City of Kwinana

Natural Areas Management Plan 2014-2024

Contents

1. Introduction.

The community of Kwinana is fortunate to be surrounded by nature and places significant value on the natural areas that exist within the City boundaries. The Natural Areas Management Plan 2014-2024 (Natural Areas Management Plan) aims to ensure that both the community values and biodiversity values in the City managed reserves are preserved and improved through appropriate management practices that consider cultural, social, heritage, environmental, scientific and practical issues and values.

The City of Kwinana actively manages 21 natural area reserves comprising coastal, woodland and wetland communities totaling an area of 240 hectares, ranging from smaller reserves in urban areas to larger reserves in rural and semi rural areas. The condition of bushland within the City's reserves varies along a scale from excellent to completely degraded according to the Keighery Scale (Ecoscape 2012).

With the significant increase in urban development within the boundaries of the City of Kwinana additional reserves will be added to its management responsibility. An initial significant increase in area, particularly areas of wetland, is forecast from 2014 followed by the steady addition of reserves for the following decade or more.

The tenure of these reserves include Crown Reserves where the City has received a management order under section 46 of the Land administration Act 1997, freehold areas of land, drainage, parks and recreation and road reserves, unallocated crown land, Council Works Depot, C class reserves and areas of landscape protection.

The preservation of cultural heritage of the City's natural areas is also a major consideration which underpins management priorities. Particular consideration will be given to the registered sites under the Aboriginal Heritage Act (AHA) 1972, of which the City of Kwinana contains 5 (Refer to Table 1).

Reserve Name	Area (Ha)	MRS	TPS	Vesting	BFS	Registered Site (AHA)
Clementi Road Reserve	33.6	Rural	Rural A	P & R	Section of 268	
Challenger Beach	3.3	P & R	MRS	Recreation and Dune Protection	Section of 268	
Postans	1.1	HVWP Redevelopment Area	MRS	Public Recreation	-	
Hendy Road	4.9	HVWP Redevelopment Area	MRS	Public Recreation	-	
Depot Swamp	6.3	P & R	MRS	Council Depot	Section of 349	
Gentle Road/Golf Course	101.2	P & R	MRS	Recreation	Section of 349	
Sloans Reserve	12	P & R	MRS	Parks and Recreation	Section of 349	Site 3711
Camp, Hunting Place						
Wildflower Reserve	15.5	Urban 'C' Class Reserve	Parks & Recreation	Parks and Recreation	272	
Homestead Ridge (x 3)	7.9	Urban	Park, Recreation and Drainage	Parkland		
Millar Road	19.3	Rural		Public Recreation	Section of 349	
Banksia Road	26.7	Rural 'C' Class Reserve	Rural A Landscape Protection Zone NE corner	Public Recreation and Drainage Rifle Range		
Lake Magenup	27.1	P & R and Water Catchment	MRS	Public Recreation		-
Chalk Hill	0.7	P & R	MRS	Chalk Hill Tourist Lookout	Section of 349	
Bertram Sanctuary	6.8	Conservation and P & R	Residential	Conservation and Public Recreation		
Belgravia Dampland	8.4	P & R	Residential	Public Recreation		
Henley Reserve	25	P & R	Residential	Public Recreation		
Parmelia Reserves (x2)	8.2	P & R	MRS	Public Recreation	BFS 67	
Kwinana Beach (Wells Park)	0.9	P & R	MRS	Crown Land		
Squires Ave	0.8	P & R	Residential	Parks, Recreation and Drainage	-	
Thomas Oval	21.7	P & R	MRS	Parks and Recreation	Section of 349	3710 Camp

Table 1. Current Management Responsibilities

Reserve Name	Area (Ha)	Time frame
Honeywood north	12	2017/2019
Honeywood central	1.3	2017/2019
Honeywood south	7.6	2017/2019
Darling Chase	13.6	2017/2019
Wandi south	4.3	2018/2020
Lyon Road PEC	4.2	2019/2021
Latitude 32 conservation area	19.2	2017/2019
Casuarina Cell wetlands	45	2019/2021
Sunrise wetlands	32	2017/2019
Wellard west wetlands	61	2018/2020
E26	4	2017/2019
Mandogalup	12	2019/2020

Table 2. Proposed Additional Management Responsibilities

Significant information on the composition and condition of each reserve has been gathered and compiled through several surveys and mapping exercises. This information is included in several reports comprising:

- vegetation community mapping;
- bushland condition mapping;
- Phytophthora Dieback mapping; and
- weed distribution and abundance mapping (% weed cover is measure being used for mapping).

This information will directly inform our on-ground weed management, disease control, access control, and fire management programs. The relevant reports have been included as appendices to this plan.

This plan is also a significant step away from the previous plan where reserves were prioritised and funds expended on the highest priority reserves. This method was appropriate when budgetary commitments to the previous Bushland Masterplan limited the activities that could be undertaken in the City's reserves. The Environment Services Team operational budget has now increased to a point where every one of the City's reserves can receive significant management attention (i.e., weed control) each year.

The aim of current management practice is to ensure that the condition of the City's reserves, as a whole, improves. This contrasts sharply with previous programs where the reserves assessed as 'high priority' were targeted for management and subsequently improved, and the 'low priority' reserves were left to further degrade.

The new Natural Areas Management Plan looks to prioritise management issues and threats facing each reserve and investigates and implements suitable methods to control these issues and threats.

