Swan Coastal Plain

Banksia attenuata woodland on sandplains of the northern Swan Coastal Plain Bioregion, W.A. Photo: G.J. Keighery.

Description

Bioregional description and biodiversity values

The Swan Coastal Plain Bioregion comprises the Dandaragan Plateau and the Perth Coastal Plain.

Its climate is classified as warm Mediterranean and rainfall ranges between 1000 and 600mm annually. It includes urban developments associated with the city of Perth, and is dominated by woodlands of *Banksia* and tuart on sandy soils, sheoak on outwash plains, and paperbark in swampy areas.

The colluvial and aeolian sand areas represent three phases of Quaternary marine sand dune development (which provide relief), and include a complex series of seasonal fresh water wetlands, alluvial river flats, coastal limestones and several offshore islands.

Younger sandy areas and limestones are dominated by heath and/or tuart woodlands, while *Banksia* and jarrah-*Banksia* woodlands are found on the older dune systems. Fine-textured outwash plains at the foot of the Darling Escarpment are extensive only in the south, and were once dominated by *Casuarina.obesa*-marri woodlands and *Melaleuca* shrublands. In the north-east, the plain rises to duricrusted Mesozoic sediments dominated by jarrah woodland. The Dandaragan Plateau is the region's north-eastern corner, and is composed of cretaceous marine sediments mantled by sands and laterites. The plateau is characterised by *Banksia* low woodland, jarrah-marri woodland, marri woodland, and by scrub-heaths on laterite pavement and gravelly sandplains. A variety of plants, including tuart are endemic to the region.

Overall condition and trend

The Swan Coastal Plain has been subjected to almost every type of environmental disturbance. The Dandaragan Plateau region has a Continental Stress Class value of two, while the very much larger Swan Coastal Plain region was mistakenly assessed at three (see Glossary). The Swan Coastal Plain's stress class value should be between one and two. The overall condition of dryland (and wetland) areas in the region is classed as degraded, a trend which is likely to continue.

Conservation priorities

The 25 Threatened Ecological Communities in the Swan Coastal Plain are associated with fertile soils of localised extent and occurrence, especially in the southern parts of the region (wetlands, clays and other alluvials and colluvials). An additional 27 other ecosystems are at risk. Of the 53 vegetation associations that occurred in the Swan Coastal Plain region in pre-European times, 18 are centered in the Swan Coastal Plain and have less than 10 per cent of their original area in conservation lands. Eight high and medium priority ecosystems in the Dandaragan Plateau are not represented in conservation lands.

The reserve management standard throughout the Swan Coastal Plain ranges between poor and good. Most of the larger reserves, national parks or conservation parks tend to be relatively well managed and most now have specific management plans. Smaller reserved areas are usually associated with protection of coastal plain wetlands or are small vegetated remnants surrounded by urban and semi-rural land uses.

Processes that threaten the ecological health of CALM-managed lands in this bioregion include:

- increased soil salinity (particularly in the northern part of the bioregion),
- bushfire control,
- feral animal control,
- disturbance by urban development,
- agricultural activities,
- root-fungus (*Phytophthora*),
- weed invasions,
- limited diversity of vegetation communities within reserves and parks,
- a lack of formalised biodiversity monitoring programs, and the costs associated with acquiring land for new reserves and ongoing management.

The Dandaragan Plateau and Perth subregions are both listed as belonging to reservation class four (10 to 15 per cent of the subregions is reserved for conservation, any tenure). However the system is strongly biased and threats are numerous and pervasive.

Nationally important wetlands

The bioregion has 26 nationally significant listed wetlands, with only one on the Dandaragan Plateau. They are in fair to good condition, requiring minimum to significant management for recovery.

Their condition is static, with a declining trend forecast for one wetland. Many threatening processes affect these wetlands, all relating to urbanisation.

Matters which need to be addressed include:

- eutrophication (a high level of nutrient runoff),
  invasion of weed species (particularly grasses from urban gardens),
- increased or decreased flow to the wetlands,
- construction of canals,
- the presence of feral animals,
- shoreline development and
- recreational activities.

Wetlands of regional significance

More than a quarter of the Perth subregion's land area (from Wedge Island to Dunsborough) is wetland. About 4700 basin and flat wetlands are listed, most of which would warrant inclusion as wetlands of regional significance. Because of the impracticality of including them all here, refer to Hill *et al.* 1996a.

