



Yangedi Bush Forever and Airfield Reserve Draft Management Plan

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TRIM REFERENCE

1. Executive Summary

1.1 Introduction

The vast majority of the Yangedi Reserve area has been identified as having high biodiversity conservation values and is Bush Forever Site 378 under the Bush Forever Project. The Shire Reserve is recognised as one of the most important biodiversity areas within the Shire and its conservation status should be recognised by good protection and management and adding conservation to the purposes of the reserve. Recent and future threats to this asset include continuing weed and dieback invasion into the reserve, indiscriminate clearing of plants or trees, and fire risks including aircraft fuel ignition, cumulative impact of septic systems in the reserve and possible health impacts from caravan use.

Reserve 25911, formerly Lot 164 Yangedi Road, covers an area of approximately 64.7 hectares. The reserve was created on 10 July 1963 and is a “C” Class Reserve designated for recreation and vested with the Serpentine Jarrahdale Shire. The original land use for this area was agriculture. In the 1950s the land was subdivided into approximately 100-acre lots for the purpose of settling migrants in the area.

Lot 164 was found to be not suitable for intensive agriculture due to low productivity sandy soils, and therefore was relinquished to the Crown and the reserve established. Grazing continued under lease until the Sport Aircraft Builders Club of WA (Inc.) formerly the Ultra Light Aircraft Association) took out a lease. There is currently a 21 year lease in place which runs till 2023. The airfield was established with two runways one of which is a grassed cross runway. The grassed cross runway has been established for safety reasons and is specifically for the ultra light aircraft. The Sport Aircraft Builders Club of WA Inc. is a non profit organisation with a constitution and currently has 318 members. Facilities include approximately 100 hangers, a clubhouse with kitchen, toilet facilities and 12 caravans, two with permanent residents as caretakers.

There is also a lease in the northwest corner of the reserve where a Bureau of Meteorology Communication Facility has been established.

Exclusion of grazing and management and enhancement by the Sport Aircraft Builders Club has resulted in the regrowth of valuable remnant vegetation. Protection from and preparedness for wildfire has occurred with fire hydrants and fire breaks being established and regularly maintained. The increased presence in the reserve by Sport Aircraft Builders Club members may have in some cases resulted in some level of degradation in some areas. For the most part greater presence may have also added to greater security and surveillance both for inappropriate use of the reserve, protecting its vegetation, and as a surveillance benefit for the area in reporting and providing for fire fighting.

1.2 Vision

VISION

Serpentine Jarrahdale Shire Yangedi Bush Forever and Airfield Reserve well protected and nurtured by the Serpentine Jarrahdale Shire and the Sport Aircraft Builders Club of WA (Inc.) for cooperative mutual benefit for all parties with good fire management and a range of purposes including recreational aviation use and conservation of wetlands, flora and fauna.

1.3 Key Strategies

Key Strategies of this Management Plan and estimated cost for its implementation:

1. Include conservation as a purpose for the reserve and implement a process to inform and advise community group members of current legislation.
2. Map and photograph the distribution of dieback (*Phytophthora cinnamomi*) within the bushland areas, zone dieback-free areas as high conservation and limit access into these dieback-free areas (Estimated Cost \$2,000).
3. Prepare and implement a local native species planting and weed eradication program by identifying and prioritising weed affected areas, including sources of weed seed outside the bushland area, such that the successful implementation of the program will produce results within target levels of restoration (Estimated Cost \$4,000).
4. Put in place and implement a new Comprehensive Fire and Emergency Plan.
5. Raise community awareness through the provision of signs, club news letters, event briefings and other communication techniques (Estimated Cost \$2,000).
6. Educate and raise the awareness of staff, volunteers and contractors of management zone restrictions on access and appropriate dieback hygiene procedures. Ensure stakeholders adhered to hygiene operations and procedures (Estimated Cost \$1,000).
7. Negotiate, and prepare a lease to be put in place when the old lease expires which will include this management plan as an Appendices and a sunset clause of lease termination

should compliance not be adequate (Estimated Cost \$1,000).

8. Consolidate degraded native vegetated areas through restoration, revegetation and protective demarcation, ensure compliance with current relevant legislation and confine further development to designated areas through establishing building envelopes. (Estimated Cost \$1,000).
9. Review current caravan, camping, building and effluent disposal systems and require a high standard of performance and compliance to minimise health and environmental impacts (Estimated Cost \$1,000):
 - Assess applications from the club for event caravans or camping;
 - Impose additional approvals for caravans or camping outside the conditions set for events;
 - Review current caravan use and camping practices in relation to health and other statutory requirements.
 - Investigate the cumulative impact of existing effluent disposals systems and investigate the feasibility of developing central effluent disposal system.
 - Ensure that suitable procedures and materials are in place for treating fuel and chemical spills and septic malfunction.

2. Governance

2.1 Land tenure

Table 1: Reserve Location and Use

Reserve Number	Area (Ha)	Land transfer date	Vesting and Purpose	Current Use
25911	64.7	10/7/1963	Serpentine Jarrahdale Shire Reserve with a Purpose of Recreation	Airfield

The Yangedi Reserve is part of Bush Forever Reserve Site No. 378 and its purpose should include conservation to acknowledge this status. The site is categorised as supporting Regionally Significant Bushland (Bush Forever 2000). As a Bush Forever Site, there is a presumption against any further clearing for expansion of the current use of the Bush Forever Site. Where clearing is proposed in Bush Forever Sites direct or indirect offsets are often required by State government. Any future expansion or intensity of use within the Yangedi Reserve requiring clearing of local native vegetation will not be supported by the Serpentine Jarrahdale Shire. There has already been a significant reduction of high biodiversity value conservation category wetland areas through providing for aircraft hangars and clearer visuals for the runway.

The Environmental Protection Authority (EPA) outlines how it will consider proposals that impact on regionally significant vegetation in a Bush Forever site and the likely level of assessment. In the case of Yangedi Reserve, the likely level of assessment is stated as being 'considered on a case by case basis'. EPA would expect proposals to be designed to minimise or avoid direct loss of bushland, consistent with Bush Forever expectations'.

In addition to the suite of statutes which relate to aspects of managing the reserve, there is also an extensive policy framework. For example, Commonwealth, State and regional plans for sustainable development have been developed. The *State Sustainability Strategy*, the *State Regional Development Policy* and the *Peel 2020* document all provide a framework for Shire land use planning and decision-making.

The Commonwealth Government has established an independent administration for the disbursement of Commonwealth funding for natural resource management. This administration is regionally based with sub-regions that relate to catchment boundaries. The area of the reserve comes under the Peel-Harvey Catchment Council, which in turn comes under the umbrella of the South West Catchment Council. These catchment councils administer much of the Commonwealth funding for natural resource management. The Serpentine Jarrahdale Community

Landcare Centre is likely to be funded primarily through this avenue, and the Shire in partnership with the Landcare Centre and other stakeholder groups applies for funding to implement natural resource management strategies.

The Serpentine Jarrahdale Shire Council has ten elected members. There is one full Council meeting each month and members also participate in formal committee meetings. This plan requires the endorsement of Council.

The *Strategic Plan 2003* for Serpentine Jarrahdale Shire includes the following vision statement:

Our community values our rural character, diverse lifestyle, natural beauty and heritage and manages responsibly today for a better tomorrow.

This statement was developed during extensive community consultation and clearly articulates the Shire's commitment to:

- Work towards the provision of opportunities and services that will enhance the quality of life for all residents; and
- Adopt sustainable management practices that ensure that future generations are not compromised by decisions that are made by current generations.

The strategic plan provides an overall framework and direction for all Shire activities, including reserve management.

In May 2003, Council endorsed a *Planning and Management Framework for Shire Vested Reserves*. This framework includes two objectives of equal importance:

- To complement State Government reserves and other biodiversity areas by preserving representative and special ecosystems within the Shire: and
- To put a formal management framework in place to ensure that the various uses of Shire reserves are managed in an equitable, integrated and sustainable manner.

The *Planning and Management Framework for Shire Vested Reserves* details the required format for reserve management plans, and the processes for developing and reviewing management plans. This policy sets out requirements for community consultation, including the establishment and support of two community forums, the Reserves Advisory Group (RAG) and the Reserve Working Group (RWG). The terms of reference and code of conduct of the RAG is included in the *Planning and Management of Shire Vested Reserves* framework.

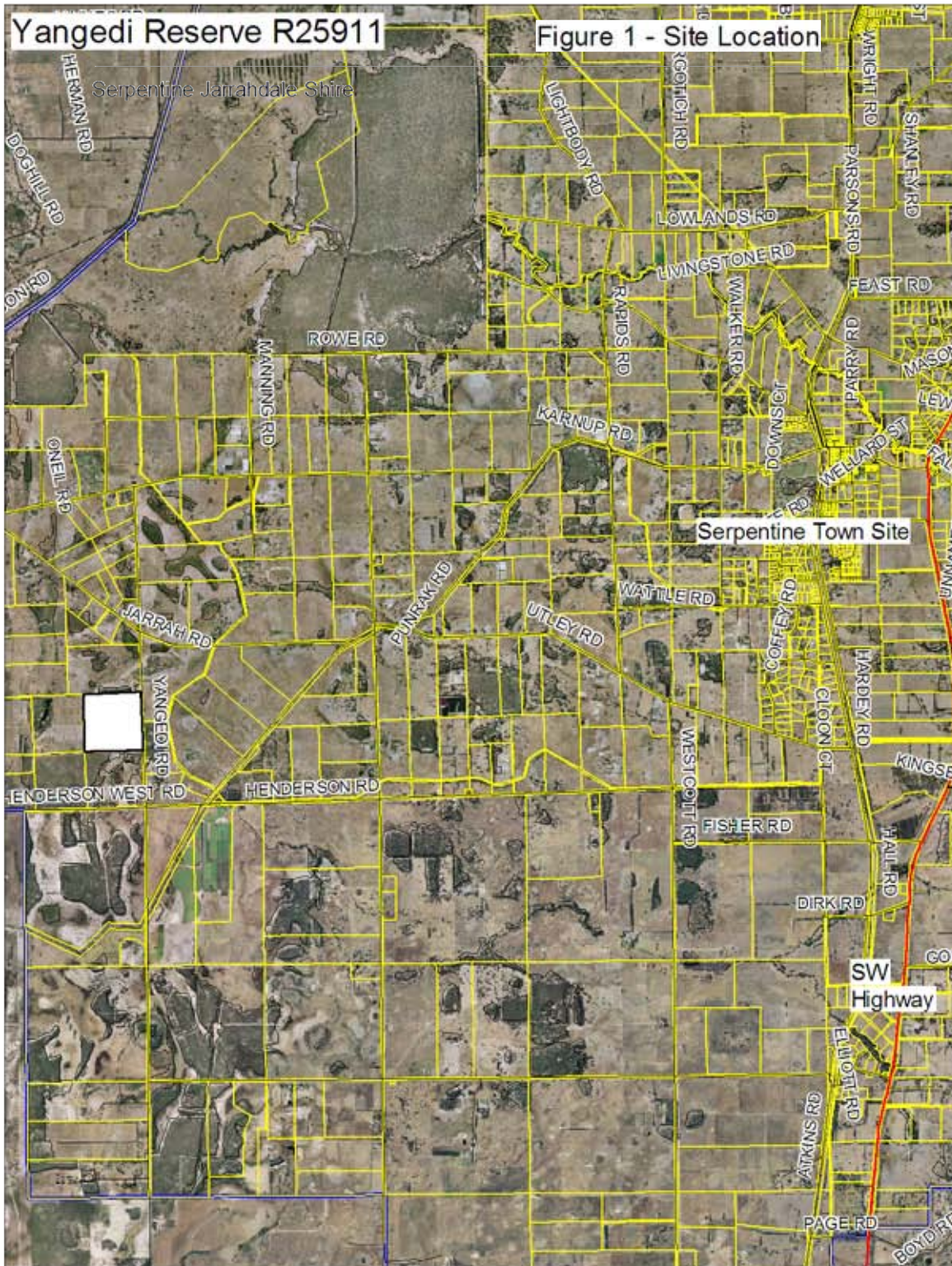
Many of the works undertaken on Shire reserves are undertaken by community members. To ensure compliance with legislation, accordance with Shire policies and approved plans, and coordination under the guidance of the Reserves Officer, the Shire has developed a second reserves-related policy that outlines the process for undertaking works. This policy is referred to as the *Policy for Reserve Improvement/Development by the Community*. It includes an application form to note recommendations and proposals for reserve developments and improvements. A

Management Zones Map has been produced below to stipulate a range of activities that can or cannot occur within each zone.