There are two principles that guide the City's Natural Areas Management Plan:

- Prevent further negative natural and anthropogenic impacts on the natural areas the City manages; and
- Reduce the impact that previous natural and anthropogenic influences have had on natural areas with the aim of improving their overall condition.

The main impact on the City's reserves is as a result of the activities of humans be they direct such as arson, drainage runoff from urbanisation, the introduction of disease, illegal dumping and illegal vehicle use or indirect such as climate change, weed invasion, habitat fragmentation, the maintenance of unnaturally high exotic predator densities in adjoining suburbs, inappropriate management or lax bio-security practices.

The requirement for management of the City's reserves is dictated through several pieces of Federal and State Legislation and Regulations that form a framework for the minimum expectations of management for conservation and public purposes of a natural area. These legislated ideals aim to preserve the local and regional environment values, preserve the ability of the public to interact with the environment, empower land managers with the ability to effectively manage those lands in their lawful control and ultimately protect the environment from inappropriate and unlawful human activity.

Key threats to the conservation of biodiversity in the natural areas managed by the City of Kwinana come in many forms and periods of scale and time. Some of the key threats are listed in the following table.

Natural Processes	Anthropogenic Processes
ACUTE	**ACUTE**
Fire	Destruction for 'development'
Flood	Mining
Storm	Arson
Pests	Illegal vehicle access (Trampling and soil disturbance)
	Illegal dumping / Littering
	Tree felling/firewood gathering
	Inappropriate management
CHRONIC	**CHRONIC**
Climate change	Weed invasion
Drought	Climate Change
Sea level rise	Groundwater depletion
Groundwater depletion	Introduction of pathogens
Disease	Eutrophication
Genetic and population effects of habitat fragmentation	Ineffective planning for biodiversity and conservation on a local and regional scale

Table 3. Biodiversity Threatening Processes

2. Management Framework

This document has several purposes and has been created to;

- Provide a well informed operational plan detailing steps that will be taken to prevent or minimise negative impacts on natural areas;
- Fulfill a requirement of the Strategic Community Plan and Corporate Plan;
- Provide information to the public on the activities the City is undertaking to ensure that natural areas are managed optimally;
- Strategically plan for the management of the City's natural areas;
- Identify limitations to delivering effective natural area management and propose solutions; and,
- Increase the accuracy of budget forecasting.

The Natural Areas Management Plan is linked to the City's Environment Plan 2011-2016, the Strategic Community Plan 2014-2024 and the Corporate Plan 2014-2018.

3. Management Objectives

As has been previously stated, two principles that guide the plan are focused on preventing further degradation and improving the natural areas the City manages.

These principles are:

- Prevent further negative natural and anthropogenic impacts on the natural areas; and
- Reduce the impact that previous natural and anthropogenic influences have had on natural areas, (and improve the condition of natural areas).

From these principles several management objectives/considerations have been created to address the main threatening processes to natural areas in the City of Kwinana. These objectives are:

- To increase the ability of natural areas to resist invasion by weed species;
- To ensure the condition of City-managed natural areas improves;
- To reduce the diversity of weed species within natural areas;
- To reduce the distribution and abundance of environmental weeds within natural areas;
- To improve areas that are degraded through restoration or revegetation;
- To develop a seed collection program as part of a revegetation strategy;
- To protect and enhance areas of good to excellent condition bushland through bushland regeneration;
- To identify and restore a fire regime and establish a fire mosaic which maximises biodiversity.
- To encourage the community to interact appropriately with the environment;
- To educate the community on the value of the natural areas that are managed by the City of Kwinana;
- To preserve cultural heritage within natural areas
- To monitor changes to natural areas
- To identify and manage declared rare flora, specially protected fauna and threatened ecological communities where required
- To maintain regional ecological linkages
- To control populations of pest species within natural areas;
- To prevent natural areas posing unacceptable risks to the community;
- To prioritise threatening processes in each reserve;
- To prioritise reserves, if required.

These objectives have been used to establish programs that can fulfill the objectives above. These programs are:

- Weed Control Program;
- Access Control Program;
- Retention, Regeneration and Revegetation Program;
- Fire Management & Fuel Reduction Program;
- Pest and Bio-security Program; and
- Community Education and Volunteer Program.

These programs are further defined in the coming sections.

4. Natural Area Management Programs

The Natural Area Management Programs have been created to detail the work required to successfully manage these areas, incorporating all of the threatening processes that are expected while leaving some room for the flexibility needed to address unexpected environmental issues that may arise during the period the plan covers.

4.1 Weed Control Program

Weed mapping for all of the natural areas managed by the City of Kwinana was undertaken in 2012 by Ecoscape. The results of the weed mapping were compiled into a report (Appendix A) which detailed relevant weed information for each reserve. The information detailed the locations and coverage of several nominated key weed species, or broad categories (such as herbs, clumping grasses, geophytes) and was presented overlain on an aerial photo of each reserve (one map per species/treatment group). Additionally, a spreadsheet (Appendix B) was created showing the nominated weeds per reserve, the appropriate control measures and the appropriate time of year that these measures should be employed.

