

## **SLIDE 1: – Saving Western Australia's Threatened Flora**

### **Threats to Western Australia's unique flora**

The Department of Conservation and Land Management is working to combat threats to the state's threatened flora. CALM works in conjunction with many other groups including Commonwealth government, State and local government departments, non-government organisations, community groups, research organisations and other people interested in flora conservation.

### **SLIDE 2: Clearing**

There are many causes of rarity and threats to Western Australia's flora. Land clearing has historically been the largest cause of rarity. There has been extensive clearing of vegetation throughout the south west of the state; in the wheatbelt and Swan Coastal Plain, in particular. These areas contain many plant species that are naturally rare, have very localised distributions, and have small population sizes. The rate of land clearing has now declined in most areas, however, except around centres of human population and other specific areas such as near mine sites.

Although most threatened plant taxa originally became threatened species because of land clearing there are other factors that continue to threaten plant species:

### **SLIDE 3: Weeds**

Weed invasion is now one of the greatest threat to remaining populations of threatened flora. Weeds often invade areas as a consequence of too frequent fire, fertiliser drift, soil disturbance and grazing. Having established, they then compete with the local flora, and increase the fire risk.

### **SLIDE 4: Salinity and water logging**

Salinity and increased water logging of soils are ever increasing threats to the wheatbelt flora, in particular. A number of plant species that are confined to the lower parts of catchments are in decline as a result of rising water tables and increasing salinity. Current estimates suggest that over 400 species may become extinct due to salinity.

### **SLIDE 5: Dieback disease**

Dieback disease caused by the introduced soil-borne organism *Phytophthora cinnamomi* is a major threat to many south-west plants. The disease is particularly noticeable in species-rich areas near the south-coast, such as Stirling Range National Park.

### **SLIDE 6: Grazing**

Grazing and degradation of vegetation by introduced herbivores such as sheep, rabbits, cattle, goats and pigs is a major threat to the state's rare flora.

### **SLIDE 7: Road and rail maintenance operations**

Threatened flora that occur on road verges or along fire breaks in bushland remnants may be damaged or destroyed during maintenance operations. Markers that indicate the presence of threatened flora along tracks, rail and road reserves help ensure that populations are not accidentally destroyed.

### **SLIDE 8: Other Threats**

There are a number of other threats to the State's flora. These include herbicide drift from farming and other activities, loss of pollinators required for plant reproduction, and too frequent fire causing depletion of seed stores and increased weed invasion.

### **SLIDE 9: CATEGORIES OF THREAT**

There are about 13,000 plant taxa in Western Australia. About 350 of these are officially listed as threatened species under the Wildlife Conservation Act. These taxa are further divided into four categories. These are Presumed Extinct, Critically Endangered, Endangered and Vulnerable.

There are another series of taxa that are poorly-surveyed, and are potentially rare or threatened. These are known as Priority Flora. There are currently four categories of Priority Flora P1, P2, P3 and P4, with P1 being flora that are the highest priority for further survey.

### **Management of threatened flora**

In WA, CALM is the department with the legislative authority for flora conservation throughout the State. This is achieved in a number of ways, including the following:

### **SLIDE 10: A system of protected areas**

- **Reservation and management of areas that contain threatened flora**

There are three particularly flora-rich National Parks in WA (Stirling Range, Fitzgerald, and Lesueur). Together, these parks contain thirty percent of the south west's flowering plant species. In addition, there are hundreds of other National Parks and Nature Reserves that help to protect the habitats of the state's flora.

### **SLIDE 11: Management Programs**

- **Designing and implementing management programs for threatened flora to prevent extinctions, and halt declines**

CALM has developed Regional and District Flora Wildlife Management Programs that prescribe the work necessary to conserve Threatened and Priority flora. There are also specific plans in place for managing some of the state's most Critically Endangered and Endangered flora. These plans, known as Recovery Plans, describe threats, and set priorities for management and research. Currently most of CALM's limited resources are directed towards management of Critically Endangered flora.

Weeds are one of the greatest threats to populations of threatened flora, so weed control is frequently an essential management action. CALM is researching the best ways of controlling weeds.