The Sport Aircraft Builders Club (SABC) of Western Australia (Inc.) operates an authorised landing area but not a registered airfield. SABC has a Constitution and Club Rules. A two kilometre aircraft noise buffer zone is recognised around the airfield. The airfield is situated within the authorised training area from Jandakot Airport and incorporated within this area are Serpentine airfield (on Yangedi Reserve) and Murray Field airfield (to the south) and they share a Common Aviation Control Area (CTAF) consisting of an oval shaped area with a five nautical mile circle surrounding each airfield. The Objects of SABC are to:

- Foster interest in the building, design, restoration and operation of light aircraft for non-commercial activities.
- Encourage Members to construct, maintain and operate sport, vintage, ultralight, experimental and amateur built aircraft.
- Maintain and develop the facilities at Serpentine Airfield.
- Encourage club support of appropriate national sport aviation bodies which aim to support amateur built and sport aircraft.
- Own and operate aircraft when appropriate.
- Inform and educate members about technical or other matters pertaining to constructing, maintaining or operating light aircraft for non-commercial activity.
- Provide avenue for social activities involving members, their families and guests.
- Encourage interaction between Members and members of other special interest groups.
- Provide a venue for charitable functions.
- Encourage and foster an interest in aviation among the broader community.
- Foster good relations with owners and occupiers of neighbouring properties by establishing suitable guidelines for the operation of aircraft at Serpentine Airfield

□ Yangedi Reserve



□ Yangedi Reserve

Figure 1 - Site Location




0%

Figure 1 – Site Location

Figure 2 Yangedi Reserve Management Zones



LEGEND

-  High Conservation
-  Conservation
-  Vegetation Management

High Conservation Zone (approximately 22%): Areas of remnant vegetation of high biodiversity and scientific reference value which are dieback (*Phytophthora cinnamomi*) free and largely weed free. This zone has no planned burn, no dieback treatment and minimal revegetation requirements. Should revegetation or any type of access for scientific or other purposes be proposed within this zone, extreme care is to be taken to not introduce any soil particles which may bring dieback into the zone.

Conservation Zone (approximately 14%): Areas of remnant vegetation of high biodiversity and scientific reference value which are not dieback (*Phytophthora cinnamomi*) free. This zone has no planned burn, but includes dieback treatment seeding, weeding and planting operations. Access within this area must consider movement, and reduce spread of dieback, from infected to uninfected areas through clean-down procedures.

Vegetation Management Zone (approximately 19%): Areas of remnant vegetation of biodiversity and scientific reference value which are not dieback (*Phytophthora cinnamomi*) free. This zone is a buffer zone and has burning prescribed for protection of people, property and conservation values, but also includes dieback treatment seeding, weeding, planting and some limited tree removal operations (Dead or alive tree removal approvals require State and local government permission in Bush Forever Reserves and may be considered necessary for safety reasons). Access within this area must consider movement, and reduce spread of dieback, from infected to uninfected areas through clean-down procedures.

Recreation Zone (approximately 43%): Depicted as the remainder of the area not included in the previous three zones. Areas with little remnant vegetation which are largely for use for active and passive recreational activities, where management is with relation to reticulation or runways, aircraft hangars or for other active recreational pursuits and the management of these.

2.2 Community Consultation and Participation

The Shire has in the past relied on community expertise and interest to maintain the high conservation or recreation values of many reserves. Continued community input to planning and management is considered essential for the protection of these values into the future. The Sport Aircraft Builders Club would like to see the development of a secure long term lease arrangement to protect their existing and proposed investments and the community would like to see a high standard of protection and management of the Shire's Reserve recognising its high biodiversity conservation values and limited carrying capacity for greater intensity of its current use.

The **Reserves Working Group (RWG)** consists of Shire staff: (Natural Reserves Coordinator, Environmental Officer, Community Liaison Officer, Parks and Gardens Coordinator, Senior Ranger and Bushfire and Emergency Services Officer), a member of staff from the Community Landcare Centre and two members of the community, one nominated by the Land Conservation District Committee (LCDC) and another by the Roadside Care Volunteers.

The RWG meets monthly to coordinate and assess the progress of on-ground works and to consider reserve management issues relating to biodiversity and recreation values within Shire vested reserves. The RWG will consider recommendations put forward by the Sport Aircraft Builders Club (SABC) in accordance with the *Policy for Reserve Improvement/Development by the Community*, and records of RWG meetings will be forwarded to the SABC and RAG for their information where issues related to Yangedi are covered. The RWG may request advice from other community groups relating to Shire reserve management issues. Where the need arises

The **Reserves Advisory Group (RAG)** consists of up to 8 members of the community and is supported by Shire staff members, who arrange for guest presenters, facilitate community consultation and provide secretarial support.

Membership is sought through a combination of advertisement and invitation, and members appointed by Council for a term of three years. Terms of office can be renewed. Members have a high level of knowledge, expertise or experience in one or more of the following areas:

- Biodiversity and conservation;
- Natural resource management;
- Sport and recreation;
- Indigenous and other cultural values;
- Equine activities; and
- Commercial tourism, wildflower and seed picking.

The combined knowledge, expertise or experience of all group members is intended to cover all of the topics listed above.

The role of the RAG is to:

- Provide advice to Council in relation to reserve values, threats to those values, management targets and management strategies that will protect the ecological and social values and take account of community aspirations for the future management of each reserve;
- Provide advice to Council and the RWG in relation to on-ground management programs and issues; and
- Undertake audits of reserve management plans and report the results to Council.

The operations of the RAG are set out in a terms of reference document and code of conduct. Members are to participate, not by protecting the perspectives of individual stakeholder groups, but instead by contributing in a non-representative manner in pursuit of management outcomes that take account of all sustainable activities within legislative and policy constraints. The Reserves Advisory Group meets when a draft management plan is being prepared and consultation will always include all relevant stakeholders.

According to the *Shire Reserves Planning and Management Framework Policy*, the RAG is required to periodically audit the implementation of this management plan. To facilitate this process, the plan adheres to a format which includes auditable recommendations or strategies for the management of all values within the reserve. The policy states that the audits are to be undertaken by the RAG as an independent group, and Shire staff members are to assist the RAG in carrying out this task. RAG is to provide audit results and advice to Council and to Shire staff. Shire staff members are to provide a response to audit reports on request from Council or if they consider a response appropriate.

Public consultation includes a three month period inviting public submissions on the management plan. This is particularly important for the incorporation of agency aspirations such as those involved with Bush Forever Sites. There are also agencies such as the Civil Aviation Safety Authority who have regulations which the Sport Aircraft Builders Club has to abide by. Stakeholders interest groups and groups which may have some interest in this draft management plan include:

Department of Environment and Conservation

Department of Planning and Infrastructure

South West Aboriginal Land and Sea Council

Civil Aviation Safety Authority

Fire and Emergency Service Authority

Serpentine Volunteer Bush Fire Brigade

Recreational Aviation of Australia

Flying Doctor Service

The Bunbury Flying Club

Governance Strategies

Issue	Target	Priority	Strategy	Responsibility
Many statutes and government policies apply to the management of the reserve.	Compliance with all Commonwealth and State Government legislation and policy frameworks.	Medium	1a. <u>Include conservation as a purpose for this reserve in its management order</u> and develop and implement a process to inform and advise community group members of current legislation. 1b. Make reserve users aware of the <i>Policy for Reserve Improvement/Development by the Community</i> . 1c. Natural Reserves Coordinator to refer all community recommendations and requests for works received under the <i>Policy for Reserve Improvement/Development by the Community</i> to the Reserves Working Group, and where the recommendation or request is of sufficient magnitude or involves the construction of new infrastructure it is to be referred	Shire in partnership with all stakeholders
	Compliance with local government laws and policies in relation to management processes and outcomes.	Medium		Shire
		Medium		Shire

			to the Development Assessment Unit or the Shire Council.	
Independent auditing provides open and accountable governance and ensures that this plan is implemented appropriately as resources are made available.	Independent audits of the implementation of management plan by Shire Officers to be undertaken and reported to Council by the RAG at a minimum frequency of every 3 years from the date of endorsement of this plan.	Medium	Reserves Advisory Group meetings to be conducted with broad membership as required in the <i>Planning and Management Framework for Shire Vested Reserves</i> .	Shire staff with Council, community groups and the broader community
Community groups are required to manage a significant administrative and management burden, yet they may not have access to governance expertise.	Community groups which regularly use the reserve to be made aware of appropriate governance training opportunities on an annual basis.	Ongoing	Maintain a record of relevant governance training opportunities and communicate this to the community groups.	Shire

3. Environmental Characteristics

3.1 Geology, Geomorphology and Soils

Within the 64 ha reserve area, four distinct soil types have been identified. The four soil types present in the reserve have the following characteristics which can be manifested in the reserve:

Table 2: Soil characteristics (Agriculture WA)

SOIL TYPE	CHARACTERISTICS
<i>Bassendean 1</i>	Wind erosion
<i>Bassendean 3</i>	Water-logging risk, phosphorus export, acidity
<i>Pinjarra 8</i>	Wind erosion, water-logging risk in low-lying areas
<i>Pinjarra 1b</i>	Moderately susceptible to salinity, soil water storage

Wind erosion

Wind erosion is preventable if the soils remain covered by vegetation. Wind erosion has been the primary cause of continued erosion from areas of *Bassendean 1* soil which has been cleared for development. The recovery of native vegetation in these areas can be very slow, however the extent to which any impact can be minimized is directly related to the timeliness of coverage with mulch or plants after any necessary disturbance.

Phosphorus export (movement of nutrients out of the reserve and into waterways)

The addition of fertilisers to soils which export nutrients is more likely to result in surface- and ground-water pollution than the application of fertilisers to soils which retain nutrients. This soil characteristic does not pose a direct threat to the soils themselves. However, excess application of fertilisers in the grassed runway would pose a threat to the chemical balance and microbial communities within soil. Nutrient management is discussed further in the water section of this plan.

Surface salinity (Water on the surface becoming saline through evaporation or rising saline groundwater)

Surface salinity can result from two causes and it is likely that both processes are operating in the Yangedi Reserve. The evaporation of open shallow standing pools causes the saline water to become increasingly concentrated and eventually depositing salt at the soil surface. Salt may also be introduced by rising saline ground-water. Surface salinity can be managed by facilitating drainage to ensure that evaporation cannot increase the salt concentrations in standing water. Rising ground-water can be controlled through the planting of deep-rooted perennial plants. An increase in salinity will cause changes to the chemical composition of soils. However, the impacts of salinity are most evident in ground and surface water resources and this topic is therefore discussed further in the water section of this management plan.

Soil compaction

Soil compaction refers to the crushing of soils to a point where the physical structure is altered. This affects the permeability of the soil to water. This in turn affects groundwater recharge, soil fertility and the natural microscopic organisms which occur within the soil. Little is known about the extent of any soil compaction which may occur on the reserve. However, the protection of fragile soils by coating them with a pathway surface material that holds its structure would help to minimise the potential for soil compaction and erosion.

Acid sulphate soils

The Yangedi Reserve is within a medium risk area for acid sulphate soils. Iron rich soils contain chemicals which form sulphuric acid when exposed to oxygen. This is both highly toxic and corrosive. The component soil chemicals of acid sulphate soils form in swamps, where their constant inundation by stagnant, anoxic water prevents the formation of acid. However, if these soils are disturbed and exposed to the air, or water is pumped from them to lower the water table, sulphuric acid forms and this not only alters the chemical nature of the soils themselves but has the potential to cause severe pollution of ground and surface water resources.

The Department of Environment and Conservation has defined the acid sulphate soil risk within the reserve as follows:

Moderate to high risk of acid sulphate or potential acid sulphate soils occurring greater than three meters from the soil surface; no risk of occurrence less than three meters from the soil surface.

The acidification of any sulphate soils within the reserve can be prevented by ensuring that there is no soil disturbance or dewatering of the soil below a depth of three meters from the surface. Any proposal that might cause or mobilize acid sulphate soils should be investigated in accordance with Department of Environment and Conservation guidelines and referenced to that Department for assessment and advice.

Environmental Characteristic Strategies: Geology, Geomorphology & Soils

Issue	Target	Priority	Strategy	Responsibility
Acid sulphate soils	<p>All members of stakeholder clubs who make management decisions and/or undertake construction or maintenance works to be aware of acid sulphate soil risk signs such as dead vegetation, rusty colour or black ooze.</p> <p>No acid sulphate soils are to be exposed.</p>	<p>Medium</p> <p>High</p>	<p>The potential risks of acid sulphate soils are to be communicated to all stakeholder groups that use the reserve. This is to take place frequently enough to ensure the management target when club members change.</p> <p>No excavation or dewatering is to take place without consultation with DEC.</p>	Shire and all other stakeholders

3. Environmental Characteristics

3.2 Water

Surface water

The Peel Harvey Estuary is of regional, national and international significance. It is listed on the Register of the National Estate, and in 1990 was also listed as a site of international significance for water birds under the Ramsar Convention. In addition, the area supports species of birds protected under international agreements with Japan and China to protect migratory birds. As a Ramsar site which supports species subject to international agreements, the estuary is protected by Commonwealth legislation, and any changes to land use within the catchment which have the potential to impact the estuary must be referred to the Commonwealth Government for assessment.

Despite its significance, the Peel Harvey Estuary has been severely degraded. High concentrations of nutrients transported from the catchment via the drainage network have caused eutrophication, or nutrient enrichment, of the river and estuarine waters, resulting in destructive algal blooms. In 1992 it was estimated that the estuary received 70 to 100 per cent more phosphorus from the coastal plain catchment than it could assimilate.

The Dawesville Channel was constructed in 1994 to increase estuarine flushing. Improved water quality was also realized through the adoption of better land management practices to both reduce nutrient input into, and increase nutrient stripping from, surface waters throughout the catchment. Gradually, the potential ecological, recreational and aesthetic values of the estuary, its ecology and the importance of good drainage systems and their management, were recognised.