Controlling every individual of every weed species present in a reserve is not practically or financially achievable in a short time frame. Instead, programs that target several priority species or groups of weeds sensitive to the same chemical treatment at the same time of year in order to significantly reduce weed populations over several years are preferred. This approach has several advantages in that it:

- is more cost-effective than ineffective short term eradication attempts;
- can be flexible and modified to suit changes in weed communities; and,
- can increase the number of weed species targeted after several years of implementation.

Without sufficient funds allocated to incrementally reduce the distribution and abundance of weed species, natural areas will suffer the continuing process of degradation through weed invasion.

4.2 Access Control.

The City implemented its Reserve Fencing Program in 2009. The program objective was to secure the reserves to prevent illegal dumping and illegal vehicle use in the City's managed areas and to reduce access points to Unallocated Crown Land in areas where antisocial behavior disturbed residents. These two activities cause significant short term and potentially long term management problems and associated costs as the materials dumped can be harmful to the environment, human health or both.

All of the City's natural area reserves are fenced with the exception of Sloan's Reserve (this reserve has post and rail fencing around one side and is connected to another large fenced area by a wetland which cannot practically be fenced).

This program also includes maintenance of the fences to ensure that they are performing their function satisfactorily. As the fences are frequently targeted by vandalism, frequent repairs must be carried out. It is important that damage to fences is detected and repaired quickly to prevent damage to the reserve and to convey to the community that these areas are valued by the City.

Details of the fencing infrastructure in the City's reserves is included in Table 4.

Reserve	Existing Fences	Approximate Cost (as at 2013)
Belgravia Dampland	500m three strand, and bollards	$8,000
Bertram Sanctuary	800m top strand and ringlock.	$11,000
Challenger Beach	800m pine post and rail with two strands of wire. 155m Armco guard rail	$16,000
Clementi Road Reserve	5 km top strand and ringlock fencing.	$70,000
Depot Swamp	400m reserve type fencing	$6,000
Gentle Road/Golf Course	2.8 km top strand and ringlock	$40,000
Homestead Ridge Reserves		$25,000
Lake Magenup	1.3 km internal fencing (post and rail)	$26,000
Banksia Road	1.9 km chainlink	$114,000
Wildflower Reserve	912m ringlock and top strand wire 450m bollards	$13,000
Sloan's Reserve	post and rail	
Parmelia Reserves	1.408 km ringlock	$18,304
Thomas Oval	rabbit proof 500 m, ringlock 500m	$27,000
Millar Road	2.2 km top strand and ring lock	$32,000
Wells Park	1.25 km pine pole and ringlock	$16,000
Postans/Hendy Road Reserve	2.0 km reserve fence	$30,000
Henley Reserve & Djilba Reserve	reserve fence black rural fence post and rail	$110,500
Gentle Road	1.4 km reserve fence	$20,000
Bingfield Road	415m reserve fence	$6,000
Total	**27.9 km**	**$588,804**

Table 4. Existing Reserve Fencing Infrastructure

4.3 Retention, Regeneration and Revegetation.

4.3.1 Retention of natural areas in 'Good' or better condition

"Conserving native bushland is a far better and cheaper way of conserving biodiversity than tree planting and revegetation projects. Healthy, complex native bushland communities are difficult, if not impossible to reconstruct once destroyed, and if achievable would be prohibitively expensive." (The Wildflower Society of Western Australia (Inc.) [http://members.ozemail.com.au/~wildflowers/bushland.html])

"Western Australia is one of the most biologically diverse places in the world with the south west botanical province being Australia's richest botanical area having a rich and endemic flora which is recognised nationally and internationally as one of the world's mega-diverse regions. An estimated 9000 species of vascular plants are found in this province, with over 70% being endemic.

The Swan Coastal Plain region is particularly diverse floristically. Most of the Perth metropolitan area is situated on this plain. The impact of the growing city on this remarkably biodiverse biogeographic region has already been severe." (Urban Bushland Council [http://www.bushlandperth.org.au/what-is-bushland])

"The worst thing that can happen ... is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired within a few generations.

The one process ongoing ... that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly that our descendents are least likely to forgive us". E.O. Wilson

These quotes provide some insight into the fact that remnant natural areas in the City of Kwinana have an unusually high biological value, that they are irreplaceable and an asset of, not only the local community, but also the global community.

The principal aim of retention is to maintain the health and condition of the managed remnant – this is achieved by managing the disturbances threatening the area. For example, the removal of invasive weeds from good or better condition bushland permits the natural recruitment of bushland species to continue. Careful, skilled and targeted weed control is therefore one of the most important continuing management actions required in the remaining areas of protected healthy bushland.

The array of species within natural vegetation does not just include the visible plants and animals but also multitudes of other living things. The habitat features required to maintain high levels of biological diversity are often still present in good condition or better remnant native vegetation, but these are usually absent in degraded or completely degraded sites.

High quality remnants (in good or better condition) can be encouraged to recruit species outwards into surrounding species-poor degraded areas, which allows for adjacent regeneration efforts. These areas can also provide seeds or other propagation materials of locally adapted plant species for nearby revegetation projects.

4.3.2. Regeneration of Natural Areas

Regeneration encourages the improvement of bushland condition through the removal of threats to natural recruitment rather than the addition of a narrow range of plants, as is the case with revegetation, and is applicable to areas that are in good or better conditions. Furthermore it permits the biological community in natural areas to re-establish, often with species which are not available for revegetation.