#### **SLIDE 12:**

- **Preventing the spread and impact of dieback**

CALM is investigating ways and means of controlling and combating dieback disease. In particular, the chemical Phosphite has proved successful in averting the devastating impacts of the disease. This chemical inhibits the pathogen and triggers the plant's defence systems. CALM has also developed strict hygiene measures to prevent the spread of the disease.

#### **SLIDE 13:**

- **Collecting and storing seed**

The seed of rare flora are collected and stored at CALM's Threatened Flora Seed Centre, and at the Botanic Gardens and Parks Authority seed store. Under a recent agreement, some seed will also be stored at Kew Gardens in Britain. The seed is used for translocations and research. In particular, plants restricted to narrow road or rail reserves, or in severely degraded areas are propagated from seed or cuttings as a conservation measure. Seedlings are then planted out to supplement existing populations or to establish new populations in more secure areas.

#### **SLIDE 14:**

- **Conducting research into the reasons for rarity**

Many populations of threatened flora are no longer able to reproduce successfully. This can be due to lack of pollinators caused by habitat destruction, lack of triggers such as fire or other disturbances, depletion of the seed store through too frequent fire, competition from weeds, and many other reasons. CALM is researching many of the reasons for increasing rarity.

### **EXAMPLES OF RECOVERY OF RARE FLORA**

#### **SLIDE 15:**

***Grevillea maccutcheonii* (McCutcheon's grevillea) South West Capes District**

This attractive red flowered grevillea is confined to ironstone soils near Busselton. The ironstone habitat was almost all cleared for agriculture, and many of the remaining patches are threatened by dieback disease. In 1998, only 10 plants of McCutcheon's grevillea survived on a single degraded road verge. CALM has purchased land adjacent to the known population and an additional block nearby that contains the right ironstone soil type. CALM staff and volunteers have planted several hundred seedlings grown by BGPA from seed collected from existing plants into these sites.

An Interim Recovery Plan has been developed for the taxon, and is being implemented by the Central Forest Region Threatened Flora and Communities Recovery Team. The team includes members of the local community. The IRP outlines future management of the species, including regular monitoring of the health of the wild and translocated plants, weed control and treating the sites with phosphite if dieback is found to be impacting.

**SLIDE 16:**

***Calytrix breviseta* subsp. *breviseta* (swamp star flower) Perth District**

The types of wetland that occur in the Kenwick area in which this starflower is found have been almost totally cleared. Consequently, the subspecies is only known from two populations totalling around 1,000 plants that occur over a total range of one kilometre. Major threats are too frequent fire, clearing, weed invasion, and possibly dieback.

The Swan Region Threatened Flora and Communities Recovery Team, which includes members of the local community, is overseeing the implementation of the Interim Recovery Plan for the subspecies. As part of the plan, seed has been collected from the wild populations, in readiness to supplement existing populations, or to translocate into similar habitat nearby. A fire management strategy is being developed. The private land on which the populations of the starflower occur has been declared a Planning Control Area, and is being progressively purchased by the government to be set aside as a conservation reserve. Other future actions include monitoring existing populations, routine weed control, and implementing an appropriate fire management strategy.

**SLIDE 17:**

***Acacia cochlocarpa* subsp. *cochlocarpa* (spiral-fruited wattle) Moora District**

The spiral-fruited wattle is only known from one population with a total of 132 plants north of Watheroo. The plants occur on a road verge and adjacent private land, and are mainly under threat from road maintenance activities.

An Interim Recovery Plan has been developed for the subspecies, and this is being implemented by the Moora District Threatened Flora Recovery Team. As part of the plan, seed has been collected from the remaining population, and a proportion of this has been used in experimental translocations trialing direct seeding and young plants. The wild and translocated populations are monitored regularly and CALM staff maintain contact with both Shire staff and the owner of land on which the subspecies occurs, to help ensure the population is not accidentally destroyed.

**SLIDE 18:**

***Caladenia elegans* (elegant spider orchid) Geraldton District**

The elegant spider orchid is known from eight populations totalling about 1,000 plants growing near Northampton. These are mainly confined to road reserves in areas where much of the natural bushland has been cleared for agriculture. The orchid is under threat from road maintenance activities, clearing, water erosion and weeds.