Land use in the Peel Harvey catchment is subject to two statutory policies that address nutrient enrichment of the estuary through setting nutrient export targets for the Estuary, the *Environmental Protection (Peel Inlet Harvey Estuary) Policy 1992 (EPP)* and the *Statement of Planning Policy No.2 (SPP)*. The EPP sets a maximum phosphorus load from the Serpentine River to the Estuary at 21 tonnes per year. In addition, the Department of Environment position statement entitled *New conventional sprinkle irrigation Agricultural Proposals in the Swan Coastal Plain Catchment of the Peel Harvey Estuary* states that the maximum nutrient application rates should be no more than 150 kilograms of nitrogen and 15 kilograms of phosphorus per hectare per year.

The reserve is located within a proclaimed catchment under the *Rights in Water and Irrigation Act 1914*. Under this Act, a license is required to take water from waterways in excess of the riparian rights for household and domestic use. A license is also required for any works that interfere with the bed or banks of a watercourse.

Groundwater

Extensive supplies of groundwater are contained in superficial aquifers within the surface sediments throughout the Swan Coastal Plain. High yields from superficial aquifers are achieved mainly from Bassendean Sand sediments. In general, the Bassendean Sand sediments, because of their higher porosity and ease of infiltration, store much larger amounts of water than the Guilford Clay sediments or Pinjarra soils.

Water use and management

The regulation of surface water flow through dams, and the extraction of groundwater via bores, regardless of magnitude, has an impact on the environment and the downstream ecological communities. Management initiatives have focused attention on water use efficiency as an important environmental, social and economic issue for the community and all levels of government.

The need for the provision of amenities for the community is also fundamental to the health of our society, but where a conflict exists between the needs of the community and needs of the environment, a balance must be reached or alternatives sought through the use of relocation, better management, innovation and technology.

Many of the 96 hangars at Yangedi have rainwater tanks for drinking water. The Club also has two large concrete tanks and another four large transportable tanks so that in total about 69 rainwater tanks have an approximate installed capacity of 580KL. There is no public reticulated water supply to the area.

Historically dams were used for water supplies. All but one dam have disappeared and the one dam remaining is no longer used. There is one main bore (about 50 meters deep) used for water supplies which is registered with the Department of Water and two domestic bores (5 to 10 meters deep). Use of bore water includes reticulation behind the clubhouse, the caravans and hangars, water supply for fire fighting purposes, a cleaning bay for tractors and the grass runway which is for smaller aircraft and compliments the larger hard surface runway for the larger aircraft.

The current Licence arrangement between the Department of Water and the Club allows for the extraction of 9395 KL per annum from the one bore:

Fire Fighting purposes;

Household Purposes

Irrigation up to 0.2 ha of grass cover and irrigation of up to 1.05 hectare of grass coverage.

This bore could also be used for monitoring groundwater quality and quantity.

Water quality

The most critical water quality issue for land draining into the Peel-Harvey Estuary is nutrient management, particularly phosphorus and nitrogen. The maximum application rates recommended in the *Department of Environment and Conservation Position Statement* are 150 kg/ha/year of nitrogen (N) and 15 kg/ha of phosphorus (P). Nutrient management on the reserve is within these recommended rates. The bore water quality other than being a bit brackish (slightly saline) is of relatively good quality and use which includes any fertilization should be discontinued or reduced to a bare minimum. The grass runway is approximately 600meters by 40 meters.

Climate change

Although climate change is a global phenomenon, local impacts have already been detected with significant changes to rainfall patterns. Predictions indicate that the drier conditions experienced during recent years are likely to stay, and may become more pronounced. This is likely to be associated with warmer temperatures and more frequent extreme conditions such as storms. Lower annual rainfall provides the growing city of Perth with fewer water resources and increased pressure to conserve and reuse water.

While the actions of those who manage the Yangedi Reserve will have little direct impact on global weather patterns, pressure is growing to curb energy use and reduce greenhouse gas emissions. The implementation of low energy and water consumption initiatives at a public facility provides the additional benefit of raising awareness among community members who use it.

Water pollution

Water pollution can have a direct impact on the health of humans, stock, vegetation as well as ecological systems and processes. Water pollution from nutrient export or aircraft fuel leakage poses a significant threat to the quality of water flowing into, through and downstream from the reserve. The main source of nutrients is fertilisers applied to turfed areas. There is also a risk that the water flowing into the reserve from upstream is already of poor quality. Fuel spills within the reserve are a serious consideration where there are multiple locations where fuel is stored without adequate bunding within hangers. This is also a fire management consideration which will be considered in the context of a Fire Management Plan.

The amounts of fertiliser applied to turfed surfaces in the reserve are well within the recommended application rates. However, even small amounts of fertiliser can cause pollution if a large proportion washes off or seeps into surface or ground-water resources. The effective application of fertiliser onto turfed surfaces relies on the nutrients soaking into the soil to a depth no greater than the vegetation roots and at a rate no greater than the rate at which nutrients can be assimilated by the plants.

Practices to minimise the potential for nutrient export from turfed surfaces include:

- The repeated application of small amounts of fertiliser as opposed to infrequent applications of large amounts of fertiliser. Monitoring nutrient levels in soil profiles provides accurate information about how much fertiliser is required and when it should be applied.
- The application of soil conditioners and wetting agents to ensure absorption rather than runoff.
- The repeated application of small amounts of water to maintain dampness in the surface layers only. Monitoring water content in soils and evaporation rates provides accurate information about the quantities of water that are required and when it should be applied.
- The avoidance of applying fertiliser before very heavy rain or just prior to inundation.
- The maintenance of healthy vegetation over all fertilised areas to maximise nutrient uptake. There is evidence that healthy turf can export less nutrients than poorly managed turf with low nutrient inputs.

While preventing the export of nutrients from the source should be standard practice in this Reserve, nutrients that do seep into ground or surface water resources can be removed if the water passes:

- through areas where plant roots can absorb the nutrients,
- at a rate slow enough for the roots to assimilate the nutrients.

The key to effective nutrient stripping therefore is the establishment of vegetation with roots at appropriate depths and the slowing down of nutrient-rich water flows through these areas. This approach will need to be considered around the turf area used as a runway currently for ultra light aircraft.

Chemicals such as pesticides, herbicides, cleaning agents and petrochemicals also pose a threat of water pollution. A precautionary approach should be taken when transporting, storing and using these chemicals, and manufacturers' instructions need to be adhered to at all times. Currently up to 200 litres of aircraft fuel is stored within some of the hangers. There are also a number of effluent disposal systems and toilets shared between hangers in addition to the club house toilet. A central location for both effluent and fuel may be more effective in minimising risk of waterway, soil and vegetation impacts should leakage occur.

Water quality in the Conservation Category Wetland

There exists one recognised Conservation Category Wetland and one Multiple Use Wetland in Yangedi Reserve. Inflow of water to the Conservation Category Wetland has the potential to significantly alter the ecological balance of this oligotrophic system (low in nutrients). Preferably there should be no hydraulic connection between a dampland conservation category wetland and the surrounding land uses. The wetland is an expression of the groundwater table, and therefore

any activities that affect the groundwater table could impact on the wetland. This includes any alteration to water levels and leaching of nutrients and other pollutants into the water table.

Salinity

Salinity alters the chemical structure of the soil and limits plant growth. This leads to the secondary impacts of bare sealed surfaces with low infiltration and increased runoff, which in turn increases the potential for erosion and both nutrient and sediment transport. Saline waters also impact profoundly on the health of freshwater ecosystems, including wetlands, waterways and rivers. On the Swan Coastal Plain the primary cause of salinity is from the accumulation of salts following evaporation of standing water on clay soils with low infiltration rates. This is known as secondary salinity and differs from the salinity caused by rising groundwater tables found mainly to the east of the Darling Scarp. Management strategies to reduce the risk of this form of salinisation include reducing the flooding time through drainage, increasing surface water use both on site and upstream and reducing evaporation by shading.

Acid sulphate soils

Acid sulphate soils are known to occur in the region. This threat is described in the geology, geomorphology and soils section of this plan. When acid sulphate soils are exposed to oxygen, sulphuric acid is released that can have direct impacts on terrestrial and aquatic ecosystems, and serious indirect impacts through liberation of high concentrations of heavy metals and acid compounds from the clay soils to water bodies and groundwater. It is important that any hydrological system for detaining and treating storm water is carried out in a manner that identifies and avoids creating an acid sulphate soils problem.

Environmental Characteristics: Water Strategies

Issue	Target	Priority	Strategy	Responsibility
Energy consumption and other emissions contributing to greenhouse gases and climate change is reducing rainfall in the Peel Harvey catchment.		Medium	Establish vegetation as required to offset emissions.	Coordinated by Shire with involvement of all stakeholders & partners.
Current water use is uncertain and needs to reflect license conditions, water conservation and wise use policies.	<p>Compliance with all groundwater license allocation and other conditions.</p> <p>Decrease water consumption by 15% of 1999/2000 levels by 2010/2011 as per Water Campaign target for Shire.</p>	<p>Medium</p> <p>Ongoing</p> <p>Medium</p>	<p>Install meters and monitor water extraction from bores.</p> <p>Prepare an inventory of all water consumption on the reserve.</p> <p>Prepare and implement a plan to reduce consumption and reuse water by, for example:</p> <ul style="list-style-type: none"> Investigating the potential for storing rain water for summer use; 	<p>Shire</p> <p>Coordinated by Shire with involvement of all stakeholders</p> <p>Coordinated by Shire with involvement of all stakeholders</p>
Excess nutrients and pollutants in the catchment	Surface waters leaving the reserve to	Medium	Design and implement a water monitoring	Coordinated by Shire with involvement of all

<p>are causing down-stream algal blooms and ecological collapse in the Peel Harvey estuary.</p>	<p>be of equal or improved water quality compared with surface waters entering reserve.</p>	<p>High</p>	<p>program.</p> <p>Maximise nutrient and pollutant stripping from flowing surface waters by reviewing, and where possible implementing, best management practices.</p>	<p>stakeholders</p>
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3. Environmental Characteristics

3.3 Biodiversity

Flora and vegetation

The Yangedi Reserve is approximately 55 km south of Perth, in the Shire of Serpentine Jarrahdale. The site is immediately west of Yangedi Road, and is bounded by rural properties to the north, south, east and west.

The Yangedi Reserve site is approximately 63 ha, and contains three distinct areas of remnant native vegetation. The remainder of the site is cleared or developed land, comprising a small airport and associated infrastructure.

No Declared Rare Flora species have been located during any survey of the Yangedi Reserve. There have been 11 vegetation units identified, of which seven showed similarities to a number of important Floristic Community Types. None of these Floristic Community Types are listed as a Threatened Ecological Communities. The condition of vegetation across the site ranged from Very Good to Completely Degraded.

The main factors contributing to a decrease in vegetation condition are human use impacts, land clearing, adjacent land uses and associated weed invasion. Five weed species were identified during the spring survey in 2007. No weed species located during the field survey are listed as Declared Plant species by the Agriculture Protection Board (Government of Western Australia, 2007). Yangedi Reserve is mapped as Bush Forever Site 378. Bush Forever Sites aim to protect and maintain regionally significant vegetation within the Swan Coastal Plain portion of metropolitan Perth (Government of Western Australia, 2000).

The site supports four wetlands, two of which are listed as Conservation Category. The other two wetlands at Yangedi Reserve are Resource Enhancement Category wetlands. Conservation Category Wetlands and their associated buffers are protected by State legislation from the potential impacts of development. Development within Resource Enhancement wetlands and associated buffers, whilst not formally covered by legislation or policy, is restricted by the Department of Environment and Conservation.

The site is in the Darling District of the Southwest Botanical Province (Beard 1990). This region typically consists of forest country with related woodlands in the southwest part of the Province. The Province is divided into four subregions or botanical subdistricts.

The site is in Swan Coastal Plain Subregion in the Drummond Botanical Subdistrict, which consists mainly of the following vegetation communities:

- Banksia Low Woodland on leached sands and Melaleuca Swamps in poorly drained areas;
- Woodland of Tuart (*Eucalyptus gomphocephala*); and
- Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) on the less leached soils (Beard 1990).

The climate of this region is warm Mediterranean, with winter precipitation of 600-1000 mm, and five to six dry months per year (Beard 1990).

Regional representation

A widely-used vegetation classification system that maps and describes vegetation communities in south-west Western Australia is *Vegetation of the Darling System in the Atlas of Natural Resources, Darling System, Western Australia* (Heddle et al. 1980). This document describes vegetation communities as vegetation complexes, and maps the distribution of each complex.

The Environmental Protection Authority's document *Levels of Assessment for Proposals Affecting Natural Areas Within System 6 Region and Swan Coastal Plain Portion of the System 1 Region* (EPA 2006) gives an estimate of the percentage of each complex that remains compared to its pre-European settlement extent, so an estimate of the scarcity of each complex can be determined. Vegetation complexes are defined as a combination of distinct site vegetation types, usually associated with a particular geomorphic, climatic, floristic and vegetation structural association. Vegetation complexes are based on the pattern of vegetation at a regional scale, as it reflects the underlying key determining factors of landforms, climate and soils.