In the early 1960s Joan and Eileen Bradley developed a series of weed control techniques for regeneration through a process of trial and error.

The aim of their work was to intensively weed small areas adjacent to healthy natural areas such that the each area would regenerate from in-situ soil seed banks or be re-colonised and stabilized by the regeneration of native plants, replacing the area previously occupied by weeds.

The Bradley method for bushland regeneration follows three main principles:

1. secure the best areas first;
2. minimise disturbance to the natural conditions (e.g. minimise soil disturbance and off-target damage); and
3. don't overclear, let the regenerative ability of the bush set the pace of weed removal.

By following a period of consecutive follow-up treatments, subsequent maintenance is needed only once or twice a year mainly along edges such as fence lines and firebreaks. The aim of 'regeneration' is therefore to improve the condition of the natural areas to such an extent that it can be maintained through 'retention' techniques.

Positioned between 'regeneration' and 'revegetation' is the use of donor topsoil.

The destruction of areas of local bushland mandated by the State as part of its urban growth plans makes biologically rich topsoil available for 'revegetation' projects. Once a donor site has been analysed for the presence of Phytophthora, a decision can be made regarding a suitable location for this soil. Covering a completely degraded or degraded natural area with topsoil from a 'development site' gives the seed and soil life existing within this soil a chance at continued existence and can provide a vastly greater diversity of life to the area than is possible through standard 'revegetation' techniques.

4.3.3. Revegetation of natural areas in 'Completely Degraded' to 'Degraded' condition

A single vegetation community can consist of dozens of plant species alone and propagation and planting cannot hope to fully recreate this diversity.

Revegetation is an expensive and effective option for improving natural areas that are in a degraded or worse condition.

Revegetation typically involves large scale broad spectrum weed control, substantial soil disturbance and trampling which threatens any existing desirable flora and soil life in the area. Furthermore, the necessary introduction of soil and plant material from outside the area and associated disease risk means that revegetation poses a risk to the long-term health of both the project site and the reserve in which it occurs. Revegetation should therefore only be undertaken in areas where success from the application of assisted natural regeneration techniques cannot be reasonably expected.

When revegetation is considered the appropriate option available to restore habitat value to a degraded area, plant stock should be sourced from the local gene pool where possible; this usually requires expert seed collection, propagation and a long lead time. Typically, revegetation features a large commitment of staff time and volunteer resources, plant tube stock, bamboo stakes, plastic tree guards, weed control, weed suppressing mulch, some soil amendment such as compost and can also involve the addition of more nutrients into the environment in the form of fertilizer tablets.

Revegetation cannot restore an area to the condition of the original habitat although it is the more biologically and financially viable option than leaving it as a field of exotic weeds. Another benefit of revegetation is that community members are more willing to participate in this activity and revegetation projects therefore provide opportunities for public education.

4.4 Fire Management and Fuel Reduction Program.

Natural areas in an urban setting, as is increasingly becoming the norm with the development of marginal areas that contain wetlands, have the potential to pose a significant risk to the community. The Fire Management and Fuel Reduction Program addresses the issues that fire poses to the community and the threat or benefits that fire can pose to the biodiversity of a natural area.

It is widely accepted that the use of fire by Aboriginal people has influenced the landscape and flora found throughout Australia including the Swan Coastal Plain and Kwinana area. The fire response of many species in the City's reserves reflects the influence Aboriginal management has had on these areas for millennia. Unfortunately the introduction of fire-adapted weed species from other parts of Australia and other countries poses a significant risk to the community and complicates efforts to maintain the biodiversity of these reserves.

Arson has greatly increased since the start of European settlement both in frequency and intensity. This has had a negative effect on native

species while favoring several weed species which flourish in frequently burnt areas.

The aims and requirements of this program are to:

- Identify reserves that have high ground fuel loading and that would benefit from an environmental controlled burn;
- Reduce and maintain fuel loads in reserves to acceptable levels, in conjunction with the weed control program, through controlled burning if it is considered appropriate;
- Use fire as a 'regeneration' tool, where appropriate;
- Have all reserve firebreaks compliant with the City's fire break requirements (3m width by 4m vertical clearance) by the beginning of November each year;
- Conduct fuel load reduction controlled burns no more frequently than every 12-16 years at each reserve;
- Minimise the risk that natural areas pose to the community from arson and natural fire events; and
- Implement a post fire weed control program after arson events or planned fires.

4.5 Pest and Bio-security Program.

Foxes, rabbits, honeybees, Phytophthora species and cats are real threats to the flora and fauna of the City's managed natural areas. Additionally, rabbits and foxes are declared pests requiring landowners to control their population.

Rabbits and foxes are controlled using similar methods including warren or den destruction or fumigation, baiting and trapping. To be successful, control campaigns need to be carried out over a large area simultaneously and involve all landowners and land managers in the area. This is not always possible so the City addresses the pest populations in its reserves and encourages other land managers to do likewise. Programs targeted at rabbits and foxes are best run concurrently to ensure that rabbit populations do not boom if fox predation is removed and similarly, foxes increasingly predate on native species when rabbit populations shrink as a result of baiting.

Wild rabbits are Australia's most widespread and destructive environmental and agricultural vertebrate pest. Rabbits damage native plants

and directly compete with native wildlife for food and shelter. Their digging and browsing leads to a loss of vegetation cover, which in turn can result in slope instability and soil erosion.