The Geraldton District Threatened Flora Recovery Team, which consists of representatives from CALM, community groups, pastoralists, local shires and various State government organisations, is overseeing the implementation of these actions. Management includes control of weeds, redirecting water flow, fencing populations to protect them from grazing, monitoring feral pig activity, habitat rehabilitation, conducting further surveys, collection and storage of seed and researching the biology and ecology of elegant spider orchid.

**SLIDE 19:**

***Lasiopetalum pterocarpum* (wing-fruited lasiopetalum) Mundaring District**

The wing-fruited lasiopetalum is known from only one population of ten plants near Serpentine. Although the population is located in a National Park, it is under threat from weeds, trampling by park users and too frequent burning. A wildfire, believed to have been lit by vandals, burned half of the known population in 1999, just after seed had been collected from them.

An Interim Recovery Plan has been developed for the species, and is being implemented by the Swan Region Threatened Flora and Communities Recovery Team. As part of the plan, some of the seed collected from the remaining wild population has been germinated in preparation for a translocation to supplement the wild population, and to establish a new population at a different location. The 1999 fire provided a good opportunity to get weeds under control, and there has been an intensive weed control program since the fire. A translocation is being undertaken in 2001.

**SLIDE 20:**

***Boronia exilis* (Scott River boronia) Blackwood District**

Scott River boronia is known from five populations totalling over 2,000 plants. Prior to the Interim Recover Plan that was completed in 1999, only one population of 100 plants was confirmed. The Central Forest Region Threatened Flora and Communities Recovery Team is implementing the plan. This plan specified the need for survey, and in implementing the plan, CALM staff located a further three populations, and over 2,000 plants.

Other threats to the species include too frequent fire, road maintenance activities, and possibly, dieback. CALM has placed DRF markers alongside the roads where the species occurs, has developed a fire management strategy and is applying dieback hygiene procedures to areas where the species occurs.

**SLIDE 21:**

***Daviesia cunderdin* (Cunderdin Daviesia) Merredin District**

Cunderdin daviesia is known from a single population totaling just three adult plants and a few seedlings. All occur on a weedy, very degraded road verge just three metres wide. CALM has developed an Interim Recovery Plan for the species that is being implemented by the Merredin District Threatened Flora Recovery Team. A poster illustrating the species and providing information on it has been prepared and circulated. Numerous surveys have been conducted, but no new populations have been found.

Threats are numerous and include little remaining and severely degraded habitat, weeds, chemical overspray, slashing during road maintenance and lack of recruitment. Recovery actions include weed control, habitat rehabilitation, seed collection, experimental fire to stimulate soil-stored seed and possible future translocation.

**SLIDE 22:**

***Darwinia carnea* (Mogumber Bell) Narrogin and Moora Districts**

Mogumber Bell is known from two widely separated locations - near Narrogin and Mogumber. Just four populations containing around 250 plants occur within these areas, and several appear to be in decline. CALM has published an Interim Recovery Plan for the species that is being implemented by the Narrogin and Moora Threatened Flora Recovery teams. A poster illustrating the species and providing information on it has been prepared and circulated. Survey in 1999 resulted in the discovery of new plants, extending an existing population.

Threats include poor recruitment, plants being eaten by kangaroos and seed being picked out by parrots. Recovery actions completed include the fencing of all populations to protect the species from grazing and the collection of seed and cutting material. Rabbits have been controlled at the Narrogin population. A translocation was undertaken in June 1999 using plants grown by the Botanic Gardens and Parks Authority. These plants were planted into two sites in the Narrogin District and currently (November 2000) appear to be doing well.

**SLIDE 23:**

***Caladenia hoffmanii* subsp. *graniticola* (granite spider orchid) Narrogin and Katanning Districts**

Granite Spider Orchid is one of two subspecies of *Caladenia hoffmanii* and by far the rarest. It is known from just three granite outcrops in the central Wheatbelt. Many surveys by CALM staff and members of the WA Native Orchid Study and Conservation Group have failed to locate further populations. CALM is preparing an Interim recovery Plan for the subspecies that will be implemented by the Narrogin and Katanning Threatened Flora Recovery teams. A poster illustrating the species and providing information on it is in the process of being prepared.

Threats include poor flowering and recruitment, small population size, weeds, drought and grazing. Surveys will be carried out in Spring 2001 in the hope of finding new populations. Seed will be collected and stored at the Botanic Gardens and Parks Authority.