The Western Australian Environmental Protection Authority recognises vegetation complexes that are not well represented in reserves as being significant. Vegetation complexes which have 10%-30% remaining are considered to be regionally significant. Proposals that would impact upon a vegetation complex with 10% or less remaining are likely to be formally assessed (EPA, 2006).

The Yangedi Reserve is divided almost equally between two vegetation complexes: the Southern River Complex which has 17% of its pre-European extent remaining and the Bassendean Complex – Central and South which has 27.0% of its pre-European extent remaining. Most of the remaining bushland areas are degraded and the Bush Forever Sites represent the best remaining examples of each complex and the best chance of protecting these elements of biodiversity.

Threatened and significant flora

In Western Australian, flora species acquire Declared Rare or Priority conservation status when populations are geographically restricted or threatened by local processes. The Department of Environment and Conservation (DEC) enforces regulations under the *Wildlife Conservation Act 1950* ('WC Act') to conserve Declared Rare Flora and to protect significant populations.

The *Wildlife Conservation Act* provides for taxa of plants to be listed as ‘threatened’. Threatened flora and vegetation lists are reviewed and changes recommended by Department of Environment and Conservation’s Threatened Species Scientific Committee. Ministerial approval is necessary before changes are given legal status by means of a notice in the Government Gazette. Declared Rare Flora species are gazetted under subsection 2 of section 23F of the *Wildlife Conservation Act*, and it is an offence to “take” or damage Declared Rare Flora (DRF) without Ministerial approval. Section 23F of the *Wildlife Conservation Act* defines “to take” as to “gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means”.

Priority Flora are under consideration for declaration as ‘rare flora’, but are in urgent need of further survey (Priorities One to Three), or require monitoring every 5-10 years (Priority Four). Priority flora are considered significant, but are not specifically protected under the *Wildlife Conservation Act*.

Flora is also classified according to its conservation status at a Federal level, and may be protected under the Environment Protection and Biodiversity Conservation Act 1999 (‘EPBC Act’). Species listed and protected under the EPBC Act are essentially a subset of those that are Declared Rare Flora at the State level.

Threatened Ecological Communities

An ecological community is a naturally-occurring biological assemblage that occurs in a particular type of habitat. A vegetation community is considered a Threatened Ecological Community (TEC) if it is classified in one of the following categories:

- Presumed Totally Destroyed;
- Critically Endangered;
- Endangered; or
- Vulnerable

Coordination of threatened species and ecological community conservation is carried out by Department of Environment and Conservation’s Nature Conservation Division, primarily through the Species and Communities Branch.

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* permit native flora, including individual plants or entire communities, to be taken only by either a clearing permit or a valid exemption. The exemption provisions are quite extensive, but do not usually apply to land development applications.

There are a number of Environmentally Sensitive Areas (ESAs) in Western Australia where exemptions do not apply. Section 51B of the *Environmental Protection Act (1986)* allows the Minister for the Environment to declare ESAs, and TECs may be considered as ESAs. Exemptions do not apply in ESAs, and therefore the presence of TECs in a site can become a

constraint to development under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

There is currently no State legislation specifically for the protection of TECs, but there is a presumption against developments likely to impact on TECs which are on a list endorsed by the Minister for the Environment, and their conservation is encouraged in the development approvals processes. The EPBC Act also lists TECs, and 16 Western Australian communities are currently listed under this Act.

Wetlands

In an effort to protect wetlands on the Swan Coastal Plain, a dataset was developed by the Western Australian Land Information System, mapping the location and management category of wetlands on the Swan Coastal Plain. A management category is assigned to each wetland based on an evaluation by the Department of Environment and Conservation, which provides guidance on the nature of the management and protection the wetland should be afforded. These categories are as follows:

- C category (Conservation) wetlands have high conservation value for natural and human use. The management objective is described as being to preserve wetland (natural) attributes and functions.
- R category (Resource Enhancement) wetlands are defined as being partially modified, but still supporting substantial ecological attributes and functions. The ultimate objective for Resource Enhancement wetlands is management, restoration and protection towards improving their conservation category.
- M category (Multiple Use) wetlands have few important ecological attributes and functions remaining. The management objective is described as being to use and develop in the context of water, town and environmental planning.

The site supports Conservation and Resource Enhancement Category wetlands.

Bush Forever

Bush Forever aims to develop a strategic plan for the conservation and preservation of regionally significant bushland and associated wetlands in Perth and its associated coastal plain. Bush Forever is concerned with the protection of regionally significant bushland and associated wetlands (Government of Australia, 2000).

Yangedi Reserve, excluding the outer extent of firebreaks, is listed as Bush Forever site 378 – Henderson Road Bushland, Peel Estate. The site is categorised as supporting Regionally Significant Bushland (Bush Forever 2000).

The EPA outlines how it will consider proposals that impact on regionally significant vegetation in a Bush Forever site and the likely level of assessment. In the case of Yangedi Reserve, the likely level of assessment is stated as being ‘considered on a case by case basis. EPA would

expect proposals to be designed to minimise or avoid direct loss of bushland, consistent with Bush Forever expectations' (Government of Australia, 2000).

Introduced plant species

The *Environmental Weed Strategy for Western Australia* contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity.

Plants may also be 'declared' by the Agriculture Protection Board under the *Agriculture and Related Resources Protection Act 1979* ('ARRP Act'). Declared Plants are gazetted under five categories (P1-P5) which define the action required. The category may apply to the whole State, to districts, to individual properties, or even to paddocks. If a plant is Declared, landholders are obliged to control that plant on their properties in accordance with the declaration (Government of Western Australia, 2007).

Database search

A database search of the area resulted in no Declared Rare or Priority Flora species being identified as potentially occurring in the area. The search also resulted in no known occurrences of Threatened Ecological Communities in the survey area. The database information was obtained from a survey conducted as part of the *South West Biodiversity Project - Potentially Locally Significant Natural Areas and Features within the Shire of Serpentine Jarrahdale*, provided by the Serpentine Jarrahdale Shire.

Field survey

Flora

Twenty-eight families, 52 genera and 62 taxa were recorded in the survey area (55 native flora taxa and seven introduced). The dominant plant families recorded in the survey were as follows:

- Myrtaceae twelve species;
- Proteaceae six species;
- Papilionaceae four species; and
- Anthericaceae four species.

Declared Rare and Priority Flora

No plant taxa gazetted as Declared Rare pursuant to subsection 2 of section 23F of the WC Act (1950) (Atkins 2006) were located in the survey area. No Endangered or Vulnerable species pursuant to section 178 of the EPBC Act (1999) were located during the survey.

All flora taxa recorded during the survey are from known population ranges, and therefore no other significant flora species occur within the site.

Vegetation

The site consisted of 11 vegetation units. The 11 communities were:

- BmBiBa - Woodland of *Banksia menziesii*, *Banksia ilicifolia* and *Banksia attenuata* over *Jacksonia furcellata*, *Dasyogon bromeliifolius* and *Patersonia occidentalis* over *Loxocarya cinerea*;
- Bm*PpNf - Low Open Woodland of *Banksia menziesii*, **Pinus pinaster* and *Nuytsia floribunda* over *Allocasuarina humilis*, *Dasyogon bromeliifolius*, *Anigozanthos manglesii* over *Loxocarya cinerea*;
- NfAcXg - Low Open Woodland of *Nuytsia floribunda* and *Adenanthos cygnorum* over *Xanthorrhoea gracilis* over *Dasyogon bromeliifolius*;
- BmBaJf - Open Woodland of *Allocasuarina humilis*, *Banksia menziesii* and *Banksia ilicifolia* over *Banksia attenuata*, *Nuytsia floribunda* and **Pinus pinaster* over *Jacksonia furcellata*, *Melaleuca thymoides* and *Regelia ciliata* over *Loxocarya cinerea*, *Lyginia imberbis* and *Lechenaultia biloba*;
- BiKgXg - Tall Open Scrub of *Banksia ilicifolia* and *Kunzea glabrescens* over *Xanthorrhoea gracilis*;
- MpRcEl - Tall Open Shrubland of *Melaleuca preissiana* over *Regelia ciliata*, *Kunzea glabrescens* over *Euchilopsis linearis*, *Hibbertia vaginata* and **Briza maxima*;
- Nf*CcKg - Open Woodland of *Nuytsia floribunda* and **Corymbia citriodora* over *Kunzea glabrescens*, *Melaleuca thymoides* and *Regelia ciliata*;
- BmKg - Low Open Woodland of *Banksia menziesii*, *Kunzea glabrescens* over **Ehrharta calycina* and **Briza maxima*;
- Mp – Low Open Woodland of *Melaleuca preissiana* over weeds;
- EmMpMt - Woodland of *Eucalyptus marginata* over *Melaleuca preissiana*, *Melaleuca thymoides* and *Kunzea glabrescens* over *Lepidosperma* species; and
- CcMtXg – Woodland of *Corymbia calophylla* over *Melaleuca thymoides* over *Xanthorrhoea gracilis*.

* denotes introduced species

Floristic Community Types

Of the above described 11 vegetation units, seven were able to be correlated against two main Floristic Community Types (Gibson et al., 1994). The Floristic Community Types considered present at Yangedi are:

- SCP04 – *Melaleuca preissiana* damplands (similarities to vegetation units MpRcEl, EmMpMt and CcMtXg); and
- SCP23a – Central *Banksia attenuata* – *Banksia menziesii* woodlands (similarities with vegetation units BmBiBa, Bm*PpNf, NfAcXg and BmBaJf)

Threatened Ecological Communities

Floristic Community Types SCP04 and SCP23a are not listed as TECs under Western Australian criteria, and are not listed under the EPBC Act.

Vegetation Condition

Condition of vegetation across the site ranged from Very Good to Completely Degraded. The main factors contributing to a decrease in vegetation community condition are human use impacts, land clearing, adjacent land uses and associated weed invasion.

Introduced Flora

The table below contains the dominant weed species identified at Yangedi.

Table 3: Dominant Weed Species Identified

* <i>Ehrharta calycina</i>	Perennial veldt grass
* <i>Carpobrotus edulis</i>	Hottentot Fig
* <i>Cyperus congestus</i>	Dense Flat-sedge
* <i>Hypochaeris glabra</i>	Smooth catsear
* <i>Pinus pinaster</i>	Pinaster pine

There were no Declared Plant species found within the site

Yangedi wetlands

The site supports wetlands, of which listings include Conservation Category, as well as Resource Enhancement Category wetlands (REC). Conservation Category wetlands are defined as wetlands that support a high level of ecological attributes and functions. They are the highest priority wetlands, and any activity that may lead to further loss or degradation of such a wetland will be opposed by the DEC. Similarly, Resource Enhancement Category (REC) wetlands are defined as being partially modified, but still supporting substantial ecological attributes and functions. The ultimate objective for REC wetlands is management, restoration and protection towards

improving their conservation category, and therefore development in or close to REC wetlands is usually opposed.

Conservation Category wetlands and Resource Enhancement wetlands usually attract buffers of 50-100 m and 30-50 m respectively. However, it is noted that there has been recent development within the mapped boundary and the buffer zone of one of the REC wetlands. Any development within REC and Conservation Category Wetlands and their associated buffers are likely to be opposed. Conservation Category wetlands are protected by State legislation from the potential impacts of development.

Flora Summary

The flora and vegetation surveys so far:

- Sixty-two taxa (55 native flora taxa and seven introduced) identified;
- No Declared Rare Flora species have been located at Yangedi;
- Of the Flora Community Types, SCP04 and SCP23a are present at Yangedi Reserve with none listed as a Threatened Ecological Community; and
- Condition of vegetation across the site ranged from Very Good to Completely Degraded.

Fauna

All native animal species are protected throughout the State under the *Wildlife Conservation Act 1950*. However, some species have been identified as rare or likely to become extinct, including both the Baudin's and Carnaby's Black Cockatoos. These birds are listed under the EPBC Act 1999 and are therefore protected under Commonwealth legislation as well as state policy. A second category of species in need of special protection includes the carpet python, which is likely to occur in the Yangedi Reserve. The disturbance, or taking, of these scheduled species attracts higher penalties.

There is high fauna species diversity on the reserve. Time has limited the establishment of other species which may also be expected.

Again the low fire frequency, high species richness of the flora and low level of human disturbance has encouraged a rich and diverse suite of faunal species.

Birds

Birds, in particular, are well represented with many resident breeding species on the reserve. Notable among these are the white-browed scrub wrens (*Sericornis frontalis*) and the splendid fairy-wrens (*Malurus splendens*). Both species are identified as having resident, breeding populations in the reserve's important vegetation community types.

During the period of the survey 43 species of birds have been identified as utilizing the available niches on the reserve. Mist-netting, and banding birds trapped, on four occasions has yielded 51 individual birds from nine different species.

Mammals

Five species of mammals have been identified on the reserve.

The short-nosed Bandicoot

The most significant of the mammals is the short-nosed bandicoot (*Isoodon obesulus fusciventer*), which was trapped in a mammal trap and identification confirmed by reference to Strahan, 1991.

The presence of wide-spread and numerous bandicoot scratchings in both the damplands and the higher ground indicates that there is a breeding population on the reserve and that the bandicoots utilize a variety of different vegetation communities.