Evidence suggests that predation by red foxes is a primary cause of the decline and extinction of many small and medium-sized mammal species in Australia. Foxes also prey on many bird species.

Cats need large amounts of fresh meat to survive and reproduce. In Australia they mainly eat small native and exotic mammals, birds, lizards and insects. Cats also carry diseases which can affect humans and other animals.

The introduction of the WA Cat Act 2011, and full implementation of it's regulations in November 2013 permits the targeting of feral and domestic cats within our natural areas.

The honeybee is the only bee in Australia that will attack and sting. Hollow-bearing trees are important nesting sites for many local bird, bat & reptile species. These natural hollows are becoming increasingly rare due to ongoing habitat destruction and tree decline. Feral honeybees can, and do, evict native birds and animals from natural nesting hollows in trees and attack native bees at nectar sources.

The removal of pollen by honeybees has been shown to affect seed set in several plant species. Additionally, honeybees visit flowers frequently and remove most of the floral resources produced. This results in the competitive displacement of native fauna that use these floral resources (such as native mammals, birds and invertebrate pollinators). Furthermore, native bees have co-evolved with local plants resulting in little-known, intricate and often very specific relationships. By contrast, honeybees are generalists and their activities result in plant hybridisation which could further disrupt native pollinators. Bee control activities should be carried out by licensed pest control operators. A direct benefit of feral bee control is the liberation of nesting habitat for native animals.

Phytophthora species, cause the disease known as Phytophthora Dieback. The organisms are motile, water moulds that infect roots, causing the death of susceptible plants. Almost half of the native plants of southwestern Australia are susceptible to the disease caused by Phytophthora cinnamomi alone. Phytophthora species can easily be transported accidentally through drainage and the movement of infected soil and vegetable matter. Once the pathogen infests an area it cannot be practicably removed.

The City has undertaken surveying of its reserves for the presence of Phytophthora Dieback using a qualified and experienced consultant. This survey is included as Appendix C. Suitable biosecurity practices are required to be carried out when moving in and between natural areas managed by the City of Kwinana. These are detailed in Table 5 and on signage erected at the entry gates to reserves.

Activity	Dieback Present	Dieback Absent
Vehicle movement	By permission only. Clean on the way out	Clean on the way in
Treatment	Phosphite injection or foliar spraying	Monitoring
Education	Signage	Signage

Table 5. Dieback Control Procedures

4.6 Community Education and Volunteer Program.

Local government is an important facilitator of both formal and informal activities that educate and support the community as they work toward conserving our natural areas. Whilst it is essential that all members of the community have access to and are able to participate in programs in natural areas, it is particularly crucial for the next generation to have positive experiences in nature.

The existing schools program which encourages activities such as planting of native seedlings, is a very important part of engaging young people in the natural environment. It is anticipated that this formal program will be built on each year, to encourage more schools to be involved and potentially extending the types of activities undertaken. To date, funding for these activities have been provided through community grants and corporate sponsorship, which has defined the scope and the number of schools involved. With a regular commitment of funds, this program could be extended, or encouraged through the development of other appropriate programs such as a Bush Kids Club.

The Community Bushcare Planting Days, Wildflower Walks, Seed Collection Workshops, Bird Identification Workshops, Nightstalks and other organised guided activities, provide opportunities for individuals to both volunteer their time within natural areas, to appreciate these areas but also to gain skills as long term volunteers, within ‘Friends/Bushcare Groups’.

Volunteers as part of Friends Groups, are often local residents who want to look after and care for their local patch of bush, and so, are often passionate and motivated. Volunteers are a great asset to local government for the time they commit to undertaking various activities including weeding, monitoring, surveying, planting, submitting grant applications, and activating and informing their local community networks.

As a local government it is important to consider the provision of the following to engage, sustain and manage volunteer groups: training opportunities, assistance with grant applications, production of a 'Friends Group' manual, advice regarding insurance, facilitation of groups particularly upon inception, provision of resources such as a bushcare trailer with tools, promotion of volunteer activities, and volunteer recognition. Whilst some of these provisions are already being undertaken others will require more formal development.

The City of Kwinana has recently developed a draft volunteer toolkit, which will guide volunteer engagement processes.

As well as formal activities it is essential that there are informal opportunities for individual residents to engage with their natural areas in the form of passive recreation. This is also where the role of interpretive signage and track related information/brochures/technology can be utilized to engage the community. Current interpretation and signage within natural areas is limited. Comprehensive signage development is required to highlight and differentiate conservation reserves from other dryland reserves common throughout the City of Kwinana, and to highlight what uses are compatible within these areas (e.g. dog on a leash, no motorbikes, cycling, presence of dieback etc). It is important that guidelines be developed to set a standard for any future developments/conservation areas that are handed to the City to manage. Also, to engage users with the important features of these conservation reserves, interpretation plays a crucial role. With limited examples available, a pilot plan of Wildflower Reserve, could provide a basis for development at other natural areas, with a focus on technology and art to encourage individuals to participate in bushland management activities.

5 Natural Area Program Action Plans

For the natural area programs to be effective a group of actions have been developed which will meet the objectives of the Natural Areas Management Plan 2014 – 2024.

5.1 Weed Control Program Action Plan

The Weed Control Program and its Action Plan is a key component of the Natural Areas Management Plan 2014-2024.

