007 recorded 22 introduced flora species as occurring in the Common (McLellan 2008). When combined with previous flora surveys undertaken by Curtin University, a total of 30 introduced flora species have been recorded, which is approximately 15% of the total number of native plant species recorded in the BioBlitz (McLellan 2008).

Table 2 lists the introduced weed species that have been listed in the report by McLellan (2008) and from a search of the Department of Parks and Wildlife (Parks and Wildlife) NatureMap database (Parks and Wildlife 2007 - 2015) based on a 10 km buffer of the Common. **Table 2** also states whether each species is listed as a declared pest plant under the *Biosecurity and Agriculture Management Act* 2007 (WA) (BAM Act) as well as its ecological impact as defined by Parks and Wildlife (2009) rankings.

Table 2: Introduced flora (weed) species listed as occurring in the Common and within 10 km radius

Scientific name	Common name	Declared Pest Plant[+]	Ecological impacts#
**Aira*. (*caryophyllea*?)	Silvery Hairgrass	No	High
**Arctotheca calendula*	Capeweed	No	Unknown
**Asphodelus fistulosus*	Onion Weed	No	Unknown
**Avena barbata*	Bearded Oats		High
**Avena fatua*	Wild Oats		Not rated
**Brassica tournefortii*	Mediterranean Turnip	No	Unknown
**Bromus rubens*	Red Brome Grass		High
**Carrichtera annua*	Ward's Weed		Unknown
**Centaurea calcitrapa*	Start Thistle		Not rated
**Centaurea melitensis*	Maltese Cockspur		Medium
**Chondrilla juncea*	Skeleton Weed	Yes	Not rated
**Cleretum papulosum*	-		Unknown

Scientific name	Common name	Declared Pest Plant+	Ecological impacts#
**Cynodon dactylon*	Couch Grass		High
**Erodium aureum*	Corkscrew		Low
**Erodium botrys*	Corkscrew		Low
**Erodium cicutarium*	Common Storksbill		Low
**Hordeum glaucum*	Northern Barley Grass		Unknown
**Hordeum* sp. *leporinum?*	Barley Grass		Unknown
**Hypochaeris sp. radicata / glabra?*	Smooth Cat's Ear; Flatweed		Unknown
**Lepidium africanum*	Rubble Peppercress		Not rated
**Medicago minima*	Small Burr Medic / Goldfields Medic		Unknown
**Mesembryanthemum* sp.* *(crystallinum / nodiflorum?*	Common or Slender Iceplant		High
**Monoculus monstrosus*	Stinking Roger		Unknown
**Opuntia stricta*	Common Prickly Pear		Not rated
**Pentaschistis airoides*	False Hairgrass		Unknown
**Raphanus raphanistrum*	Wild Radish		Unknown
**Rostraria pumila*	-		Unknown
**Schismus barbatus*	Kelch Grass		Unknown
**Sisymbrium irio*	London Rocket		Unknown
**Sisymbrium runcinatum*	-		Unknown
**Trifolium glomeratum*	Cluster/Ball Clover		Unknown
**Ursinia anthemoides*	Ursinia		Unknown
**Vulpia* sp.* *(myuros?)*	Silver Grass; Rat's Tail Fescue		Unknown
**Zaluzianskya divaricata*	Spreading Night Phlox		Unknown

+ Declared Pests under the BAM Act (Department of Agriculture and Food Western Australia [DAFWA] 2015a), # Ecological impacts as listed by Parks and Wildlife (2009) and defined as "Impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure and composition".

2.4.3 Fauna

Although no comprehensive or baseline fauna surveys have been conducted in the Common, there have been nine mammals, five reptiles, 51 birds and 44 invertebrates recorded in the Common (McLellan 2008). This includes one species of particular interest, the Little Long-tailed Dunnart (*Sminthopsis dolichura*), which was thought to have become locally extinct in many parts of the Wheatbelt. Whilst this species is not listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Wildlife Conservation Act 1950* (WC Act), its presence within the Common is a significant finding

and reflects the importance of the Common to native fauna. There is also potential for several conservation significant fauna species to occur in the Common, such as the Chuditch (*Dasyurus geoffroii*) and Malleefowl (*Leipoa ocellata*) (Parks and Wildlife 2007 – 2015).

Fourteen conservation significant fauna species (including six Threatened, four protected under international agreements, one other specially protected and three Priority taxa) have been recorded in the Shire. Some of these species could potentially occur within the Common.

Native fauna has faced a number of threats since European settlement and clearing of the Wheatbelt began. Vast tracts of remnant vegetation have been cleared to make way for wheat and sheep production, and subsequently exotic animals, pests and diseases were introduced. The clearing has profoundly changed the biota of this region, including causing the extinction of many native fauna species (Bennett and Watson 2011).

The protection and enhancement of native fauna species and their habitats in the Common is considered a management priority for the Shire.

Four introduced fauna species have been recorded in the Common (McLellan 2008):

- Dogs (**Canis lupus familiaris*)
- Cats (**Felis catus*)
- Rabbits (**Oryctolagus cuniculus*)
- Foxes (**Vulpes vulpes*).