The open spaces created by the presence of runways and firebreaks appears not to have discouraged these animals from moving from one vegetation community to another.

This species is listed as an endangered species and as such should be left undisturbed.

Western Grey Kangaroo

Western Grey Kangaroos (*Macropus fuliginosus*) are frequently seen grazing on the shorter grasses bordering the runways. Up to eight individuals have been observed at any one time and the presence of young indicates an actively breeding group is established on the reserve. Management of this small population may be necessary in the future.

Reptiles

Snakes

Two dugites (*Pseudonaja affinis*) were observed on the higher ground in the northern section of the reserve.

One western tiger snake (*Notechis scutatus*) was observed near a hangar building and numerous reports were received from members of the Sport Aircraft Builder's Club as to their presence in the area around the hangars and in the damplands.

Lizards

One specimen from the Gekkonidae was found near the clubhouse. This was the marbled gekko (*Phyllodactylus marmoratus*).

Numerous specimens of Black-tailed Monitor lizards (*Varanus tristis*) were observed in the Banksia woodlands on the reserve.

The presence and numbers of the snakes and the larger lizards indicates a more than adequate food supply being available. The frequently recorded frog calls in the older soak in the dampland area would indicate that frogs are an important dietary component for the snake population on the reserve. Frog species were not determined in this study and further work needs to be undertaken to locate and identify specimens of this diminishing group of amphibians.

Fauna Summary

Yangedi Reserve includes a number in a long chain of wetlands running north-south along the Swan Coastal Plain. Located on the Bassendean Complex it has an array of wildlife living within a rich diversity of vegetation, proving its status as an essential component to the conservation network of the Swan Coastal Plain.

Common to wetlands of the area is the Short-Nosed Bandicoot (*Isoodon obeselus*). The dense vegetation provides suitable coverage and allows the bandicoot safety within its own niche and appears not to be limited by the sections of open space and fire breaks on the reserve. The conservation importance of the Yangedi Reserve is greatly influenced by the inhabitation of the Short-Nosed Bandicoot as it is recognized by the Department of Environment and Conservation in Western Australia as being “Fauna which is Rare or Likely to Become Extinct”.

Unfortunately the Short-Nosed Bandicoot is in decline due to the introduction of feral predatory fauna such as the fox and cat, the destruction of its native environment due to land clearing and road kills.

Dieback (*Phytophthora cinnamomi*)

The accelerating spread of dieback is a critical threat to the survival of much of Western Australia’s bushland. Dieback is a disease that affects the roots of many species, usually leading to their death. It is caused by several fungi of the genus *Phytophthora*, most commonly *Phytophthora cinnamomi*. Plant species vulnerable to *Phytophthora* include Jarrah, the banksia family, the heath family, pea family, hibbertia family, balga and zamia. The marri, kangaroo paws, reeds and rushes are not affected. The fungus is spread either by the movement of water or soil from infected sites or directly between plant roots.

The most common vectors for moving the fungus to new areas are human activities, particularly vehicles. Vehicle tyres, shoes and horse hooves which can pick up divots of soil, are recognized vectors.

There is no known mechanism to eliminate dieback once it has been introduced into an area. The general strategy to control dieback is therefore to minimize its spread by controlling the movement of vehicles, people and stock from affected areas into dieback free areas. It is standard management practice to:

- route pathways in a manner that avoids crossing the boundaries between dieback infected and non-infected areas;

- provide wash-down or other hygiene facilities for vehicles and footwear prior to entering dieback free areas;
- provide education for visitors; and
- avoid the transportation of soil and plant material into dieback free areas unless it can be guaranteed disease free.

There are now chemical treatments available to control the intensity of dieback. The application of phosphoric acid by spraying small plants and injecting large plants is an intensive management technique which will only control the intensity of disease, not kill it. Dieback in Yangedi Reserve is readily apparent on the outskirts of the reserve where weeds have also been spread. Dieback mapping will need to occur along with treatment, signage and restrictions on entering certain core areas of the reserve.

Fire

Fire is an important tool for stimulating regrowth and regeneration in native ecosystems. However, uncontrolled fire can take lives, damage property and remnant vegetation and cause high mortality of fauna. Aircraft Fuel is currently being stored individually up to 200 litres in some hanger at any one time. Should a very intense wildfire occur, it may be better for a well managed and designed centralised fuel storage facility to be developed to reduce risk of fire ignition and fuel source. Aircraft fuel storage options should be included in a Fire Management Plan for Yangedi.

Small areas of remnant vegetation are vulnerable to local extinctions from single catastrophic fires which sweep through the whole area. Reducing the risk of catastrophic wildfire involves the maintenance of fire breaks and/or controlled burning to reduce fuel loads. Direction on what time of the year and what intensity to burn for vegetation management will be guided by advice from the Department of Environment and Conservation. Identifying strategic firebreaks, locations of fire fighting equipment, fuel sources and procedures to follow should the Yangedi Reserve be threatened by fire are important elements to be included in a Fire Management Plan.

Use of the airfield for fire fighting aircraft should also continue to be investigated although their use is unlikely due to the short length of the main runway. The Sport Aircraft Builders Club have provided a deep water bore with facilities for emergency fire fighting helicopter landing and water loading with one minute turn around. Also provided and maintained by the Club outside the reserve fence on Yangedi Road is a 4 inch delivery stand pipe which can fill a 14 thousand litre tank truck in 15 minutes. This is used by the local Shire fire brigades when necessary. An independent generator is connected so it will work should electricity not be available during a fire.

Fire prevention measures include but are not limited to:

- Maintaining areas around hangers with a 3 meter statutory firebreak and an area void of flammable material a further 8 metre distance from hangers;

- Maintaining a 20 metre low fuel load buffer area around all assets and the natural bush areas with no drip line of any tree being closer than 10 metres;
- Maintaining a 20 metre low fuel load buffer area adjacent to the pine plantation on the northern boundary;
- Maintaining firebreaks around the reserve to a minimum of four metres wide;
- Applying for permits for winter/autumn burning of small piles of debris where required;

Clearing

Any clearing occurring in this Bush Forever Site needs to be given approval from the State government under Department of Environment and Conservation (DEC) clearing regulations as well as from local government. The Department of Planning (DoP) is also included in the approval process as they are the current custodians of Bush Forever Sites and management controls. Vegetation management zones are not condoning any physical clearing and any herbicide application. Herbicide application is to be arranged by Shire Officers in vegetation management remnant vegetation zones around the edge of the reserve. Included under clearing regulations is the protection of dead standing trees from being cleared due to their habitat values. Fines of up to \$500,000 can apply. Should any clearing take place and fines imposed these should be paid directly by the offender and not the Serpentine Jarrahdale Shire.

Clearing permits have been received in the past for hangers and for the development of the Bureau of Meteorology communication facility. Understorey degradation has occurred in some high biodiversity value areas for safety purposes and some areas require continuous understorey clearing for these purposes. Any native vegetation clearing applications to DoP and DEC within this Bush Forever Site would not be supported by the Serpentine Jarrahdale Shire for any other purposes. Individual trees or vegetation will need specific approvals for clearing for verified safety reasons.

Weeds

Introduced flora comprises up to 11 per cent of the plant species found in Western Australia. These plants pose a significant threat to native plant species through competition for limited resources, particularly space, light and water. Weeds flourish in disturbed sites and often out-compete the remaining native understorey. The displacement of native plant species leads to a loss of habitat for dependant fauna.

One means of controlling weeds in remnant vegetation is to avoid disturbance to begin with. Direct disturbance can be caused by trampling, grazing and soil disturbance. An increase in nutrient into an area particularly in wetland areas gives a competitive advantage to exotic plant weeds. Fire also constitutes a disturbance that results in a substrate that is vulnerable to weed predominance.

Another essential strategy to minimize the threat of weeds is to reduce the vectors or carriers of weed seed. This includes any materials such as the movement of soil into or out of the area. It

also includes controlling the movement of storm water runoff that can introduce nutrients and other pollutants. This is especially important in wetland areas.

Many of the weeds that impact on the reserve are grass species with seeds that are distributed by wind. Each plant is the potential source of many others, so it is important to control the seed source. The saying; *one year's weeds, ten years' seeds* sums up the importance of targeting weed outbreaks as soon as they appear. The most effective strategy to manage the spread of seeds is to remove weeds from areas of light infestation first. The second priority should be given to heavily infested areas that are invading adjacent to healthy areas. Other priority areas will include heavy infestations that are upwind from less infested sites.

Techniques to control the spread of seed and weed plants range from selective removal of seed heads to physical or chemical removal of the plants. Large-scale removal of weeds needs to be carefully integrated with a revegetation programme, otherwise the bare areas will be recolonised by other opportunistic plants many which will be exotic. The removal of weeds that provide significant habitat values also needs to be carefully planned and integrated with revegetation. Weeds are for the most part located on the outskirts of the core areas of the reserve within the Vegetation Management Zone. Weed mapping and control in this reserve is best carried out by specialists contracted by the Shire or Landcare to minimise any impact to native flora.

Drainage and drawdown

Lowering of the water table as a result of bore usage in and adjacent to the reserve could affect all plant communities, particularly the wetland communities which are dependant on hydrological balance. Groundwater extraction and modifications to water courses require State Government assessment and approval to ensure regulation and minimal impact.

Feral animals

Feral animals are an ongoing threat to both the flora and fauna of bushland remnants. Rabbit colonies can seriously disturb vegetation and limit any regeneration. As populations grow they also impact on local fauna through competition for food resources and the removal of habitat. Foxes pose a direct threat of predation to small mammals such as the Bandicoot.

Feral rodents thrive in adjacent agricultural and equine properties, and most likely also occur in the reserve bushland area where they would compete with native fauna. Feral honey bees are increasingly being recognized as a threat to native wildlife. Not only do they compete with native bees and in some cases prevent the pollination of highly specialized plants, but they can also take over the nesting hollows of native birds and other animals.

Foxes and Deer

The red fox is an introduced species and is a known predator of fauna. Two specimens were found dead on the airfield during the time of a past survey. Numerous fox prints have been observed. Foxes are known predators of rabbits as well as native fauna such as the Bandicoot. Management of the fox population will need to be considered in conjunction with rabbit control

and management of the bandicoot population. Deer escapes from nearby properties have also been found within the reserve.

Cattle and Rabbits

Cattle have been known to wander into the Reserve on very rare occasions when fencing has on adjacent properties has broken down or not been maintained at a standard that would exclude stock. Rabbits are numerous on the reserve. No attempt has been made to estimate numbers or distribution as these are feral animals and will need controlling in any future management plan.

Cats

During the time of the survey two individuals were observed in the bush and three individuals were trapped and removed permanently from the reserve.

It is not known whether these were domestic or feral animals. Cats are known predators of small mammals such as rabbits and bandicoots (Atkinson 1989). A cat control program in conjunction with fox and rabbit control will be essential to protect the bandicoot and other small mammal population on the reserve

Appreciation, understanding and awareness

A lack of appreciation of the importance of protecting biodiversity, together with a lack of understanding of the processes that threaten biodiversity, are themselves a significant threat to good management of biodiversity values. Programs to raise the awareness of user group members through, for example, club news letters, guided walks and presentations should be extended to all users of the reserve, using techniques such as sporting event briefings and interpretive signage.

Climate change (Changing weather patterns such as global warming and storm surges)

Climate change is likely to cause a general southerly shift in species distribution, and significant southerly extensions to the distributions of some species have already been recorded. The availability of ecological linkages will play a vital role in facilitating this shift and providing greater resilience for flora as well as fauna.

To cope with the stresses of climate change the vegetation needs to remain healthy and support as large and diverse a population as possible. This requires careful management of all the threatening processes and positive action to increase the resilience of the ecosystems generally.