Riparian zone

The Moore/Gingin, Hill, Swan, Serpentine, Murray, Harvey, Collie, Preston, Capel and Wellesley rivers flow through the Swan Coastal Plain. Most have their catchment areas in bioregions to the east. Vegetations associated with these rivers and catchments are in poor to fair condition, with further decline in vegetation quality expected. Threatening processes affecting riparian vegetation include:

- broadscale vegetation clearing,
- increasing fragmentation,
- changes in hydrology caused by salinity and altered flow regimes,
- grazing pressure,
- exotic weeds and
- feral animals.

Ecosystems at risk

The bioregion has 25 Threatened Ecological Communities listed under WA legislation. Eleven have been declared as being critically endangered, five as endangered and nine as vulnerable.

An additional 27 ecosystems (seven of which are 'Beard' vegetation associations) are also at risk. A total of 48 ecosystems (vegetation units) have a substantially reduced area on the Swan Coastal Plain. Ecosystems at risk include eucalypt woodlands with shrubby understoreys and other shrublands which includes wetlands.

The wetland environments on the Swan Coastal Plain are under particular threat from altered surface flow regimes and groundwater levels as well as invasion of weed species, disturbance by people, vehicles, and feral animals.

Eucalypt woodlands have been adversely affected by vegetation clearing and fragmentation, weed invasion, feral animals and changed fire regimes. *Banksia* woodlands appear to be under the same pressures as eucalypt woodlands, and several are listed as threatened.

Only two of the 48 ecosystems are showing signs of improvement. Their status is that four are declining rapidly, 27 are declining, 18 are static and one is unknown. Most ecosystems at risk are in fair or good condition, but two – critical weight range mammals and a *Casuarina obesa* association (between Thomas Rd and the Serpentine River) – are currently in a degraded condition.

Forty-one of the Beard vegetation associations in the Swan Coastal Plain region each covered more than 0.1 per cent (1334 hectares) of the region in pre-European times. Seven have less than 10 per cent (the average is 3.5 per cent) of their original area remaining and could be considered at risk. Few are adequately represented in reserves. At best, less than 3.4 per cent of the original area is reserved. Eighteen vegetation associations have between 10 and 30 per cent of the original area remaining and of these, only four have more than 10 per cent of the region's pre-European area in CALM reserves.

Thirty-one vegetation associations are not represented in reserves or are poorly reserved in the region, and are a high priority to include.

Species at risk

Twenty five per cent of the Swan's original mammal fauna is now extinct in the region.

State legislation has listed 15 plants, one reptile (the western swamp tortoise) and one crustacean (the Crystal Cave crangonyctoid) as being critically endangered in the region. Nineteen plants and one bird (the Carnaby's cockatoo) are listed as endangered.

Vulnerable species include 18 plants, four mammals, one bird, and two reptiles. One species *Dasyornis broadbenti litoralis* (rufous bristlebird - western subspecies) is extinct in the region. Fauna is in a poor or degraded condition with the exception of invertebrates, the status of which is often unknown.

There is no clear trend for fauna although only two mammals – the chuditch and the quokka – are improving. The rest are either static or declining and once again, the invertebrate trend is unknown.

Declared rare flora is in fair or good condition but trends vary widely. Targeted survey work has resulted in the discovery of more populations, and thus an improving trend. However the ongoing effects of various threatening processes can lead to declining or rapidly declining trends. Threats to all species at risk include:

- broadscale vegetation clearing,
- increased fragmentation,
- grazing pressure,
- feral herbivores (rabbits),
- feral predators (foxes and cats),
- exotic weeds,
- changed fire regimes,
- pathogens,
- changed hydrology (due to both salinity and altered flow regimes), and
- the recreational use of areas by people.

Management responses

Reserve system

In the Swan Coastal Plain subregion there are 65 nature reserves, eight national parks and two conservation parks. Two reserves at the northern and southern ends of the Dandaragan Plateau make up the vast proportion of the conservation estate in that subregion.

Approximately half the nature reserves in the Swan Coastal Plain subregion are small (less than 100 hectares), with 10 reserves being less than 10 hectares and only eight exceeding 1,000 hectares. In the southern and central zones of the subregion, the areas highly disturbed by urban development and intensive agricultural activities include nature reserves which are frequently associated with the protection of coastal plain wetlands or small vegetated remnants surrounded by urban and semi rural land uses.