The presence of these species threatens the continued existence of many native animals in the Common, due to predation, increased competition and destruction of habitat. Feral animal control programs can help to mitigate the impacts of introduced fauna on native species and habitats. The need for a comprehensive feral predator control program was reinforced with the discovery of the Little Long-tailed Dunnart within the Common (McLellan 2008). The persistence of the Little Long-tailed Dunnart and other significant fauna species in the Common may be dependent on the eradication of cats and foxes.

Current control measures in the Shire include a baiting program conducted by the Shire as part of the North East Wheatbelt Regional Organisation of Councils (NEWROC) program, as well as control programs implemented by private landholders such as 'Red Card for Rabbits and Foxes'.

Other introduced species, such as the House Mouse (**Mus musculus*) and Domestic Pigeon *(*Columba livia*) could occur in the Common (Parks and Wildlife 2007 - 2015). These species do not pose significant threats to native fauna or their habitats, and as such have not been considered as part of the feral fauna control programs.

2.4.4 Fire ecology and management

Currently little is known about fire regimes and the ecological impact of fires in ecosystems similar to those which occur in the Common (Watson et al 2008). Little is also known about historical fire regimes in the broader Wheatbelt region. There has been one study conducted in *Eucalyptus salubris* woodlands, looking at floristic diversity and density at various post-fire ages. This study, undertaken by the Department of Environment and Conservation (now Parks and Wildlife), found species density and diversity was highest in *Eucalyptus salubris* woodlands at > 200 years post fire, suggesting fire is not required to maintain diversity in this community (Gosper et al 2013). It is also known that some Wheatbelt woodland tree species are sensitive to fire and can be killed, and recovery of woodlands with these species may take years (DoE 2015b). Further research needs to be conducted into the role of fire in the Wheatbelt landscape.

2.4.5 Mining and gravel/sand extraction

Within the Common, there are numerous relics of historic mining and prospecting activity such as abandoned shafts, former house sites, tracks and old rubbish tips (McLellan 2008). Just north of the Westonia town site is the Edna May Gold Mine, which is currently operational (Shire of Westonia 2015). The Edna May Gold Mine occurs outside out the Common's boundary. The Edna May deposit was discovered in 1911 and mining activities/operations have occurred there intermittently to the present day (Shire of Westonia 2015). Two of the reserves (R16295 and R15981) included in the Common have a vested purpose of gravel/sand.

Currently, permission to undertake mining activities is required to be sought through an environmental approvals process. Typically once approval is gained, it is accompanied by conditions that must be adhered to so unreasonable impact to biodiversity values is avoided. Although the Edna May Gold Mine is outside the Common boundary, the mining activities have the potential to have adverse effects on biodiversity values through direct and indirect means. This could include accidental impacts such as flooding events (e.g. pipeline or dam burst) or chemical discharge. Furthermore, with two of the reserves vested purpose being for gravel/sand, extraction of these resources may be sought at some point, which could result in clearing of remnant native vegetation.

2.4.6 Firewood harvesting

The Common is currently at risk of illegal collection of firewood. Timber removal can have impacts such as reduction in habitat integrity and loss of vegetation cover. It can also result in disturbance to soil and vegetation by people collecting firewood (e.g. through trampling and illegal vehicle access). The extent of firewood collection in the Common is currently unknown.

2.5 Tourism and sustainability

The Shire aims to provide high quality, sustainable and integrated tourism experiences to extend the length of stay of visitors to the area. The Shire is dedicated to the ongoing protection of the Common through a number of projects, including the management of natural resources and Landcare facilitation (Shire of Westonia 2015).

The Shire receives many visitors each year, who primarily visit the area for its wildflower displays in spring. The Woodlands and Wildflowers Heritage Trail is a 4 km round-trip that guides the public through parts of the Common and Westonia town site, indicating points of interest with a series of interpretative signs. The town of Westonia has a range of sporting facilities available and numerous recreational areas including picnic spots, parks and gardens. The town also has a rich architectural, gold mining and pioneering heritage. While there is established walk trails and signage these can be further enhanced to encourage and promote greater visitor numbers and participation in biodiversity management.

The Common contains many historical reminders of the area's rich pioneering and mining history, and is considered part of the character of the bush (McLellan 2008). The debris has historical value and provides habitat for a range of terrestrial fauna.

3 Management issues, priorities and impacts

In order for the Shire to implement best practice management approaches for the Common that involves strategies and projects that are effective in managing the biodiversity values, a review of current management issues is required. By understanding the current management issues the impacts to biodiversity values can be determined and investigated further.

3.1 Management issues

Table 3 below outlines management issues and priorities for the Common:

Table 3: Westonia Common management issues, priorities and impacts

Key value	Management Issue	Impacts
Biodiversity Values and risks	Flora and vegetation	Reduction in native species diversity and cover
		Changes to vegetation structure (e.g. reduced understorey layer)
	Environmental weeds	Displacement of, and competition with, native plants
		Reduction of native plant regeneration
		Changes to nutrient conditions and hydrological patterns
		Modification of fauna habitat
		Provision of habitat for feral animals (e.g. Rabbits) and an increase in fire hazard
	Fauna	Destruction, fragmentation and alteration of native fauna habitat
		Decline in abundance of native fauna through predation by introduced fauna
		Competition with introduced fauna for food resources and habitat
		Damage to native plants and habitats by grazing, trampling and digging by introduced fauna
		Soil erosion caused by introduced fauna
	Fire ecology and management	Decline in species diversity and regeneration caused by inappropriate fire regimes (intensity, frequency and extent)
	Mining and gravel/sand extraction	Clearing of native vegetation and habitat fragmentation
	Firewood harvesting	Reduction in habitat integrity and loss of vegetation cover