**SLIDE 24**

***Tetratheca aphylla* (Bungalbin tetratheca) Goldfields region**

Bungalbin Tetratheca is known from just a few populations on banded ironstone hills north of Koolyanobbing. It is likely that it is a naturally rare species that has always been restricted to these hills as, although similar hills nearby are uncleared, it has not been found elsewhere.

The main threat is mining of the hills and a conservation reserve in the area, which accommodates associated rare species, would help ensure its long-term conservation.

## **SLIDE 25**

### ***Caladenia winfieldii* (Winfield's spider orchid) Southern Forest region**

This attractive spider orchid is known from two populations in State Forest near Manjimup. The habitat is well protected and the populations have increased in size in recent years. During recent surveys the second population was found several hundred metres north of the first. CALM has published an Interim Recovery Plan for the species that is being implemented by the Southern Forest Region Threatened Flora recovery Team. A poster illustrating the species and providing information on it has been prepared and circulated.

Threats have been largely ameliorated. Recovery actions implemented so far include the erection of pig exclusion fences, hand pollination and seed collection and storage at the Botanic Gardens and Parks Authority. An associated symbiotic fungus required for the growth of the orchid has also been collected and is currently being cultured by Kings Park research staff.

#### **CONCLUSION:**

There is a rich and varied flora in Western Australia. Many of the State's species require conservation actions to ensure they do not become extinct. While the recovery process is being led by CALM, flora conservation is being achieved with the cooperation and help of many community groups, other government departments, research institutions and other interested individuals. Some of the achievements in flora recovery have been discussed here, and will always include the need to manage the habitat, and for continued public support and participation.

## **SLIDE 1: SAVING WESTERN AUSTRALIA'S THREATENED ECOLOGICAL COMMUNITIES**

As recently as 1994 people began to recognise that, in addition to species conservation, there is also a need to conserve whole communities of species that occur together. This is partly because we know it would be impossible to put conservation efforts into every single species individually. By conserving groups of species that occur together as communities, we can make a start to looking after some of the other groups of organisms that are too small and too numerous to have individual conservation efforts directed at them. Also, a community is much more than just the sum of its parts: the relationships and processes are also important.

## **SLIDE 2: DEFINITION OF ECOLOGICAL COMMUNITY**

An ecological community is basically a recognisable group of species that occur together. The scientific definition is "a naturally occurring biological assemblage that occurs in a particular type of habitat."

## **SLIDE 3 AND SLIDE 4: CATEGORIES OF TECS**

Like threatened flora and fauna, Threatened Ecological Communities are ranked according to the level of threat into the following categories:

**presumed totally destroyed -**

**critically endangered**

**endangered –**

**vulnerable**

**data deficient** - where there isn't enough information to assign a threat category.

**lower risk** - where communities are not believed to be currently under threat

A number of different types of threatened ecological communities have been already identified in Western Australia. Besides plant communities, there are invertebrate communities in cave systems and in mound springs. There are also threatened microbial communities. One example of this type of community is thrombolites - the strange structures that you may have seen at Lake Clifton near Mandurah, that look much like the stromatolites in Shark Bay.

Here are some specific examples of threatened ecological communities that occur in Western Australia.

## **SLIDE 5: GINGIN IRONSTONE COMMUNITY**

The ironstone soil type is very restricted and occurs in a number of areas in the south west of the state. These ironstones are believed to have been laid down in bogs. This first example of an ironstone plant community occurs in the Gingin area.

The Critically Endangered Gingin Ironstone community probably only ever covered a few hundred hectares. The community was extensively cleared for agriculture very early on as it is located on the heavy soils of the eastern side of the Swan Coastal Plain. This community is the only one on the Swan Coastal Plain that has daisies dominating the understorey. It is flooded for three or more months a year, and consequently contains a number of aquatic plants, but is really distinguished by the suite of daisies and other herbs in the understorey.

There is only one area of about 55 hectares of the community left uncleared. This was on private land, but was purchased by Environment Australia and CALM and is now a Nature Reserve. The site really only needed fencing from stock and this has been done. The area is being managed under an Interim Recovery Plan drafted by CALM and is improving in condition over time.