The largest reserves are found in the northern part of the Swan Coastal Plain. Only two are less than 700 hectares. These reserves contain coastal and northern sand plain communities grading to low eucalypt woodlands, which are used by commercial apiarists in season.

There are no resident staff on nature reserves. Management visits vary greatly; urban wetland reserves are often frequently visited while others are restricted to a minimum of once a year. Only a small number of reserves have formally approved management plans or interim management guidelines.

In the southern and central parts of the region, because of their small size and position low in the landscape, most reserves have significant weed invasion (especially watsonia, arum, bridle creeper, kikuyu and other annual and perennial grasses). Feral animals (foxes, rabbits and pigs increasingly in the south) in all but the largest reserves are not controlled. Significant problems impede the Department of Conservation and Land Management's ability to undertake control programs in urban and semi urban environments.

Across all areas of the bioregion, *Phytophthora* (dieback) disease is changing the species composition of reserves. In many of the smaller reserves, understorey species composition is poor and in a degraded state resulting from:

- grass and other weed invasion (but some small reserves, including those on the heavy soils of the eastern coastal plain, are able to retain the majority of the original species),
- grazing impacts (including from kangaroos) and
- too frequent fires.

Fire regimes aimed at biodiversity conservation outcomes are generally absent, deliberately lit wildfires can and do occur frequently depending on the proximity of the reserve to urbanization, and formal biodiversity monitoring programs are absent.

Five of the eight national parks have management plans which are being implemented, although targeted ecological monitoring programs are either absent or inadequate. Park areas range from 1,059 to 26,965 hectares, with two of the eight parks primarily servicing the recreation and day visitor requirements of the Perth metropolitan area. Three parks have resident staff. All but two (Lesueur and Moore River national parks) are on or near the coast so the diversity of vegetation communities in these parks is limited.

Feral animal control (fox, rabbit) is carried out in national parks but is hampered by the animals' proximity to urban areas.

Salinity issues are not evident on the western side of the region but the extensive use of ground and surface water resources may affect the health of the vegetation in a number of these parks.

The fungal disease dieback (*Phytophthora* sp, *Armillaria* sp.) is present in all parks. Tuart decline caused by borer (*Phorocantha* spp.) is significantly affecting much of Yalgorup National Park, as well as having an impact on Neerabup and Yanchep national parks. The southern and central Swan Coastal Plain parks often have high weed loads especially arum, bridle creeper and pasture grass species, often associated with riparian and moisture gaining sites.

Fire regimes are often dominated by a requirement to protect adjoining land values.

In most parks formal biodiversity monitoring programs are absent. Neither of the conservation parks have resident staff , although a management plan is available for Leschenault Peninsula. The size ranges from 27 hectares to approximately 1,000 hectares.

Weed invasion along riparian habitats and pasture grass invasion along the boundaries is of concern. Fox and rabbit control is undertaken. Fire regimes currently set at exclusion are yet to be optimised for biodiversity outcomes. Formalised biodiversity monitoring programs are absent but vegetation assessment plots were established during the Swan Coastal Plain Vegetation project and could form the basis of permanent monitoring program.

The bioregion has been assigned a reservation class of four, however the threatening processes are significant enough in the region to warrant a higher priority. However, there are a number of factors which constrain CALM's ability to acquire reserves. The priority issue is that the bioregion has many competing land uses (such as agriculture, mining, urban area and grazing), and the cost of purchasing land close to urban areas is very high.

Off-reserve conservation for species and ecosystem recovery

The major threat to biodiversity of the Swan Coastal Plain bioregion is clearing, often for urban development, and the landscape is highly fragmented. The priorities for off-reserve conservation in the bioregion include a large number of Declared Rare Flora that have populations outside reserves, threatened invertebrates (only found on non-reserved land), diatomite lakes of the Dandaragan Plateau, plant assemblages of the Wannamal Lake system, the assemblage of critical weight range mammals (many of which are now subregionally extinct), remnant vegetation complexes on the Abba Plains, *Agonis* and/or tuart woodlands along coastal wetlands, and a range of Threatened Ecological Communities (such as upland vegetation, wetlands, stromatolites, caves and sedgelands). The most important recovery action for these communities and assemblages is habitat retention and protection through reserves, on other State lands and on private land. Most critically endangered flora and one bird have recovery or interim recovery plans, as do a couple of endangered plants. Only critically endangered TECs have interim recovery plans (drafts in some stages) and no other TECs or ecosystems at risk have recovery documentation.