Key value	Management Issue	Impacts
		Changes to nutrient balance of ecosystems and disturbance of soils by people collecting firewood
Tourism and sustainability	Visitors and human activities	Damage to vegetation through trampling and collection of native flora
		Introduction and spread of weeds (e.g. seeds from other areas attached to shoes may dislodge in the Common, or seeds from within the Common may be spread throughout the Common)
		Increased risk of fire (e.g. from discarded cigarettes)
		Interference with fauna (e.g. feeding may create dependence on food from people)
		Rubbish dumping increases risk of introduction of weed species (e.g. from household garden waste), contamination of soil and damage to vegetation (e.g. from hydrocarbons and other pollutants such as asbestos), and diminished visual amenity
		Vehicle access (e.g. 4WD) resulting in erosion and contamination (e.g. due to hydrocarbon spills) of soil, damage to vegetation, and disruption to fauna (e.g. from noise and vegetation damage) from vehicle access
		Risk to public safety from abandoned mine shafts and inadequate fencing around Boodalin Soak
	Climate change	Biodiversity decline due to altered climate

3.2 Gaps in current knowledge

The Common and broader Westonia area has in the past been subject to limited biological studies:

- The WWF conducted a biodiversity study called a 'BioBlitz' in 2007 in the Common (McLellan 2007)
- Greening Australia produced a report in 2009 detailing results from the Westonia Ecoscape Landscape Audit, which incorporated Westonia and surrounding areas (Greening Australia 2009)
- WWF's Woodland Watch project has four sites in the Shire, which were last surveyed over 10 years ago (WWF 2005)
- Parks and Wildlife's Roadside Conservation Committee (RCC) conducted a roadside vegetation survey of the Shire's roads in 2006 (RCC 2007).

Knowledge gaps relating to biodiversity values, tourism and sustainability are presented in **Table 4**.

Table 4: Gaps in current knowledge of Westonia Common

Key value	Management Issues	Gaps in current knowledge
Biodiversity values and risks	Flora and vegetation	Lack of comprehensive vegetation condition assessment and mapping to establish a baseline to compare against in future years
		Lack of information available on the changes in vegetation cover over time through on-ground assessments and/or remote sensing
		Lack of a comprehensive rehabilitation plan to provide guidance on revegetation techniques, strategies, priorities, species lists and costings for degraded areas of the Common that require rehabilitation
	Environmental weeds	Lack of an integrated and specific weed management plan outlining a control program for high priority weed species, target areas for control and management, guidance on hygiene measures and strategies to reduce weed dispersal
		Lack of detailed and comprehensive mapping of high priority weed species locations/distribution and cover (%)
		Limited information on the impacts of weeds species on vegetation condition over time (through monitoring)
		Lack of a Standard Operating Procedure (SOP) detailing methods to undertake management activities
	Fauna	Lack of baseline survey and current understanding of fauna assemblages in the Common, including presence of conservation significant fauna
		Lack of information on introduced species locations/distribution across the Common
		Lack of baseline data and monitoring to assess effectiveness of current control/eradication method(s)
		Lack of information on existing impacts of introduced fauna on native species
		Lack of a Standard Operating Procedure (SOP) detailing methods to undertake management activities
	Fire ecology and management	Lack of a fire management plan detailing appropriate fire management approach to maintain biological and human values

Key value	Management Issues	Gaps in current knowledge
		Lack of historical fire records (e.g. fire scar mapping, fire incidences)
		Lack of understanding of fire ecology of ecosystems in the Common (e.g. appropriate burning regime to maintain ecosystem diversity)
	Mining and gravel extraction	N/A
	Firewood harvesting	Lack of information on the extent of firewood harvesting
Tourism and sustainability	Visitor and human activities	Lack of a visitor management strategy (e.g. monitoring number of visitors and impacts they are having)
		Lack of information on the frequency of vehicle access (e.g. 4WD) and impact on biodiversity
		Lack of information on the frequency of rubbish dumping and impact on biodiversity
		Lack of a strategy to deter rubbish dumping and unauthorised vehicle access (e.g. fencing/access restrictions as above)
	Climate change	Lack of understanding of the susceptibility of biodiversity in the Common to adverse impacts from climate change

3.3 Management priorities

In order to assist in decision making and in prioritising recommended projects to address key issues a priority ranking system has been developed and is shown in **Table 5**. The framework has three categories: High, Medium and Low and are assigned to each management action / project listed in section 3.

Table 5: Priority rankings for implementation of management

Priority ranking	Definition and justification
High	High priority projects are considered to be an essential requirement and are highly recommended to be implemented. These projects will enable effective management decisions to be made and guide future management actions
Medium	Medium priority projects are considered to be important and are recommended to be implemented once the high priority projects are addressed first. Medium priority projects could also be implemented when additional funding and opportunities exist
Low	Low priority projects are considered less essential however, if suitable funding and opportunities exist can be investigated and implemented as additional value adding components and to gain additional knowledge and understanding of biodiversity values

4 Management of Westonia Common

This section sets out objectives, remedial actions, performance measures, targets and priorities for implementing management. The remedial actions are listed as a series of projects that include project schedules and indicative budgets.