Environmental Characteristics: Biodiversity Strategies

Issue	Target	Priority	Strategy	Responsibility
Dieback disease (<i>Phytophthora cinnamomi</i>) is already present within the bushland area and it has the potential to cause local extinctions of some species and significantly alter community structures.	No increase in the area of bushland infected by dieback.	Key	Map and photograph the distribution of dieback within the bushland areas, zone dieback free areas as high conservation and limit access into these dieback free areas.	Shire in partnership with DEC and community groups. Shire in partnership with community groups.
		Medium	Treat vegetation for dieback by spraying and injecting vulnerable plants at 3 to 5 year intervals.	Shire to coordinate with involvement of all stakeholders. Shire to coordinate with involvement of all stakeholders.
		Key	Raise community awareness through the provision of signs, club news letters, event briefings and other communication techniques.	Shire to coordinate with involvement of all stakeholders. Shire to coordinate with involvement of all stakeholders.
		Key	Raise the awareness of staff, volunteers and contractors of management zones, restrictions on access and appropriate dieback hygiene procedures and ensure they are adhered to.	
		High	Minimise risks of disease spread by reconciling the alignment of access ways with dieback fronts, and where necessary	

		High	<p>constructing barriers to prevent any vehicle or walker from crossing dieback fronts.</p> <p>Minimise risks of disease spread by adopting dieback hygiene processes including:</p> <ul style="list-style-type: none"> • Construction and maintenance work to be undertaken in dry conditions only; • Wash-down of vehicles and footwear prior to commencing construction or maintenance work in the bushland area; and • No introduced material, e.g. soil and pathway surfaces, into the bushland area unless guaranteed dieback free. 	
A new Fire and Emergency Plan should be developed in		Key	Put in place and implement a new Comprehensive Fire and Emergency Plan.	Shire to coordinate with the Department of Environment and Conservation

consultation with the Club and the Department of Environment and Conservation.				
The level of knowledge in relation to the biodiversity values of the reserve is low.	Databases of biodiversity values to be established.	Medium Medium	Monitor Black Cockatoos' usage of the reserve.	Shire with bushland group Birds Australia, Department of Environment and Conservation and WA Museum
Many weeds out-compete indigenous plants, causing significant changes to species compositions and habitat structure.	All areas of bushland currently free of weeds to remain free of weeds.	High Key Medium	Map and photograph the distribution of weeds within the bushland areas at least every 2 years and compare areas of infestation with previous maps. <u>Prepare and implement a local native species planting and weed eradication program</u> by identifying and prioritising weed areas. This includes sources of weed seed outside the bushland area, with an aim that the successful implementation of the program will produce results where the vegetation is classified as having been restored. Remove weeds with physical and chemical	Shire in partnership with community group. Shire in partnership with community groups. Shire to coordinate with involvement of all stakeholders. Shire to coordinate with involvement of all stakeholders. Shire in partnership with community groups. Shire to

			<p>treatments, in accordance with the weed control program.</p> <p>Mulch, brush, seed, or plant treated areas with indigenous plant species appropriate to that pre existing ecological community.</p>	coordinate with involvement of all stakeholders.
		High		
		Medium	<p>Minimise disturbance and weed introduction, and actively remove weeds from the bushland area through:</p> <ul style="list-style-type: none"> • Reconciling the number and widths of access tracks to minimise disturbance of vegetation and soil within the bushland area; • Diverting nutrient rich surface drainage away from bushland areas; and • Raising the awareness of all users of the bushland the importance of 	

			<p>minimising the spread of weeds through event briefings and other communication techniques.</p>	
<p>Feral animals predate native species, compete with them and destroy their habitat.</p>	<p>All nests of feral bees and rabbit warrens to be eradicated from the bushland areas of the reserve as far as possible.</p>	<p>Medium</p>	<p>Maintain records of incidental sightings of feral animal occurrences and monitor the bushland areas of the reserve annually for rabbit burrows.</p>	<p>Shire to coordinate with the participation of all stakeholders.</p>
		<p>Medium</p>	<p>Destroy foxes, cats rabbits and feral bees where required.</p>	<p>Shire in partnership with community groups.</p>
		<p>Medium</p>	<p>Raise awareness among surrounding landowners about the damage done by foxes and feral cats and other animals on the reserve, and encourage owners to restrain their pets and control pests on their land.</p>	<p>Shire in partnership with Aircraft Club</p>
		<p>High</p>	<p>Disallow the placement of bee hives anywhere on the reserve.</p>	<p>Shire</p>

4. Social and Economic Characteristics

4.1. Indigenous Heritage

Local Aboriginal people are part of the Noongar community, whose territory extends from Geraldton south along the coast to Cape Leeuwin, across to Esperance and back diagonally to Geraldton. Prior to European settlement, family groups in the Serpentine region were part of the Whadjug tribe. During the post-European settlement period, however, forced migration to Aboriginal settlement camps or into areas where labour was required resulted in a shift of tribal groups from their traditional lands.

Noongar family groups did not have permanent places of habitation and generally moved along major river systems such as the Serpentine and Murray River systems, or chains of freshwater bodies. The family groups would camp at favoured points for short periods of time along the created trails, where food and water resources were reliable. The use of food resources from these systems is still carried out today by the local indigenous population.

The water systems are also spiritual places for Aboriginal people. Local tradition records that Waugal, the dreaming ancestor, created the Murray and Serpentine River systems. The Waugal is a spiritual force with a physical serpentine manifestation that is widespread throughout the south west region. Most of the major rivers that drain the Darling Range, and many creeks, springs, pools, swamps and lakes within the Swan Coastal Plain, are associated with the Waugal belief, which remains today.

The reserve lies on a level to undulating plain, much of which used to be inundated swamp land during the winter months. The wetland areas within the reserve would have been used as a source of food and may have held spiritual meaning for the local Aboriginal people. Aboriginal people maintain a responsibility to care for their country, but information relating to the nature of any specific spiritual connection with the reserve area was not available for this report.

The Swan Coastal Plain has a high density of Aboriginal archaeological sites, which is associated with the richness of food resources. The Department of Indigenous Affairs, under the *Aboriginal Heritage Act 1972*, currently has 69 sites listed within the Shire's boundaries. Under this Act, all places and objects of Aboriginal importance are protected, requiring land managers to take all necessary steps to avoid disturbance.

The Serpentine River is listed on the register of mythological and ceremonial sites. However, the exact locations of areas of particular value along and near the river remain unpublished to assist with their protection. Instead, the registered site includes a wide enough buffer to encompass all the Aboriginal values that occur in the vicinity. It is through this protection process that the Yangedi Reserve is encompassed within the buffer and therefore formally listed as a Heritage site under the *Aboriginal Heritage Act 1972*.

A Native Title Claim currently exists over land extending from Garden Island, south to a point due west of Capel, east to Kojonup, north to Corrigin and west back to Garden Island, encompassing an area of 30,424.531 square kilometres. The Shire of Serpentine Jarrahdale is included in this Claim area. Native Title enables local Aboriginal people to have their rights and interests in land and waters under traditional laws and customs recognised under Australian law.

The Gnaala Karla Booja claim, which resides over the Shire, was submitted to the National Native Title Tribunal for registration on the 17 September 1998, and passed the registration test the following year. With the Gnaala Karla Booja Claim having passed registration into mediation, this gives the claimants the right to negotiate in relation to land management issues on lands subject to the claim. However, in 2002, a determination was made in that Native Title is extinguished on Crown Lands that were vested prior to December 1996, and this is the case with the reserve. Administration of the Gnaala Karla Booja Land Claim is being co-ordinated by the South West Aboriginal Land and Sea Council, and although Native Title has been extinguished over the reserve, the Shire is required to notify this body of any intended public works and to give claimants the opportunity to document their concerns.

When a recent application for hanger area clearing was lodged with the Department of Environment and Conservation, the South West Aboriginal Land and Sea Council were notified and as a result of this communications with the traditional owners there will be an ongoing dialogue with the Aboriginal community regarding management of the reserve.

A lack of effective consultation with Noongar people and their representatives may result in management practices not guided by traditional laws and customs. This could lead to management decisions that may cause conflict of use on the reserve and potentially the degradation of Aboriginal values.

Social and Economic Characteristics: Indigenous Heritage

Issue	Target	Priority	Strategy	Responsibility
Aboriginal peoples need to be informed of public works on the reserve but there are no Indigenous representatives currently involved in reserve management.	An effective process for ongoing Aboriginal liaison established and thereafter implemented.	High	<u>Administrate the Reserves Advisory Group with the membership of at least one person who can speak for local Indigenous people as required.</u>	Shire Shire to oversee with involvement RAG members Shire to oversee with involvement of RAG members
		High	Consult the South West Land and Sea Council and South West Catchment Council for advice on other appropriate liaison processes and implement as appropriate.	
Aboriginal names have not been used for places or events on the reserve.		Medium	When naming a place, structure or event give consideration to Aboriginal names, seek advice from Aboriginal representatives and obtain approval for the use of appropriate names from the South West Land and Sea Council and the Shire Council.	Shire and stakeholders
Reserve visitors generally do	Provide interpretive material for visitors to the reserve about	High	Develop interpretation information to	Coordinated by Shire with involvement of all

not know about Indigenous perspectives on areas in and around the Yangedi Reserve.	Indigenous perspectives.		include in the reserve management plan that takes account of Aboriginal heritage values.	stakeholders
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4. Social and Economic Characteristics

4.2 European Heritage

In March 1827, Captain James Stirling of the British Royal Navy arrived in the Swan River and pronounced that the land possessed great natural attractions. This landing and subsequent report by Stirling to His Majesty's Government back in England led to the foundation of the Swan River Settlement in June 1829. Soon after this in 1830, Mandurah was established and settlers started to move up the Murray River in search of agricultural land. Remnant bushland on the reserve provides a rare glimpse of what the early settlers encountered.

Around this time explorers ventured up the Serpentine River, but due to navigational difficulties, settlement was delayed. The area that was to become Serpentine was initially part of a massive 250,000 acre land grant to Thomas Peel known as Peel Estate. This land grant went from Wungong near Armadale to Pinjarra and out to the coast. However, due to the nature of the land and vegetation, together with the availability of good agricultural land elsewhere, much of this Peel Estate remained in its natural state for many years to come.

Some farms were established along the Serpentine River between the scarp and the vicinity of the present day town in 1865. These were smallholdings, the largest being only a few hundred hectares. At this time the Serpentine settlement was established on the Serpentine River at the foot of the scarp, about 1km east of its present location, but in 1893, with the Perth to Bunbury railway almost complete, the present Serpentine townsite was gazetted.

Major agricultural development of the area occurred with the implementation of the group settlement scheme in the early 1920s. Land which was previously part of the Peel Estate was bought by the Government and made available to settlers from England. They were organised into groups and were paid a small allowance while they developed their land for agriculture. The sandy soil and persistent winter inundation of much of the area made the transition from native bushland to farmland particularly difficult.

A program to drain the group settlement areas of the Peel Estate began in 1922. Large drains were cut with the aid of horse-drawn carts and finished by hand, a challenging task as they were dug during the middle of summer to avoid inundation. By 1925, 540 km of drains had been completed at a cost of over 300,000 pounds, all this when the original estimate had been worth just 97,000 pounds. The drainage network was later expanded, and the administration and management of most of the drains was taken over during the 1950s by the Public Works Department, later to become the Water Corporation.

In the 1950s the land was subdivided into approximately 100-acre lots for the purpose of settling migrants in the area. Lot 164 was found to be not suitable for intensive agriculture due to low

productivity sandy soils, and therefore was relinquished to the Crown and the reserve established. Grazing continued under lease until the early 1970s. The reserve was subsequently vested with the Serpentine Jarrahdale Shire as a recreation reserve. It was initially allocated to the local Jarrahdale Sportsman's Club for their use but the Club unfortunately never prospered as its founders had hoped and consequently the property was never developed.

The Ultra Light Aircraft Association of WA – ULAA (WA) – determined in the early 1970s that an aircraft was required to allow full development of sport aviation in the metropolitan area and where amateur built Sport Aircraft could be operated and enjoyed as a way of life. Lot 164 Yangedi Road, Hopelands was identified as an unused Crown Reserve of suitable size.

The Ultra Light Aircraft Association – which later became the Sport Aircraft Builders Club of WA (Inc) – entered into discussions with the Serpentine Jarrahdale Shire and Sportsman's Club to take over the lease of the Reserve in 1972. When development was commenced the site had been used for grazing and as a consequence it was very scant in vegetation. Aerial photography is available showing this. By 1974, a gravel runway had been constructed and the first hangers were erected. In 1975 a clubhouse was completed. Enhancement plantings were undertaken by the Sport Aircraft Builders Club including local native species propagated by seed collected locally.

An airfield was established with two runways and the construction of club facilities and hangers. The grassed cross runway has been established for safety reasons and is specifically for the ultra light aircraft. The main airfield is now a bitumen all weather runway which includes “pilot activated lighting” for night operations. The Sport Aircraft Builders Club of WA Inc. is a non profit organisation with a constitution and currently has over 300 members. Facilities include approximately 100 hangers, over 120 aircraft, a clubhouse with kitchen, toilet facilities and 12 caravans, two with permanent residents as caretakers.

Exclusion of grazing together with vegetation management and enhancement plantings has resulted in new growth and the regrowth of remnant vegetation, and a certain amount of protection from fire has occurred due to increased presence in the area by the Club and regular establishment of firebreaks.

Comprehensive and accurate records of activities and developments need to be maintained in this reserve. Other than the remnant bushland providing an example of what the early settlers encountered, there are no obvious historical remains on the reserve. There are therefore no direct threats to the current historical values on site. However, if visitor experience is to be enriched by knowledge and understanding of cultural heritage, it could be interpreted through signage on site, displays at the local museum, school programs and other publications.

The current value of the reserve for its biodiversity conservation value is not and should not be downgraded, or devalued by the historic or current use of the reserve. A management plan is clearly needed in this particular reserve which includes actions or strategies for establishing, monitoring and managing this asset while allowing for the historic and current use of the reserve. The Sport Aircraft Builders Club has accorded a large number of pilots and amateur aircraft builders the opportunity of enjoying a cherished aviation lifestyle as well as providing a valuable asset to the community. Photos follow showing recent and historic views of Yangedi from the air.



Social and Economic Characteristics: European Heritage

Issue	Target	Priority	Strategy	Responsibility
Historical records relating to Yangedi Reserve are scarce and scattered.	All developments and activities to be documented and archived from the date of endorsement of this plan.	Ongoing	Summarise and document developments and activities in the reserve from the Shire and the Sports Aircraft Builders Club records and file appropriately.	Coordinated by Shire with involvement of all stakeholders
Reserve visitors generally do not know of the European history on the reserve and surrounding areas.	Raise visitor awareness of local European history.	Ongoing	Include historical information in the Reserve Management Plan possibly in an Appendix that takes account of European heritage values.	Coordinated by Shire with involvement of all stakeholders

4. Social and Economic Characteristics

4.3 Recreation

In a climate of growing social pressures, sport, recreation, and active lifestyles are vital for individual and community health and well-being. The social, emotional, psychological and physical benefits of sport and recreation are well known.