Task	Timeframe	Cost	Responsibility
Tender for grass weed control	2014-2015 2015-2017 2017-2023	$150,000* $150,000 pa $175,000 pa	Environment Services Officers - Contractor
Bushland weed and condition mapping	2017 2022	$50,000 $65,000	Environment Services Officers - Contractor
Tender for Environmental Weed Control	December 2014 – 2016 2016 – 2019 2019 – 2023	$35,000 pa* $90,000 pa $105,000 pa	Environment Services Officers - Contractor
Prepare and implement a works program to control significant Environmental weeds in Kwinana Reserves	Yearly	Staff Time	Environment Services Officers
Investigate and apply for grants for environmental weed control	Yearly	Staff Time	Environment Services Officers
Budget for New reserves	yearly	Staff Time	Manager, Bushcare, Wetlands Officers
Post Controlled Burn/Arson Weed Control	As needed	$5,000 Contingency	Environment Services Officers - Contractor
**included in the 2014-2015 budget*			

Table 6. Weed Control Action List

5.2 Access Control Action Plan

Access Control can comprise installation of fencing, pedestrian chicanes, boom gates or large materials (logs or limestone armour sized boulders). Fences maintain their value while they are performing their intended function, it is therefore important that suitable and timely maintenance and repairs are carried out.

The Access Control Plan utilises some funds collected through Rates Waste Levies ($2 per household) to install infrastructure to minimise illegal rubbish dumping and prevent access to City managed reserves.

Task	Timeframe	Cost	Responsibility
Routinely inspect fences, gates and pedestrian access points for damage and arrange repairs	Weekly	$35,000 pa*	Environment Services
Install fences at Bertram Sanctuary	2014/2015	$5,500*	Contractor
Removal of illegal dumping/ litter from reserves	Weekly	$20,000 pa*	Environmental Services
Install 1.1 km of reserve fence at Kwinana Beach Bushland	2014/2015	$20,000*	Contractor
Upgrade fencing at Sloan's Reserve	2015-2016	$30,000	Environment Services/ Contractor
Install pedestrian chicanes at Homestead Ridge	2015-2016	$16,000	Environment Services/ contractor
**included in the 2014-2015 budget*			

Table 7. Access Control Action List

5.3 Retention, Regeneration and Revegetation Action Plan

Task	Timeframe	Cost	Responsibility
Staff – site preparation, weed removal, installation planting, maintenance, weed control	2014-2015	$100,000pa* $40,000pa*	2 field staff (2 FTE)* labour hire x 3 months
	2016-2019	$200,000pa $80,000pa	4 field staff (4 FTE) labour hire x 3 months
	2020	$300,000pa $120,000	6 field staff (6 FTE) labour hire x 3 months
Consumables	2014-2015	$20,000*	$20,000 divided between 18 reserves = $1,111 per reserve
	2016-2019	$40,000	$40,000 divided between 18 reserves = $2,222 per reserve
	2020	$60,000	$60,000 divided between 18 reserves = $3,333 per reserve
Post-arson weed management	yearly	$5,000	Contingency
Project - Revegetate erosion at Thomas Oval	2014/2015	$5,000*	Environmental Services
Project - Improvement of bushland in Clementi Reserve	2014/2015 2017/2018	$6,000* $8,000	Environmental Services
Project - Restoration of Threatened Ecological Community (SCP Community Type 26a – Shrub lands of limestone ridges) at Parmelia reserves	2015/2016	$5,000	Environmental Services
Project - Improvement of bushland in Millar Reserve	2015/2016 2018/2019	$6,000 $8,000	Environmental Services
Project - Restoration of threatened ecological community (SCP Community Type 26a - shrublands of limestone ridges) at Chalk Hill Reserve	2016/2017	$5,000	Environmental Services
Project - Improvement of sections of very good bushland in Wildflower Reserve	2016/2017	$6,000	Environmental Services
Project - Revegetation of degraded bushland surrounding Wellard Park – Homestead Ridge	2017/2018	$7,000	Environmental Services
*included in 2014-2015 budget			

Table 8. Retention, Regeneration and Revegetation Action plan

5.4 Fire Management and Fuel Reduction Action Plan

Task	Timeframe	Cost	Responsibility
Fuel load assessments	Yearly	Staff time	Environment Services, Community Emergency Services Coordinator
Controlled Burn	One per 2-3 years as required	$1,500 ha*	Environment Services, Community Emergency Services Coordinator
Fire Mapping	yearly	Staff time or $1,500 per 3 years	Environment Services, Community Emergency Services Coordinator
Firebreak maintenance	Yearly	$15,000*	Environment Services, Community Emergency Services Coordinator, contractor
Fire mosaic planning	2015	$15,000	Environment Services, Community Emergency Services Coordinator
Controlled patch burns (<0.25ha)	1-2 yearly	$2,000	Environment Services, Community Emergency Services Coordinator
*included in 2014-2015 budget			

Table 9. Fire Management and Fuel Reduction Plan

5.5 Pest and Biosecurity Action Plan

Task	Timeframe	Cost	Responsibility
Surveying reserves	2014 2017 2023	$5,000* $8,000 $11,000	Environment Services, Contractor
Rabbit control	2014 Yearly	$4,000* $8,000	Environment Services, Contractor
Fox Control	2014 Yearly	$4,000* $6,000	Environment Services, Contractor
Phytophthora Control	Yearly	$7,000	All staff
Cat Control	Yearly	$5,000	Environmental Services/ Ranger Services
Bee Control	Yearly	$5,000	Environmental Services
*included in 2014-2015 budget			

Table 10.