The objectives are set under each key value/threat, such as flora and vegetation, fauna, weeds etc. This will allow the key performance indicators to be tracked and reported against.

4.1 Biodiversity values and risks

4.1.1 Flora and vegetation

The Common represents a very significant remnant of native vegetation as it occurs in a region which has been extensively cleared for agriculture. It is important for maintaining the unique biodiversity of the region. The vegetation of the Common is, however, at risk of reduced native species diversity and cover, from a range of influences such as introduced flora and fauna species and human-related disturbance (e.g. clearing/trampling).

To effectively implement a management strategy to mitigate impacts and maintain and enhance the unique vegetation and flora values, an understanding of the current flora and vegetation values is recommended. To obtain this understanding, a comprehensive baseline study should be undertaken along with monitoring. Monitoring changes in vegetation allows any inadequacies in management strategies to be identified and adjustments made where necessary. It also allows remedial actions to be triggered in cases of significant adverse impacts from threats such as increased weed cover.

The baseline study should include establishment of up to 20 permanent quadrats across the Common. Permanent quadrats will facilitate ongoing monitoring of the condition of vegetation to detect any adverse changes (or improvements). To enable ease of monitoring in subsequent years, quadrats should be placed in close proximity to tracks/pathways (though placement should be far enough to avoid edge effects). Data collected at each quadrat should include species present, cover, structure, and vegetation condition. Photographs should also be taken at each quadrat. It is recommended that the methodology, in particular condition rating, is aligned with that described in the Technical Guide - Flora and Vegetation Surveys for Environmental Impact Assessment produced by the Environmental Protection Authority and the Department of Parks and Wildlife (2015). While this technical guide is for environmental impact assessments, it is still recommended as it is the most up to date guide for undertaking flora and vegetation surveys. The baseline survey should also include weed mapping and fuel load assessments (more detail on these values are discussed in sections 4.1.2 and 4.1.4).

An option that may also be considered for monitoring the ongoing condition and cover of vegetation is remote sensing. Remote sensing is useful for determining vegetation distribution, occurrence, growth levels, vegetation loss and overall health. Some other advantages of remote sensing are:

- reduces ground-based surveys over large areas;
- assists in targeting ground assessments and reduces time required for in field monitoring;
- it can complement field surveys to provide a better understanding of a local area or region; and
- provides a permanent record of vegetation health for future analysis.

Specifically for Westonia Common, remote sensing would allow the Shire to track changes in vegetation cover and condition over time and inform its ongoing management actions. Remote sensors use data from reflected energy of the Earth's surface, which is collected through satellites or aircraft (i.e. aerial photography, LiDAR and satellite imaging). Photosynthetically active biomass (PAB) is the most suitable data to analyse for vegetation health over time, and it is efficient to run and easy to compare. Pixels are assigned a reflectiveness value which is compared over time, whereby greener and well hydrated vegetation will reflect more than unhealthy vegetation. From this analysis, it is possible to determine the fluctuations in photosynthetic activity over different years and seasons, which can then inform vegetation cover and condition patterns over time.

There are a number of imagery sources and options available for analysis. Lower resolution Landsat imagery (25 m x 25 m) is offered free of charge and would provide a basic understanding of the vegetation condition at a regional scale. For an area the size of Westonia Common, the cost of higher quality imagery ranges from $600 to $3000 (to obtain imagery), depending on the resolution required. The cost for the associated report and analysis would be approximately between $4000 and $5000. Higher resolution imagery would allow detailed analysis of specific sections of interest in the Common (i.e. restoration progress, weed infestations, and unauthorised activities).

Other projects to ensure maintenance and improvement of vegetation values could include developing a rehabilitation plan from the baseline study, identifying priority areas for improvement (e.g. undertaking rehabilitation in areas which are highly disturbed and within which the natural structure of vegetation has be altered). Environmental weeds are likely to be a significant factor affecting the condition of vegetation. Environmental weeds are discussed in further detail in Section 4.1.2; however, they should be considered in unison with management of flora and vegetation values.

Table 6 outlines key performance indicators (KPIs) for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 6: Projects and Key Performance Indicators for management of flora and vegetation

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
Maintain the diversity and condition of native vegetation communities and where required improve the condition over time	Diversity, cover and condition of native vegetation communities	No decrease in known level of diversity, cover and condition	1.1 Implement a flora and vegetation survey to establish baseline information on the vegetation communities and condition by establishing monitoring quadrats and vegetation and condition mapping. Photo points to be established at each quadrat	High	Spring	One baseline survey $25,000-$30,000

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
			1.2 Follow up flora and vegetation survey of monitoring quadrats to record diversity, cover and condition to determine changes and trends. Should include vegetation condition mapping and photo points	High	Spring	Monitoring every four years $25,000-$30,000
			1.3 Application of remote sensing tools to provide measures of vegetation condition (Note: this project is an alternative to project 1.2 and 1.2)	Medium	Timing not dependent on season, however should be taken at the same time each year	Every two years $600 - $3,000 (imagery) $4,000 - $5,000 (analysis and report)
			1.4 Comprehensive rehabilitation plan to provide guidance on revegetation techniques, strategies, priorities, seed collection, species lists and costings for degraded areas of the Common that require rehabilitation.	Medium	N/A	One plan $5,000

4.1.2 Environmental weeds

Introduced (weed) species are often widespread in fragmented landscapes that have been highly modified, and where nutrient enrichment of soils and frequent disturbance encourages the establishment of weeds over native vegetation. Established weeds compete with native plants, affecting their recruitment and survival, and can increase flammability of vegetation and diminish habitat quality for native fauna (RCC 2007). Once established, weeds become a long-term and potentially costly management issue.