The recently published State Government document *Strategic Directions for Western Australian Sport and Recreation 2003 - 2005* provides a vision for the sport and recreation industry as follows:

Lifelong physical activity and sport and recreation participation is valued as a cultural trademark of Western Australian society.

This document goes further in providing a state-wide perspective on sport and recreation outcomes as follows:

Table 4: Sport and recreation key areas and outcomes from *Strategic Directions for Western Australian Sport and Recreation*

KEY FOCUS AREAS	OUTCOMES
Industry development	A cohesive industry that provides a framework to optimise the social, economic and health benefits of sport and recreation
Organisational development	Organisations that provide sport and recreation services that are effective, viable and responsive to their stakeholders
Participation	A more physically active society in which sport and recreation maintains and increases its contribution to community well-being
High performance	Excellence is achieved in sporting performance
People development	All providers of sport and recreation in Western Australia are well informed, skilled and resourced
Infrastructure	All Western Australians, regardless of the level at which they participate, their means or geographical location, have access to quality sport and recreation facilities

This document also recognises the following issues as some of the key challenges for the next few years:

- The implementation of legislative reforms to address the public liability crisis and risk management while balancing the interests of both service providers and consumers;
- Increasing the activity levels of target groups with low participation rates (e.g. seniors, people with disabilities, adults with young children, Indigenous people and adolescent girls);
- Contemporary principles of human resource management need to be applied to volunteer personnel to provide improved volunteer management practices; and
- Sport and recreation infrastructure planning and development needs to embrace sustainability principles in design and management.

Building and Facility Standards and Risk management

Currently there are two groups using the Yangedi Reserve both with exclusive lease areas: The Sport Aircraft Builders Club and the Bureau of Meteorology. The Bureau of Meteorology has a communication tower and maintenance access to the facility in the northwest corner. The buildings and facilities provided by the Sports Aircraft Builder's Club are approved through reserve development approval processes, development application, building licences and septic system approvals.

The Sport Aircraft Building Club has provided a high capacity fire hydrant on Yangedi Road for the local bushfire brigade and water filling facilities on the airfield for fire fighting helicopters. FESA makes use of the airfield for training of helicopter crews prior to bushfire season.

Fencing and signage will be developed of a high standard. Areas specifically for the footprint of the communication tower, hangers and sports club facility buildings will need to be identified and confined by building envelopes to control expansion and intensification. Vegetation restoration in areas neighbouring the defined building envelopes will focus on only local native species plantings and the gradual replacement of any introduced non-local species.

Lack of formal risk management plans may expose participants to unacceptable levels of risk. Increasing insurance premiums and stricter attitudes to liability have made risk management plans mandatory for recreational facilities and clubs. Formal risk management plans need to be developed by each user group in cooperation with the Serpentine Jarrahdale Shire.

Reserves Advisory Group and Sport Aircraft Builders Club

Conflict among user groups can lead to group withdrawal from cooperative management of the reserve, either formally or informally. This would cause further difficulties in resolving conflict. In addition, conflicts over the use of resources can lead to ineffective use of those resources and possibly to their degradation. Conflict can arise for many reasons including:

- Long-term lack of resolution to issues and uncertainty relating to future management;
- Misunderstandings of roles and responsibilities;

- Perceptions of inequity; and
- Lack of comprehensive management guidelines from the Shire to the Club

Social and Economic Characteristics: Recreation

Issue	Target	Priority	Strategy	Responsibility
Clubs or organizations operating within Yangedi Reserve may not have a comprehensive risk management plan.	All operating within the Yangedi Reserve on a regular basis to develop and implement a risk management plan.	High	All operating within the Yangedi Reserve to develop and implement plans that identify and minimise risks.	All users with advice from the Shire. Club members selected by club.
Conflict among users can result from a lack of resolution to issues, misunderstandings of roles and responsibilities and a perception of inequity.	<p>Any issues between stakeholders to be raised, and a process for a resolution be agreed to at a meeting after the issue has been identified.</p> <p>No significant issues of disagreement to be allowed to remain unresolved for any unreasonable length of time.</p> <p>Full record of decisions at Reserves Advisory Group (RAG) and Reserves Working group (RWG) meetings minuted, with reciprocal arrangements for viewing minutes from each others meetings where relevant issues are discussed.</p>	Medium	Encourage members of the Reserves Advisory Group and the Sport Aircraft Builders Club to attend each other's meetings.	Shire and all committee, club and group members

<p>Security of the lease for existing lessees for a substantial period of time to include a high standard of management of the area are required</p>	<p>A secure substantial period of lease arrangement with assurance of a high standard of management for the reserve.</p>	<p>Key</p>	<p>Negotiate and prepare a lease to be put in place when the old lease expires which will include this management plan as an Appendices and a sunset clause of lease termination should compliance not be adequate.</p>	<p>Shire in consultation with the club</p>
<p>In maintaining a high standard of development within the reserve the same rigour of approval should apply as in the rest of the Serpentine Jarrahdale Shire.</p>	<p>A high standard of development within the reserve.</p>	<p>Key</p>	<p>Consolidate degraded native vegetated areas through restoration, revegetation and protective demarcation, ensure compliance with current relevant legislation and confine further development to designated areas through establishing building envelopes. (Estimated Cost \$1,000).</p>	<p>Shire in consultation with the club</p>
<p>Ensure that camping and caravan use complies with health regulations.</p>	<p>All camping/caravans associated with events has prior approval from the Shire.</p> <p>Camping/caravans associated with events to be compliant with conditions of camping approval set out by the Shire.</p> <p>All camping/caravans to be more compliant with health and other</p>	<p>Key</p>	<p>Review current caravan, camping, building and effluent disposal systems and require a high standard of performance and compliance to minimise health and environmental impacts:</p> <ul style="list-style-type: none"> • Assess applications from the club for event caravans or camping; • Impose additional approvals for caravans or camping outside 	<p>Shire in consultation with the club</p>

	regulations.		<p>the normal requirements for event planning approvals;</p> <ul style="list-style-type: none"> • Review current caravan use and camping practices in relation to health and other statutory requirements. • Investigate the cumulative impact of existing effluent disposal systems and investigate the feasibility of developing a central effluent disposal system. • Ensure that suitable procedures and materials are in place for treating fuel and chemical spills and septic malfunction. 	
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5. Implementation and Monitoring

Introduction

Various divisions within the Shire will be responsible for implementation and it is anticipated that the recommendations will be acted on over a period of several years.

All recommendations in the report are reproduced in a single table below, along with priorities, responsibilities and potential partners.

Priorities

Priorities have been classified as follows:

- Key – within the next financial year
- High – within the next five years
- Medium – within the next ten years
- Ongoing – as required.

Responsibilities, Monitoring and Review

The Shire of Serpentine-Jarrahdale is responsible for recommendations within this plan. In some instances, the Shire may be assisted in implementing a recommendation by a relevant partner who has an interest or responsibility in the recommendation being considered. There may be opportunities for grant funding to assist in the implement of strategies. The management plan strategies will be monitored, reviewed and the management plan will be revised if necessary. Monitoring will include both the efficiency and effectiveness of the management plan's implementation. Key performance indicators and targets will be included such that no net loss of remnant vegetation area or condition can be reported on. Periodical strategy implementation progress reporting will also occur.

Implementation Monitoring Strategies

Issue	Target	Priority	Strategy	Responsibility
That there may be a continuing decline in the Bush Forever's vegetation area and condition	No Net Loss of Remnant Vegetation area or condition	Ongoing	Target for no net loss of remnant vegetation area and condition and report on this to the Reserves Advisory Committee.	Environmental Services
That the management plan may not be effective in achieving management goals or efficient in terms of action outcome implementation	Progress reporting to ensure efficiency and effectiveness of the management plan and its implementation	Ongoing	Monitor the efficiency and effectiveness of the management plan's implementation through the preparation of strategy implementation progress updates and report on this to the Reserves Advisory Group.	Environmental Services

The best single point of contact will be the Natural Reserves Coordinator. Divisions within the Shire with responsibilities for implementation includes the Sports Aircraft Builders Club and collaborations as follows:

- Engineering Services –
 - Operations, Parks & Natural Reserves Coordinator
 - Water Sensitive Urban Design Project Manager
 - Fire and Emergency Services
- Strategic Community Planning
 - Environmental Services
 - Community Development
- Development Services Directorate
 - Planning
 - Building
 - Health
 - Ranger Services
- Sport Aircraft Builders Club of WA

STRATEGIES

Key strategies for the first year are in bold
Subsequent year costs will be determined on a needs basis

	Strategy	Priority	Cost Estimate	Responsibility
1.	<p>a. Include conservation as a purpose for the reserve and implement a process to inform and advise community group members of current legislation.</p> <p>b. Make reserve users aware of the <i>Policy for Reserve Improvement/Development by the Community</i>.</p> <p>c. Natural Reserve Coordinator to refer all community recommendations and requests for works received under the <i>Policy for Reserve Improvement/ Development by the Community</i> to the Reserve Working Group, and where the recommendation or request is of sufficient magnitude or involves the construction of new infrastructure it is to be referred to the DAU or the Shire Council.</p>	<p>Key</p> <p>Medium</p> <p>Ongoing</p>	<p>\$1,000</p> <p>\$1,000</p> <p>\$1,000</p>	<p>Environmental Services and Operations, Parks and Natural Reserves Coordinator</p>
2.	Reserves Advisory Group meetings to be conducted with broad membership as required in the <i>Planning and Management Framework for Shire Vested Reserves</i> .	Ongoing	\$1,000	Operations, Parks and Natural Reserves Coordinator
3.	Maintain a record of relevant governance training opportunities and communicate this to the community groups.	Medium	\$1,000	Community Development
4.	<p>a. The potential risks of acid sulphate soils are to be communicated to all stakeholder groups that use the reserve. This is to take place frequently enough to ensure the management target when club members change.</p> <p>b. No excavation or dewatering is to take place without consultation with the Department of Environment and Conservation.</p>	<p>Medium</p> <p>High</p>	<p>\$1,000</p>	<p>Environmental Services</p>
5.	Establish vegetation as required to offset emissions.	Medium	\$1,000	Sport Aircraft Club

6.	<p>a. Install meters and monitor water extraction from bore.</p> <p>b. Prepare an inventory of all water consumption on the reserve.</p> <p>c. Prepare a plan to reduce consumption and reuse water by, for example:</p> <ul style="list-style-type: none"> • Investigating the potential for storing rain water for summer use; 	Medium	\$1,000	Sport Aircraft Builders Club
7.	<p>a. Design and implement a water monitoring program.</p> <p>b. Maximise nutrient stripping from flowing surface waters by reviewing, and where possible implementing, best management practices including:</p>	Medium	\$1,000	Water Sensitive Urban Design Project Manager
8.	<p>a. Map and photograph the distribution of dieback within the bushland areas, zone dieback free areas as high conservation and limit access into these dieback free areas.</p> <p>b. Treat vegetation for dieback by spraying and injecting vulnerable plants at 3 to 5 year intervals.</p> <p>c. Raise community awareness through the provision of signs, club news letters, event briefings and other communication techniques.</p> <p>d. Raise the awareness of staff, volunteers and contractors of management zones, restricted access and appropriate dieback hygiene procedures and ensure they are adhered to.</p> <p>e. Minimise risks of disease spread by reconciling the alignment of access ways with dieback fronts, and where necessary constructing barriers to prevent any vehicle or walker from crossing dieback fronts.</p> <p>f. Minimise risks of disease spread by adopting dieback hygiene processes including:</p> <ul style="list-style-type: none"> • Construction and maintenance work to be undertaken in dry conditions only; • Wash-down of vehicles and footwear prior to commencing construction or maintenance work in the bushland area; 	Key	\$6,000	Operations, Parks and Natural Reserves Coordinators and Environmental Services and Sport Aircraft Builders Club