#### **SLIDE 6: BUSSELTON IRONSTONE COMMUNITY**

This Critically Endangered community in Busselton is also located on rich red ironstone-derived soils. The community used to cover 1200 ha, but through clearing for agriculture now only covers about 90 ha. A total of nine threatened plant species and seven others that are on CALM's Priority list also occur in this ironstone community. The remaining 90 ha is therefore extremely significant in terms of the conservation of both threatened flora and ecological communities. These remaining areas are so significant that two blocks of land that contain the community have been jointly purchased by CALM and Environment Australia as nature reserves.

Besides clearing, the community is also suffering from the impacts of dieback disease and too frequent fire. CALM is spraying the community with phosphite to help combat the disease, and fire management strategies have been developed for all areas of the community.

#### **SLIDE 7: MICROBIAL COMMUNITY LAKE CLIFTON**

The microbial communities are relicts of the most ancient forms of life on earth. Some fossils of microbial communities in WA are the oldest signs of life on earth – they are about 3.5 billion years old. The communities are a complex group of microbes that take minerals from the water to form odd structures - like the well known ones at Shark Bay.

The difference between thrombolites and stromatolites is that thrombolites have a clotted internal structure, whereas stromatolites have a layered or laminated internal structure. Some of the microbialites that are under threat in the south west are at Lake Clifton and Lake Richmond - these are both thrombolitic. Stromatolites occur at Shark Bay and Lake Thetis, but only the stromatolites at Lake Thetis near Cervantes appear to be under threat

Lake Clifton, which is about 100 kilometres south of Perth, contains a quite spectacular looking microbial community that is Critically Endangered. These structures are under threat from changes to water quality. The algae *Cladophora* is growing in the lake and smothering the thrombolites. This alga is able to thrive because of increased nutrients being washed from surrounding land with uses like hobby farms, and increased sewage from increasing numbers of houses. Other factors such as abstracting too much water from bores near the lake may also impact the thrombolites.

So, even though the Lake Clifton thrombolites are inside Yalgorup National Park doesn't necessarily mean they are safe. Land uses in the rest of the catchment of the lake outside of the park also have an impact in this case. Land Use planning near the lake, and careful management by neighbours, will be extremely important in determining the fate of the Lake Clifton thrombolites in future.

### **SLIDE 8. MOUND SPRINGS**

These Critically Endangered springs occur at a junction in soil types on the Swan Coastal Plain. This is where the water in the sandy soils in the Gnangara Mound flowing east towards Ellen Brook meet the impermeable clay soils near the scarp and the water is forced up under pressure to the surface as springs.

These springs used to be reasonably common between about Bayswater and Muchea. Most of them have been cleared and packed with limestone as they mainly occurred in agricultural areas and were too wet to be of use for grazing or cropping. We now know of only three areas that contain vegetated springs, one of which has been purchased by CALM and Environment Australia and is now a nature reserve.

The springs accumulate peat over time. This is a great place for invertebrates and plants that rely on moisture to survive during climate changes and general dry spells. Because of this there are unusual groups of plants and invertebrates surviving there - either way outside their normal range or having died out everywhere else. Some of the invertebrates that occur in the springs are relicts from when Australia was part of the supercontinent - Gondwana and when WA was a lot wetter.

The slide is the area recently purchased as a Nature Reserve before it was burnt by the previous owner. The scrub was very thick

### **SLIDE 9: THE SAME MOUND SPRING AREA AFTER BEING BURNT**

This is the same spring area after the burn. The canopy is opened up and cattle could then get in. Weeds were also a lot more noticeable after the fire - kikuyu and *Isolepis prolifera* - (matted club rush?) in particular. The peat mounds themselves can also burn and be destroyed by fire - if fire occurs when the area is dry.

## **SLIDE 10: MOUND SPRING AREA AFTER FENCING**

CALM built a fence around the mound spring area soon after CALM and Environment Australia had purchased it. This occurred in May 1996, and the vegetation is now regenerating well. CALM's Perth District are growing local species to revegetate the peat mounds and are revegetating the dune that acts as a buffer to the springs and is part of the spring's catchment.

In collaboration with CALM, a Green Corps Team has also done some weed control and collected seed for rehabilitation work on the spring and the adjacent dune. The works are being done as part of an Interim Recovery Plan drafted by CALM that specifies methods of conservation management of the springs into the future.