An integrated approach to environmental weed management was developed in the Environmental Weed Strategy for Western Australia (Conservation and Land Management 1999). As part of this strategy, environmental weeds are rated in terms of their environmental impact on biodiversity. This strategy is in the process of being replaced with Parks and Wildlife's Weed Prioritisation Process, which is a new system currently being developed for prioritising weeds for each of the 26 bioregions in Western Australia.

The Weed Prioritisation Process ranks weeds by region based on their invasiveness, ecological impact, potential and current distribution and feasibility of control (Parks and Wildlife 2009). The Wheatbelt Bioregion Ranking Summary, which is currently under revision, and therefore information could change when the next version is released. This revision will result in setting priorities for weeds considered to be high impact, rapidly invasive and still at a population size that can feasibly be eradicated or contained to a manageable size (Parks and Wildlife 2009).

As a land manager, the Shire of Westonia is also required to follow the requirements for management of weed species listed as declared pest plants under the BAM Act.

Firstly, the weeds that pose a threat to the Common, should be identified. It is recommended that an initial desktop assessment is undertaken and a priority weed species ranking category (low, medium and high priority) developed and assigned to potentially occurring weeds. The Parks and Wildlife Weed Prioritisation Process (once released) and Western Australian Organism List may be used as guidance for assigning appropriate ranking categories for weeds.

Weed mapping should then be undertaken, with a focus on high priority weeds to establish their extent of occurrence in the Common. Weed mapping can follow guidance in the 'Techniques for mapping weed distribution and cover in bushland and wetlands', Parks and Wildlife Standard Operating Procedure (SOP); however, it is recommended that the following density categories (cover classes) are used: < 5%, 6-30%, 31-60% and > 61%, instead of the much broader categories listed in the SOP. This is recommended as these categories provide a more useful mapping outcome that ties into the on-ground management.

A monitoring program should then be implemented to track any changes in weed cover and composition and trigger any management actions or reviews. Resources permitting, an integrated and specific weed management plan should be developed, which would outline priorities for management, such as priority weed species and target areas to manage weeds, and include an SOP for weed control techniques (e.g. spraying) and monitoring. The weed management plan should also provide indicative costs to undertake management actions.

Table 7 outlines KPIs for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 7: Projects and Key Performance Indicators for management of environmental weeds

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
Minimise the impacts of environmental weeds on the condition of native vegetation communities	Changes in the abundance and distribution of environmental weeds rated as high priority for control	No increase in the abundance or distribution of high priority weeds	2.1 Determine high priority weed species for control through a desktop analysis. The priority weed rankings will inform the baseline weed mapping survey (project 2.2)	High	N/A	One desktop report $3000 - $5000
			2.2 Baseline weed mapping survey in	High	Spring	One baseline

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
			accordance with Parks and Wildlife SOP survey methods (with adjustments to the cover classes mentioned above)			survey (in conjunction with the flora and vegetation survey).
			2.3 Follow up weed mapping to record changes in cover and distribution compared with the baseline	Medium	Spring	Every four years (in conjunction with the flora and vegetation survey).
			2.4 Integrated and specific weed management plan to provide guidance on strategies, priorities, methods and costings for high priority weed control. The weed management plan will also provide guidance on hygiene measures and strategies to reduce weed dispersal	Medium	N/A	One Management plan $5000

4.1.3 Fauna

Landscape changes which have occurred in the region such as clearing and habitat fragmentation can affect species directly and indirectly through increased predation and competition, from both native and introduced fauna. The Common represents one of only a few isolated pockets of remnant bushland in the Wheatbelt which continue to provide refuge for native fauna.

As currently there is limited knowledge of fauna occurrence within the Common, it is recommended that a comprehensive baseline fauna survey is undertaken. The baseline survey should allow for detection of all faunal groups and specifically target potentially occurring conservation significant species. Methodology may include undertaking trapping (using various trap types e.g. pit traps, funnel traps, cage traps), deploying motion sensor cameras and sound recording equipment, bird observations and undertaking targeted searches. Methodology should align with that described in Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (Environmental Protection Authority and Department of Environment and Conservation 2010). While this technical guide is for environmental impact assessments, it is still recommended as it is the most up to date guide for undertaking fauna surveys. Follow up monitoring should also be undertaken to track any fluctuations in fauna presence through comparison with baseline data and any other monitoring data. This approach

will allow any decreases in native fauna assemblages and abundance to be detected and remedial actions implemented in a timely manner.