5.6 Community Education and Volunteer Action Plan

Task	Timeframe	Cost	Responsibility
Information Brochures/ Posters & Promotion	yearly	$3,000*	Environmental Services
Waterwise Garden & Community Energy Efficiency Workshops	Yearly	$4,000*	Environmental Services
Schools Planting events	4 per year	$1,000*	Environmental Services
Community Planting Events	6 per year	$5,000 (Event costs only, not including plants and material)*	Environmental Services
Guided Activities (eg. Bushwalks Nightstalks Bird walks Wildflower tours)	5 per year	$4,500 = $900 each (includes catering, presenters, advertising)*	Environmental Services
Clean Up Australia Day	1 per year	$4,000*	Environmental Services, Works Depot
Volunteer training	1 per year	$2,500*	Environmental Services
Signage and Interpretation; Wildflower Pilot	Once off +maintenance	$12,000	Environmental Services/ Cultural Development Co-ord
TourApp for smartphones	Investigate in 2014/2015	N/A	Environmental Services
Collection of provenance seed	yearly	$9,681.85* $10000	Environment Services
Bush Kids Club	2016/2017	One year trial	Environmental Services
*included in 2014-2015 budget			

Table 11.

6 Operational Requirements

Although a more recent addition to the role of Local Government, natural area management is nonetheless a responsibility of the City and action is required in order to comply with Federal, State and local legislation and policy and the wishes of the community

The Strategic Community Plan 2014 - 2024 clearly articulated that the community has a very high appreciation of natural areas in Kwinana and an expectation that these areas will be preserved and managed effectively.

To ensure that the both the City's responsibilities and the community's expectations are met, suitable capital and operating budgets should be provided to allow the quality of services to continue to be provided and improved upon.

6.1 Funding

A significant increase in the Councils contribution to it's natural environment operating budget (Environment Services Department, net projects) has occurred between 2010/2011 (was $98,000) and 2013/2014 (now $376,000). As the City manages 220 hectares of natural areas, this equates to a cost of $1,709 per hectare.

The increase in Council contribution can be attributed to:

- An increase in the overall area managed by the City;
- An increase in the area actively managed by the City;
- An increase in the quality and effectiveness of natural area management methods;
- An increase in the security of the City's reserves;
- An increase in the City's response to minimise risk posed by fire on the community; and
- A further understanding of the community's appreciation of the City's natural areas.

It is important to continue to maintain and gradually increase this level of funding commitment to the City's natural resources to enable a sufficient and appropriate level of management to occur within each reserve that the City is responsible for. This will also prevent reserves becoming a liability from risk of fire, illegal dumping and weed invasion.

The City applies for and receives grant funds to undertake additional works within it's reserves. It is important to not solely rely on grant funding to undertake operational works as external funding can be unreliable. As many of the grants available require a matching financial contribution it is also necessary to have these matching funds available to the Environment Department to assist in securing these grant monies.

The Environment Department has and will continue to explore other options to progressively increase the departments funding of operational and project budgets, in line with the increase in additional land vested with the City for management, and to ensure appropriate management levels.

Future funding opportunities:

- Environmental Levy. A portion of the funds collected from the Rates Environmental Levy should be used to undertake works in the City's natural areas given the community's expectation and the City's management responsibilities.
- Increased grant funding applications;

6.2 Human Resources

The City of Kwinana Environment Services Department is responsible for undertaking a wide range of services and activities as indicated below.

Compliance	Prosecution	Media enquiries	Community events	Water efficiency
Inspections	Infringements	Administration	School education	Sustainable urban design
Planning	Monitoring	Policy making	Sustainability	Government liaison
Reporting	Community liaison	Internal advice	Energy efficiency	Surveillance
Infrastructure management	Maintenance	Biodiversity management	Community safety	Climate Change adaptation
Coastal protection works	Contract management	Tendering	Local Law implementation and review	

Table 12. Environment Services Activities

The City currently relies on three sources of labour to carry out operational management and rehabilitation works. Staff directly employed by the City, volunteers from schools, 'Friends of' groups and the general community who are utilised for tree planting and manual weed control, and contractors who are utilised to carry out technical management activities such as chemical weed and pest control, manual weed removal, infrastructure installation and maintenance and GIS data gathering.

The Environment Services Department has had a conservative growth in staffing levels and now has a Full Time Employment complement of 2.7 comprising:

- Manager Environment 1 FTE;
- Bushcare Officer 0.5 FTE
- Wetlands Officer 0.6 FTE
- Sustainability officer 0.6 FTE

The Natural Area Management Program has an FTE commitment of 1.1 (Bushcare and Wetlands Officers).

Included in the 2014/2015 budget are two additional full time positions being two Environmental Field Officers (plus vehicle and sundries) to undertake reserve management practical duties (fence repairs, weed control, rubbish collection, tree planting and green stock maintenance). The aim of these positions is to decrease the City's reliance on external contractors and to minimise costs associated with appointing contractors to carry out tasks that could be undertaken in house. These positions have been funded from the existing Environment Services Budget converting contractor costs to salaries. To achieve this, minimal increases in the operating budget for Environment Services for 2014/2015 were proposed.