## **SLIDE 11 – CALLITRIS COMMUNITY GARDEN ISLAND**

The *Callitris preissii* (Rottnest Island Pine) - *Melaleuca lanceolata* (Rottnest Tea Tree) community is only known from Garden Island, at Woodman Point, and a degraded area at Peppermint Grove. The community has been destroyed on Rottnest Island and most of the areas where it occurred on the coast near Perth through clearing and too frequent fires. There is about 400ha of this community left and it is classified as vulnerable.

The community is threatened by fire, as the *Callitris* is killed by fire, but can only reproduce by seeding. However, it must reach maturity before it can reproduce, so too frequent fire is very damaging.

The *Callitris* community is a simple one with *Callitris* and Rottnest Teatree *Melaleuca lanceolata* dominating the overstorey and herbs and mosses underneath. The area of the type in best condition is on Garden Island. The introduced Arum lily used to be common there but has been pretty much eradicated through weed control done mainly by CALM rangers. The island has a management plan that specifies areas where no fire should be allowed to occur.

## **SLIDE 12: CALLITRIS COMMUNITY WOODMAN POINT**

This is the *Callitris* community at Woodman Point. You can see the predominance of weeds in the understorey. A local Friends group helps manage this area. They gather seed from the *Callitris* and are regenerating the area. Bridal creeper has invaded this site in particular, and the Friends group have received some grants to do weed control on that species.

## **SLIDE 13. LAKE TOOLIBIN COMMUNITY**

This wheatbelt wetland community is technically named the 'Perched wetlands of the Wheatbelt region with extensive stands of living sheoak and paperbark across the lake floor (Lake Toolibin)'

Toolibin Lake in the Wheatbelt is another critically endangered community. It is one of the last remaining freshwater wooded wetlands in the wheatbelt that hasn't succumbed to salinity and water logging as a result of clearing in the catchment.

Around 30 families who have farms located in the Toolibin Catchment are part of a Landcare Group and are involved in actions that will protect their own land, and eventually the lake, against the threats of salinisation and water logging. The actions are part of a recovery plan for the lake that was developed with the input of stakeholders. The plan is helping to prevent the lake's rapid deterioration. CALM and Agriculture WA coordinate work in the catchment and emergency actions to recover the lake. Funds for the work are supplied by, CALM, Environment Australia, ALCOA and other groups. Some of the major recovery actions include large-scale replantings in the catchment, drainage control, pumping and redirecting water from under the lake.

#### **SLIDE 14: TAARBLIN LAKE**

This lake is immediately downstream of Toolibin. This shows how Toolibin would end up with no remedial work on the catchment.

#### **SLIDE 15 LAKE BRYDE**

Lake Bryde and East Lake Bryde are two of the few remaining freshwater wetlands in the Wheatbelt. They are the only known wetlands to contain and be dominated by both the Lignum, *Muehlenbeckia horrida* subsp. *abdita*, and an inland variety of the samphire, *Tecticornia verrucosa*. Threats include salinity and water-logging. Already plants at the wetlands' edge are dying and salt tolerant species have begun to invade the wetlands.

Both Lake Bryde and East Lake Bryde are part of a Natural Diversity Recovery Catchment declared under the State Salinity Strategy. A Recovery Team has recently been set up to deal with both in-wetland and whole-of-catchment processes. The Team includes members from the local community representing the three sub-catchments within the recovery catchment.

#### **CONCLUSION:**

Five blocks of land containing threatened ecological communities (totalling about half a million dollars worth) have now been purchased and there have been many other major efforts at conservation of areas assessed as threatened. There are already a number of areas that have not been cleared as a result of their significance being recognised as threatened ecological communities. Many other threatened ecological communities are now being managed for conservation - in terms of fencing, weed control and fire management. The Ministry for Planning and Department of Environmental Protection are also considering threatened ecological communities when assessing development proposals, and the threatened ecological community information is included in Bush Forever.

The recognition of the importance of threatened ecological communities by community groups and individuals, and industry, and their involvement in conserving them is also extremely important for their future conservation.

All of these processes mean that the significance of threatened ecological communities is likely to be more recognised in future and that their conservation is becoming an important part of biodiversity conservation in Western Australia.