Baseline information should also be collected on the presence and abundance of introduced fauna species. This information can be obtained through methods such as motion sensor cameras. Motion sensor cameras are straightforward to deploy and can be left on site for long periods of time, maximising fauna detection. Motion sensor cameras should be located in areas frequented by fauna (e.g. kangaroo tracks). Baseline data on introduced fauna should then be used to develop a formalised introduced fauna control program including SOPs for undertaking control practices. Monitoring should also be implemented to ensure programs are successful in controlling the abundance of feral animals throughout the Common. Monitoring the activity and distribution of feral animals can provide an indication of the effectiveness of control programs over time, or whether there is a need for additional control efforts. Monitoring techniques include remote motion cameras, track count surveys (monitoring sand pads for footprints), and targeted trapping. To monitor trends in activity and distribution over time, surveys should be conducted at seasonal intervals every one to two years.

Currently in WA, the naturally occurring poison 1080 (found in plants of the genus *Gastrolobium*) is used in the development of baits to target feral animals. Control of feral cats by baiting is much harder than foxes and rabbits, as cats are less inclined to eat the baits used in most baiting programs (Algar et al. 2013). To combat this, scientists have developed a cat-specific bait called Eradicat®, which, unlike the fox baits, is only partially dried and far more palatable to cats (Parks and Wildlife 2015). Field trials of the Eradicat® baiting program at Lorna Glen (now known as Matuwa) have revealed significant and sustained feral cat control success in arid environments, observing significant reductions in feral cat activity immediately after baiting (i.e. an average of 26.4 cats/100 km prior to baiting compared to 6.4 cats/100 km once baiting had commenced; Algar et al. 2013). Additional monitoring at Matuwa found a 50-60 % reduction in feral cat activity as a result of the baiting program (Parks and Wildlife 2015).

A program to either eradicate or control the numbers of rabbits should also be implemented. The rabbit control program should use the Threat abatement plan for competition and land degradation by rabbits Eradication methods include warren fumigation, poisoning, trapping and shooting produced by the Department of the Environment, Water, Heritage and the Arts (now DoE; 2008). The use of poison baits to control rabbits must be conducted with caution as some baits (e.g. pindone baits) are thought to be toxic to native mammals (DAFWA 2015b). Shooting and trapping are only likely to be successful when very few rabbits are present, therefore should only be used as supplementary methods of control. Other less invasive methods of rabbit control include warren/harbourage destruction, tree guards, and repellents (DAFWA 2015b). These methods could be employed to supplement eradication methods.

In order to ensure control methods remain successful in the long term, rabbit-proof fencing could be installed around each reserve in the Common. However, due to the size of the Common and the multiple reserves incorporated within it, installation and maintenance of rabbit-proof fencing would be very costly. It is therefore considered unlikely to be feasible for the Shire to implement rabbit-proof fencing without additional funding measures.

A comprehensive feral animal control program would ideally use a combination of baiting, trapping and shooting. Baiting must be conducted by a licenced pest management technician and in accordance with relevant Commonwealth and State legislation (DAFWA 2015b).

Timing of feral animal control programs are best conducted when pest densities are low, such as during the non-breeding season or in drought for rabbits; and when prey availability is low for predators (Algar et al. 2007, 2013). The feral animal control programs should follow an adaptive management framework, to ensure control efforts remain successful and cost effective in the long term.

Programs that provide support and encouragement to landholders to undertake concerted and timely control programs would also be beneficial to maintain introduced fauna for the Shire.

Table 8 outlines KPIs for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 8: Projects and Key Performance Indicators for management of fauna

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
Protect native fauna and their habitats	Changes in native fauna species abundance and distribution and extent of habitat	No significant decrease in native fauna species abundance or habitat	3.1 Implement a detailed fauna survey to establish baseline information on the fauna assemblages, presence of conservation significant species, habitats and guidance on management	Low	Late Spring	One baseline survey $25,000-$45,000
			3.2 Follow up fauna monitoring surveys to record presence/absence of key species (such as the Little Long-tailed Dunnart (*Sminthopsis dolichura*)	Low	Late Spring	Monitoring every four years $20,000-$25,000
			3.3 Undertake a baseline surveys to determine introduced fauna densities across the Common using monitoring techniques including remote motion cameras and track count surveys (monitoring sand pads for footprints). Follow up monitoring should be undertaken every 1-2 years. This data will assess the effectiveness of current control/eradication method(s) and efforts	High	Seasonal intervals	Every 1 - 2 years $10,000 - $15,000
			3.4 Formalise and implement an introduced fauna control program document that includes a Standard Operating	High	N/A	$5,000 - $10,000

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
			Procedure (SOP) for control measures undertaken and community liaison			
			3.5 Undertake feral baiting programs, including using Eradicat® baits for cats and 1080 meat baits for foxes. Control measures should follow the fauna control program and SOP	High	Seasonal intervals	$5,000 for each baiting event
			3.6 Undertake rabbit control using eradication methods including warren fumigation, poisoning, trapping and shooting.	High	Seasonal intervals	$5,000 for each baiting event
			3.7 Undertake rabbit-proof fencing exclusion areas for sections of the Common. This research project will allow data to be collected on the response of the vegetation, such as diversity and cover changes in native flora. Flora monitoring quadrats could be established in the rabbit-proof fencing exclusion areas, as discussed under project 1.1	Low	Spring	$4,000-$6,000/km of rabbit-proof fencing materials

4.1.4 Fire ecology and management

Fire can have an important role in maintaining biodiversity values through shaping vegetation patterns, community composition and diversity. Understanding how fire interacts with a particular environment, however, is crucial as inappropriate fire regimes can present a major threat to conservation values. For example, frequent occurrence of fires in some ecosystems may have a detrimental effect on species diversity, as a short interval may not allow sufficient time for some species to re-establish.