The benefits of having a crew of Environmental Field Officers is wide ranging and include:

- Decreased contractor costs;
- Increased number of man hours available to the City;
- Increased surveillance of natural areas;
- Increased visibility of the Councils operations;
- Significant decrease in administration time and cost;
- Decrease the time technical staff undertake administration;
- Increase the time technical staff utilise their technical skills;
- Increased community education;
- Increased quality and effectiveness of program actions;

Additional benefits will be noted once a minimum of two field staff are employed (including trainee and mentoring programs).

At year three (2016) of this plan it is recommended that an additional two field staff (including a vehicle) are budgeted for. This recommended increase in staff correlates with the rapid increase in area of reserves vested in the City resulting from development of the Eastern Residential Intensification Concept

(ERIC) areas. It is further recommended that another 2 field staff with vehicle be budgeted for at year 7 of this plan (2020), for the same reasons.

The aim of increasing staff levels is to increase the amount of direct labour available to maintain the City's reserves and reduce reliance on the more expensive option of contractors.

6.3 Budget forecast

Management of natural areas is an expensive, time consuming and a technical task that needs to be undertaken by diligent professional and dedicated task based staff. The management includes managing and minimising risk that natural areas pose to the community whilst also managing them to preserve and improve their biodiversity and community value.

A cost forecast for the term of the plan (overleaf) has been developed based on:

- Current management costs;
- An increase of areas to be managed due to development (based on the expiration of developer management responsibilities for these areas);
- Increase in staff and/or contractors required to provide uniform delivery of services across the term of the plan;
- Costs to increase the community and biodiversity value of natural areas with lower condition classifications.

Item	Description	Budget year									
		2014-2015*	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
Bushcare Program	Greenstock maintenance, tree watering, fence repairs	$64,351	$64,351	$66,925	$69,602	$72,386	$75,281	$78,292	$81,424	$84,681	$88,068
Weed Control Program	Grass weeds and woody weed control programs	$175,000	$175,000	$200,000	$200,000	$200,000	$210,000	$210,000	$225,000	$225,000	$240,000
Biosecurity Program	Fox, cat, rabbit and bee control programs	$8,000	$12,000	$12,000	$15,000	$15,000	$18,000	$18,000	$20,000	$20,000	$20,000
Mapping and Monitoring	Weed distribution and bushland condition mapping. Fauna surveying				$50,000					$65,000	
Firebreaks	Firebreak maintenance	$7,500	$7,500	$7,500	$7,500	$10,000	$12,000	$12,000	$15,000	$15,000	$17,000
Existing Reserve management operational costs	Reserve management costs. Revegetation,	$101,800	$136,552	$142,014	$147,694	$153,602	$159,746	$166,136	$175,181	$179,631	$186,880
Natural areas salaries	2 staff in 2014 + vehicle, 2 additional staff in 2016/17 + vehicle, 2 additional staff 2020/21 + vehicle	$159,734	$124,734	$248,545	$215,437	$217,405	$219,451	$322,335	$289,549	$291,851	$294,245
Future Reserve management operational costs	Reflects the increase in natural areas vested to the City for management			$106,471	$160,712	$197,129	$311,057	$366,748	$437,641	$548,702	$631,461
Total		**$516,385**	**$520,137**	**$783,455**	**$865,945**	**$865,522**	**$1,005,535**	**$984,511**	**$1,243,795**	**$1,371,965**	**$1,477,654**
*** Approved in 2014/2015 budget**											

Table 13. Budget forecast during the term of this plan

7 Monitoring and Evaluation

The effectiveness of the Natural Areas Management Plan needs to be quantified every five years to highlight those tasks and management methods that have been successful and those that may have not fulfilled their objectives.

One method is to undertake bush land condition and weed distribution mapping which provides information on both the effectiveness of previous works and identifies areas where future works are required. This information is also necessary to provide an accurate forecast of budget costs.

Two bushland and weed distribution mapping events are recommended to be undertaken during the period this management plan is in effect being in September 2017 and September 2022.

The cost to undertake quality a surveys is approximately $40,000 to $50,000 in 2017 and is estimated to be $60,000 to $65,000 by 2022.

8 Recommendations

The community of the City of Kwinana has demonstrated that they place considerable value on existing environmental assets in natural areas. The community has also demonstrated that the interaction with these natural areas is also of high value and that there is a significant connection with the bush.

Management of these natural areas is an expensive and technical task undertaken by professionals with suitable qualifications and demonstrated experience. The City of Kwinana is a leader in natural area management as can be seen by comparing the condition of the reserves it manages to those of our neighbors and State agencies. As the number of reserves and the area under management both increase in line with the increase in population and their proximity to these natural areas it is recommended that a significant commitment is made to the Kwinana community and the City's responsibility to correctly manage the natural areas under it's control.

This will require a financial commitment to increase staff numbers primarily and to continue to allocate funds to the ongoing operational maintenance and improvement of it's environmental assets contained within it's many reserves.

It is recommended that Council:

- Adopt the Natural Areas Management Plan 2014 - 2024
- Utilise the Natural Areas Management Plan 2014 - 2024 to inform the Capital Works Program, Long Term Financial Plan, Workforce Development Plan, Asset Management Plan and Maintenance Schedules during the period 2014 - 2024.