In addition to habitat retention and protection, other common recovery actions include weed control, feral animal control, revegetation, fencing of remnant vegetation, capacity building with friends groups and Green Corps, reinstatement of hydrology, fire management and research. Aquatic root mat communities require emergency artificial watering during dry seasons as an additional recovery action. There are significant constraints to the application of some necessary recovery actions. The high cost of land associated with urban and semi-rural property reduces CALM's ability to acquire further conservation estate. Remnant vegetation and reserves are generally very small and sometimes highly modified from their original composition. The proximity to cities and urban areas constrain the agency's ability to undertake effective feral animal and weed control as well as fire management. However, the proximity to urban landscapes encourages community involvement, public education and concern regarding conservation issues.

The Swan Coastal Plain requires significant off-reserve effort to prevent the further degradation of ecosystems and species within the bioregion.

Integrated natural resource management (NRM)

Natural Resource Management actions such as soil conservation, land clearing legislation, Bushcare, strategies for local government, and local conservation have been largely ineffective in the Swan Coastal Plain bioregion. Consequently, there are many opportunities for NRM activities to operate more effectively and suggestions include the following:

- Incentives for conservation on private property, such as rate rebates, or additional subdivision rights.
- Legislation - including duty of care for leasehold and other lands - requires more rigorous control and needs to be concentrated on high disturbance areas such as rail and road reserves.
- Institutional reform such as rural reconstruction, industry reconstruction, new tenure and management arrangements.
- Tradable rights: carbon credits would provide impetus to new revegetation efforts.
- Other planning opportunities including local government planning and National Action Plan for Water Quality and Salinity.
- Integration with property management planning, catchment planning and Landcare. Increasing the role of NRM in all agricultural activities.
- Coordinated threat abatement planning.
- Improved local government planning.
- Increased/improved integration with property and catchment management planning.

A number of impediments exist. The current role of Government Departments in NRM and policing of activities such as land clearing is fragmented and unclear. Departments that have responsibility for resource exploitation may also have resource protection roles. Penalties for undertaking activities such as land clearing are comparatively minor and do not have the support of the greater rural community. There is a need to increase awareness of conservation values through education of various industries (mining, agricultural) and the public in general. There is also a high level of property speculation for assumed future urban or rural subdivision at inflated land prices, and a large part of this speculation is on bush blocks. Limited financial resources are also a major constraint. Both subregions are ranked as having major constraint problems to implement effective NRM actions due to the extent of past degradation, competing land uses, high property values, and urbanisation pressures.

Major data gaps and research priorities

As yet there has been no regolith mapping in the Swan Coastal Plain and vegetation mapping is 1:250,000 at best (though some areas have higher resolution but this is not available throughout the bioregion). Most reserves do not have long term survey data for vertebrates and many of the invertebrate specimens have been yet to be sorted, identified or analysed, even though existing data suggests there may be significant species or groups of species within the bioregion. There is relatively little data available on the habitat requirements for virtually all invertebrates, persisting critical weight range mammals and uncommon vertebrate and plant species.

There is no data to provide a regional context (including population trends) for most species, including introduced or pest species. Detailed floristic surveys have been carried out in the southern part of the Swan Coastal Plain which has provided valuable information, especially about Threatened Ecological Communities, however more survey work is required in the northern part of the region. At present there is no quantitative data on the effects of exotic predators, weed colonisation, fragmentation and farm clean up, fire or mineral extraction (on gypsum). To date there has been no systematic monitoring of the effect of salinity on species composition of communities, although 10 bench-mark quadrats have now been established.

References

Hill, A.L., Semeniuk, C.A., Semeniuk, V. and Del Marco, A. (1996a). *Wetlands of the Swan Coastal Plain. Volume 1: Wetland Mapping, Classification and Evaluation - Main Report*. Prepared for the Water and Rivers Commission and the Department of Environmental Protection, Perth, Western Australia.