As little is known about appropriate fire regimes to maintain biodiversity values in the Common, it is recommended that research be conducted into the relationship between fire and biodiversity values in the Common. This may be achieved through creating opportunities or encouraging research projects (e.g. PhD study) to be undertaken in the Common. In the interim, however, it is recommended that a fire management plan be developed containing management objectives and actions guided by research

conducted in similar ecosystems, such as the *E. salubris* study undertaken by Parks and Wildlife. In light of this, management actions may include suppression of any fires that occur within the Common. Other suggested items for inclusion include fuel mapping and, if any fires occur in the Common, fire scar boundary mapping and maintaining records of data such as the date of occurrence, intensity, and ignition source. This plan should be reviewed periodically and any outcomes from research incorporated to further refine management objectives and actions to specifically maintain and protect biodiversity values in the Common. A review of access tracks and fire breaks should also be included in the management plan.

Table 9 outlines KPIs for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 9: Projects and Key Performance Indicators for fire management

Key objective	KPI					
	Performance measure	Target	Management actions / projects	Priority ranking	Timing	Frequency & costs
Conserve biodiversity assets across the Common and protect life and community assets	The impact of wildlife on life, property and biodiversity assets	No loss of life and property. No detrimental effects on biodiversity assets	4.1 Develop a fire management plan containing management objectives, actions, strategies and fuel load mapping. The data for the fuel load mapping could be collected during the flora and vegetation survey (project 1.1). A review of access tracks and fire breaks should also be included	Medium	N/A	Updated every five year $5,000 - $7,000

4.1.5 Mining and gravel/sand extraction

With mining activities adjacent to the Common and some of the reserves' vested purpose being gravel/sand, there is the potential for environmental impacts to occur. However, these activities must have approval which usually includes environmental conditions. It is recommended that future vegetation clearing is kept to a minimum within the Common. There are no projects recommended for this objective. All mining and gravel extraction activities to follow due process, including undertaking suitable rehabilitation

4.1.6 Firewood harvesting

Collection of firewood can reduce the availability of habitats for some fauna species. Since the extent of firewood collection in the Common is unknown, investigations should initially be carried out to establish whether this activity requires management. If firewood collection is found to be an issue for the Common, recommended management measures include installation of signage, making people aware that it is illegal to collect firewood from an undesignated collecting area. If possible, bollards / gates and / or

fencing should be installed at entry points to the Common to prevent unauthorised vehicles from entering the area.

Table 10 outlines key performance indicators for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 10: Projects and Key Performance Indicators for management of firewood harvesting

Key objective	Key performance indicators (KPIs)					
	Performance measure	Target	Projects	Priority ranking	Timing	Frequency & costs
Conserve and protect biodiversity values and habitat from the impacts of illegal firewood harvesting	The impact of illegal collection of firewood on biodiversity values, such as reduced habitat logs and canopy cover	No illegal firewood collection	5.1 Investigate the extent of existing firewood collection and determine need for management	Medium	N/A	Annually Internal Shire cost
			5.2 If deemed necessary following project 6.1, establish adequate gates and / or fencing to limit vehicle access to areas of the Common that are prone to illegal firewood harvesting	Priority depends on outcome of project 5.1	N/A	$4,000 - $6,000 per kilometre for standard cyclone fencing (materials only)

4.2 Tourism and sustainability

4.2.1 Visitors and human activities

Appropriate facilities and management of visitors are integral to maintain the biodiversity of the Common. Furthermore attracting visitors to the area can be beneficial to the local community. With appropriate management systems in place, biodiversity values can be maintained successfully in harmony with increased visitor numbers.

Projects to ensure visitors continue to enjoy the Common without affecting biodiversity values can include development of walk trails, and provision of facilities such as designated picnic areas and interpretive signage. For example, a formalised walk trail encompassing Boodalin Soak (also known as Boodalin Well and one of a series of dams and wells sunk between York and the Goldfields by Charles Hunt in 1865) may be developed and could include a picnic area and interpretive signage about the history of the soak and other local history such as gold prospecting and the nearby capture of Moondyne Joe in 1866. Improvements should also be made to fencing around the perimeter of Boodalin Soak to ensure visitor safety and also prevent damage to the soak. Upgrades could also be made to exiting tracks throughout the Common to develop these into more formalised walk trails. Additional walk trails should be developed to encompass the variety of vegetation, flora and landscape features with the Common, such as York Gum Woodlands, Salmon Gum Woodlands, Gimlet Woodlands and granite outcropping. Where possible existing tracks should be used to minimise requirement to clear any vegetation. Due to the limited lifespan of signage (e.g. fading over time) and its susceptibility to damage/graffiti, utilising technological resources