	<p>and</p> <ul style="list-style-type: none"> No introduced material, e.g. soil and pathway surfaces, into the bushland area unless guaranteed dieback free. 			
9.	Put in place and implement a new Comprehensive Fire and Emergency Plan.	Key	\$1,000	Fire and Emergency Services
10.	Monitor Black Cockatoos' usage of the reserve.	Medium	\$1,000	Parks Operations and Natural Reserves Coordinator
11.	<p>a. Map and photograph the distribution of weeds within the bushland areas at least every 2 years and compare areas of infestation with previous maps.</p> <p>b. Prepare and implement a local native species planting and weed eradication program by identifying and prioritising weed affected areas including sources of weed seed outside the bushland area, such that the successful implementation of the program will produce results within target levels of restoration.</p> <p>c. Remove weeds with physical and chemical treatments, in accordance with the weed control program.</p> <p>d. Mulch, brush, seed, or plant treated areas with indigenous plant species appropriate to that pre-existing ecological community.</p> <p>e. Minimise disturbance and weed introduction, and actively remove weeds from the bushland area through:</p> <ul style="list-style-type: none"> Reconciling the number and widths of access tracks with the need to minimise disturbance to the vegetation and soil within the bushland area; Diverting nutrient rich surface drainage away from bushland areas; and Raising the awareness of all users of the bushland area of the importance of minimising the spread of weeds through event briefings and other communication 	<p>High</p> <p>Key</p> <p>Medium</p> <p>High</p> <p>Medium</p>	\$3,000	Operations, Parks and Natural Reserves Coordinator and the Sports Aircraft Builders Club

	techniques.			
12.	<p>a. Maintain records of incidental sightings of feral animal occurrences and monitor the bushland areas of the reserve annually for rabbit burrows.</p> <p>b. Destroy foxes, cats, rabbits and feral bees where required.</p> <p>c. Raise awareness among surrounding landowners about the damage done by foxes and feral cats and other animals on the reserve, and encourage owners to restrain their pets and control pests on their land.</p> <p>d. Disallow the placement of bee hives anywhere on the reserve.</p>	<p>Medium</p> <p>Medium</p> <p>Medium</p> <p>High</p>	\$1,000	Operations, Parks and Natural Reserves Coordinator and Ranger Services
13.	<p>a. Administrate the Reserves Advisory Group with the membership of at least one person who can speak for local Indigenous people as required.</p> <p>b. Consult the South West Land and Sea Council and South West Catchment Council for advice on other appropriate liaison processes and implement as appropriate.</p>	<p>High</p> <p>High</p>	\$1,000	Environmental Services
14.	When naming a place, structure or event give consideration to Aboriginal names, seek advice from Aboriginal representatives and obtain approval for the use of appropriate names from the South West Land and Sea Council and the Shire Council.	Medium	\$1,000	Environmental Services
15.	Develop interpretation information to include in the reserve management plan that takes account of Aboriginal heritage values.	High	\$1,000	Environmental Services
16.	Summarise and document developments and activities in the reserve and file appropriately.	Ongoing	\$1,000	Operations, Parks and Natural Reserves Coordinator
17.	Include historical information in the Reserve Management Plan that takes account of European heritage values.	Ongoing	\$1,000	Environmental Services
18.	All users or organisations that use the Yangedi Reserve to develop and implement plans that identify and minimise risks.	High	\$1,000	Operations, Parks and Natural Reserves

				Coordinator
19.	Encourage members of the Reserves Advisory Group and the Serpentine Sports Aircraft Club to attend each other's meetings as observers.	Medium	\$1,000	Operations, Parks and Natural Reserves Coordinator
20.	Negotiate and prepare a lease to be put in place when the old lease expires which will include this management plan as an Appendices and a sunset clause of lease termination should compliance not be adequate.	Key	\$1,000	Corporate Services and the Sports Aircraft Builders Club
21.	Consolidate degraded native vegetated areas through restoration, revegetation and protective demarcation, ensure compliance with current relevant legislation and confine further development to designated areas through establishing building envelopes (Estimated Cost \$1,000).	Key	\$1,000	Environmental Services Planning Building and Health
22.	<p>Review current caravan, camping, building and effluent disposal systems and require a high standard of performance and compliance to minimise health and environmental impacts:</p> <ul style="list-style-type: none"> • Assess applications from the clubs for normal event caravans or camping; • Impose additional approvals for caravans or camping outside the conditions set for events; and • Review current caravan use and camping practices in relation to health and other statutory requirements. • Investigate the cumulative impact of existing effluent disposal systems and investigate the feasibility of developing a central effluent disposal system. • Ensure that suitable procedures and materials are in place for treating fuel and chemical spills and septic malfunction. 	Key	\$1,000	Planning Building and Health

23.	Target for no net loss of remnant vegetation area and condition and report on this to the Reserves Advisory Committee.	Ongoing	\$1,000	Environmental Services
24.	Monitor the efficiency and effectiveness of the management plan's implementation through the preparation of strategy implementation progress updates and report on this to the Reserves Advisory Group.	Ongoing	\$1,000	Environmental Services

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Appendix 1: Plant Species Recorded in Yangedi Reserve

In spring 2008, a flora survey and monitoring program was initiated by Shire staff at Yangedi Reserve. This consisted of setting up a permanent monitoring site, which consisted of a 10m x 10m quadrat, within which all plant species present were identified. The following table lists all plant species recorded during the survey, and any additional species identified during previous surveys of the reserve.

Plant species
<i>Acacia huegelii</i>
<i>Acacia pulchella</i>
<i>Acacia saligna</i>
<i>Actinostrobos pyramidalis</i>
<i>Adenanthos cygnorum</i>
<i>Adenanthos obovata</i>
* <i>Aira caryophylla</i>
<i>Allocasuarina fraseriana</i>
<i>Allocasuarina humilis</i>
<i>Anigozanthos humilis</i>
<i>Anigozanthos manglesii</i>
<i>Aotus procumbens</i>
<i>Arnocrinum preissii</i>
<i>Astartea fascicularis</i>
<i>Astartea scoparia</i>
<i>Astroloma</i> sp.
<i>Austrostipa</i> sp.
<i>Baeckea camphorosmae</i>
<i>Banksia attenuata</i>
<i>Banksia ilicifolia</i>
<i>Banksia menziesii</i>
<i>Bossiaea eriocarpa</i>
* <i>Briza maxima</i>
* <i>Briza minor</i>
<i>Burchardia congesta</i>
<i>Burtonia conferta</i>
<i>Caesia micrantha</i>
<i>Calytrix angulata</i>
<i>Calytrix flavescens</i>
<i>Calytrix fraseri</i>
* <i>Carpobrotus edulis</i>
<i>Cartonema philydroides</i>

Plant species
<i>Comesperma</i> spp.
<i>Conostephium pendulum</i>
<i>Conostylis aculeata</i>
<i>Conostylis juncea</i>
<i>Corymbia calophylla</i>
* <i>Corymbia citriodora</i>
* <i>Cuscuta campestris</i>
* <i>Cyperus congestus</i>
<i>Dampiera linearis</i>
<i>Dasypogon bromeliifolius</i>
<i>Daviesia</i> spp.
<i>Desmocladius flexuosus</i>
* <i>Disa bracteata</i>
<i>Drosera bulbosa</i>
<i>Drosera glanduligera</i>
<i>Drosera menziesii</i>
<i>Drosera nitidula</i>
<i>Drosera paleacea</i>
* <i>Ehrharta calycina</i>
<i>Eremaea pauciflora</i>
<i>Eriostemon spicatus</i>
<i>Eucalyptus marginata</i>
<i>Eucalyptus rudis</i>
<i>Euchilopsis linearis</i>
<i>Evandra pauciflora</i>
* <i>Gladiolus caryophyllaceus</i>
<i>Gompholobium knightianum</i>
<i>Gompholobium tomentosum</i>
<i>Haemodorum spicatum</i>
<i>Hemiandra pungens</i>
<i>Hibbertia ferruginea</i>
<i>Hibbertia hypericoides</i>
<i>Hibbertia vaginata</i>
* <i>Hordeum leporinum</i>
<i>Hovea trisperma</i>
<i>Hypocalymma angustifolium</i>
* <i>Hypochaeris glabra</i>
* <i>Hypochaeris radicata</i>
<i>Hypolaena exsulca</i>
<i>Jacksonia furcellata</i>
<i>Johnsonia</i> sp.
<i>Juncus pallidus</i>
<i>Kunzea glabrescens</i>
<i>Latrobea tenella</i>
<i>Laxmannia squarrosa</i>
<i>Lechenaultia biloba</i>
<i>Lechenaultia floribunda</i>
<i>Lepidosperma angustatum</i>
<i>Lepidosperma longitudinale</i>
<i>Lomandra</i> sp.
<i>Loxocarya cinerea</i>

Plant species
<i>Lyginia barbata</i>
<i>Lyginia imberbis</i>
<i>Macarthuria australis</i>
<i>Macrozamia riedlei</i>
<i>Melaleuca preissiana</i>
<i>Melaleuca thymoides</i>
<i>Neurachne alopecuroidea</i>
<i>Nuytsia floribunda</i>
* <i>Orobanche minor</i>
<i>Patersonia occidentalis</i>
* <i>Pennisetum villosum</i>
<i>Pericalymma ellipticum</i>
<i>Petrophile linearis</i>
<i>Phlebocarya ciliata</i>
* <i>Pinus pinaster</i>
<i>Podotheca</i> spp.
<i>Regelia ciliata</i>
* <i>Romulea flava</i>
* <i>Romulea rosea</i>
<i>Schoenus</i> spp.
<i>Scholtzia involucreta</i>
<i>Siloxerus humifusus</i>
<i>Stirlingia latifolia</i>
<i>Stylidium brunonianum</i>
<i>Stylidium dichotomum</i>
<i>Stylidium neurophylla</i>
<i>Stylidium repens</i>
<i>Thysanotus sparteus</i>
<i>Thysanotus triandrus</i>
<i>Trachymene pilosa</i>
<i>Tricoryne elatior</i>
<i>Xanthorrhoea gracilis</i>
<i>Xanthorrhoea preissii</i>

- Introduced species

Compiled by Dr Penny Hollick, Serpentine Jarrahdale Shire 2008

Appendix 2: Animal Species Recorded in Yangedi Reserve

Animal species	Scientific name
Short-nosed bandicoot	<i>Isoodon obesulus fusciventer</i>
Western grey kangaroo	<i>Macropus fuliginosus</i>
*Fox	<i>Vulpes vulpes</i>
*Cat	<i>Felis catus</i>
*Rabbit	<i>Oryctolagus cuniculus</i>
Dugite	<i>Pseudonaja affinis</i>
Western tiger snake	<i>Notechis scutatus</i>
Marbled gekko	<i>Phyllodactylus marmoratus</i>
Black-tailed monitor	<i>Varanus tristis</i>

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Appendix 3: Bird Species Recorded in Yangedi Reserve

Birds are well represented, with many resident breeding species on the reserve. Notable among these are the white-browed scrub wrens (*Sericornis frontalis*) and the splendid fairy-wrens (*Malurus splendens*). Both species are identified as having resident, breeding populations in the vegetation community types 3c and 4.

During the period of the survey in 1995, 43 species of birds have been identified as utilizing the available niches on the reserve. Mist-netting, and banding birds trapped, on four occasions has yielded 51 individual birds from nine different species.

Bird species	Scientific name
Black swan	<i>Cygnus atratus</i>
White-faced heron	<i>Egretta novaehollandiae</i>
Great egret	<i>Ardea alba</i>
Straw-necked ibis	<i>Theskiornis spinicollis</i>
Swamp harrier	<i>Circus approximans</i>
Nankeen kestrel	<i>Falco cenchroides</i>
Buff-banded rail	<i>Gallirallus philippensis</i>
Spotted turtle-dove	<i>Streptopelia chinensis</i>
Common bronzewing	<i>Phaps chalcoptera</i>
Crested pigeon	<i>Ocyphaps lophotes</i>
Baudin's black cockatoo	<i>Calyptorhynchus baudinii</i>
Carnaby's black cockatoo	<i>Calyptochynchus latirostris</i>

Galah	<i>Cacatua roseicapilla</i>
Australian ringneck	<i>Barnadius zonarius</i>
Red-capped parrot	<i>Purpureicephalus spurius</i>
Elegant parrot	<i>Neophema elegans</i>
Fan-tailed cuckoo	<i>Cacomantis flabelliformis</i>
Southern boobook owl	<i>Ninox novaeseelandiae</i>
Laughing kookaburra	<i>Dacelo novaeguineae</i>
Sacred kingfisher	<i>Todiramphus sanctus</i>
Rainbow bee-eater	<i>Merops ornatus</i>
Splendid fairy wren	<i>Malurus splendens</i>
White-browed scrub wren	<i>Sericornis frontalis</i>
Brown thornbill	<i>Acanthiza pusilla</i>
Western thornbill	<i>Acanthiza inornata</i>
Yellow-rumped thornbill	<i>Acanthiza chrysorrhoa</i>
Western gerygone	<i>Gerygone fusca</i>
Red wattlebird	<i>Anthochaera carunculata</i>
Brown honeyeater	<i>Lichmera indistincta</i>
New Holland honeyeater	<i>Phylidronyris novaehollandiae</i>
White-cheeked honeyeater	<i>Phylidronyris nigra</i>
Western spinebill	<i>Acanthorhynchus superciliosus</i>
Red-capped robin	<i>Petroica goodenovii</i>
Rufous whistler	<i>Pachycephala rufiventris</i>
Grey fantail	<i>Rhipidura fuliginosa</i>
Willy wagtail	<i>Rhipidura leucophrys</i>

Black-faced cuckoo-shrike	<i>Coracina novaehollandiae</i>
Dusky woodswallow	<i>Artamus cyanopterus</i>
Grey butcherbird	<i>Cracticus torquatus</i>
Western Australian magpie	<i>Gymnorhina tibicen</i>
Australian raven	<i>Corvus coronoides</i>
Richard's pipit	<i>Anthus novaeseelandiae</i>
Welcome swallow	<i>Hirundo neoxena</i>
Tree martin	<i>Hirundo nigricans</i>
Silvereye	<i>Zosterops lateralis</i>