to inform visitors could be considered. Once such example is the development of 'Story Maps'. Story Maps are interactive web based maps which can include narrative text, images and multimedia content. All information associated with a Story Map can be accessed from any device (e.g. smart phone or tablet) with an internet data connection. The Story Maps can also be accessed through social media and visitors may share them with their networks, which is a potential additional method of promotion for the Common. Further information about Story Maps, along with examples can be found at http://storymaps.arcgis.com/en/app-list/map-journal/gallery/#s=0&md=storymaps-apps:map-journal.
Another option is to create an opportunity for visitors to take a guided tour of the Common in which the tour leader provides information about local history and biodiversity. This could include information on the species diversity in the woodlands, including the high number of orchid species that occur in the Common. Information signs could be placed in strategic locations (e.g. at walk trail entry) advising visitors of any restrictions (e.g. it is illegal to collect native flora, no littering, use paths provided, etc). Consideration should also be made for public safety, in particular the abandoned mine shafts and Boodalin Soak. Access to these features should be restricted and compliant with best practice visitor safety management such as appropriate fencing. If the location of abandoned mine shafts is unknown suitable mapping should be undertaken to allow appropriate planning around management. This mapping can be undertaken as part of project 1.1.

To promote the region and attract visitors to the Common, signage with high resolution images could be established along the Great Eastern Highway showcasing attractions such as wildflowers in full bloom. Further promotion of the region could be through media outlets in particular social media platforms such as Facebook and Instagram. Throughout the year, photos and information about the region may be uploaded to dedicated pages on these social media platforms. The presence on social media could also be advertised on the signage promoting the area on Great Eastern Highway.

If feasible, it is also recommended that a visitors centre/interpretive centre be established in a more central location. Community involvement in the Common should also be encouraged. This could be through establishing a community group or friends group with a focus on incorporating the core values and objectives of this management plan. Examples of activities in which community members can participate in management of the reserve include assistance with maintaining facilities (e.g. busy bee days to clean-up rubbish and repair damaged facilities) and with biological surveys and monitoring (e.g. through bird watching and logging fauna observations).

Given that the Common is not fenced it is currently susceptible to illegal activities such as vehicle access and rubbish dumping. These activities can cause considerable damage to the environmental values of the Common through impacts such as direct damage to vegetation and fauna habitat, as well as contamination from chemicals and pollutants (e.g. hydrocarbon spills). Investigations should be carried out on the extent of these activities occurring within the Common and their priority for management. If these activities are found to be an issue, management actions could include installation of signage advising people of restricted access to vehicles or notifying people of implications for partaking in illegal activities (e.g. signage with fine amounts for rubbish dumping). Other methods would be to establish direct deterrents such as gates or bollards and / or fencing at entry point. Note, if implemented, this project will also cover some management actions for issue described in section 4.1.6 Firewood harvesting. Tracks should be reviewed and closed if no longer required, such as for fire management purposes, and allowed to rehabilitate. Internal tracks in particular should be closed if not required as they are a potential source of weed invasion.

Table 11 outlines KPIs for each management action/project. This table outlines the key objectives and performance measures and targets as well as the priority ranking for implementation of the management actions/projects.

Table 11: Projects and Key Performance Indicators for management of visitors and human activities

Key objective	KPI					
	Performance measure	Target	Projects	Priority ranking	Timing	Frequency & costs
To provide a range of high quality, sustainable and integrated tourism experiences	Level of visitor satisfaction and participation in tourism activities	Positive visitor satisfaction levels maintained and increasing trend of visitor participation over time	6.1 Develop walk trail to and around Boodalin Soak and improve facilities at this attraction, including establishing interpretive signage and picnic facilities.	Medium	N/A	$10,000 - $20,000 (materials and labour)
			6.2 Establishing walk trail which traverse different vegetation and landform features of the Common (e.g. woodlands, granite) and incorporate Story Maps	Low	N/A	Walk trail establishment $5,000 - $10,000. Story maps $2,000 - $5,000
			6.3 Improve marketing/promotion of the area through establishing signage on the Great Eastern Highway showcasing the Common and local area and establish a presence on social media (e.g. set up a page on Facebook/Instagram and regularly update)	Medium	N/A	Signage $5,000 - $10,000 Social media Internal Shire cost
			6.4 Establish visitors centre/interpretive centre which includes information and option to take a guided tour of the Common. Also encourage participation from community members in management of the Common through volunteering.	Low	N/A	Facility building cost vary depending on design and size
			6.5 Restrict or deter illegal activities (e.g. 4WD access and rubbish dumping) through strategically placed	Medium	N/A	Signage $5,000 - $10,000

Key objective	KPI					
	Performance measure	Target	Projects	Priority ranking	Timing	Frequency & costs
			information signs detailing restrictions/consequences and limit track accessibility for vehicles (e.g. gates/bollards).			

4.2.2 Climate change

The vast majority of projections indicate that there will be an increase in future rainfall variability and in temperature across the Australian Wheatbelt (Watson et al. 2015). It is hard to determine how this will effect Westonia because the changes are unlikely to be uniform across the region, with much local variation possible, making it difficult for planning and management. However, like the past three decades (Barron et al. 2012), it is expected that there will be continued drought throughout the region.

Due to the unpredictability of the effects climate change will have on biodiversity of the Common, no projects are currently recommended. Climate change should however be considered as a potential cause if biodiversity decline if observed in other projects (e.g. project 1.2. flora and vegetation monitoring).

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