



Dieback and Invasive Weed Management Plan CPS 9524/1



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1 Introduction:

The Shire of Esperance is renowned for its high biodiversity, it contains over 3000 known flora species, and is part of the one of the world's 34 biodiversity hotspots. It contains many endemic and rare and priority flora species, as well as threatened ecological communities (TECs) including large areas of the Proteaceae dominated Kwonkgan Shrublands TEC. Two of the biggest threatening processes to the biodiversity and native vegetation within the Shire of Esperance include invasive weeds and dieback.

The Shire of Esperance is made up of two interim biogeographic regions; The Esperance Sandplain and the Esperance Mallee. The Esperance Sandplain biogeographic region consists of sandy and sandy-duplex soils, experiences annual yearly rainfall in the range of 400mm in the north to 600mm in the south and vegetation is dominated by mostly mallee-heath interspersed with granite and wetlands. The Esperance Mallee biogeographic region consists of heavier soils on a level to very gently inclined internally drained landscape, it experiences annual yearly rainfall in the range of 400mm in the south to 300mm in the north and vegetation is dominated by mostly eucalypt-mallee with some Eucalypt woodlands and *Banksia media* heath and well as samphire dominated salt-lake communities. The location of project areas within these two biogeographic regions affects dieback susceptibility and the types of weeds that are also a threat.

The Shire of Esperance manages over 380 reserves and maintains over 4,800km of sealed and unsealed roads and roadside reserves. In 2009, The Shire of Esperance published its Environmental Weeds Strategy. This strategic document was undertaken to assist in the management and control of environmental weeds across the Shire of Esperance. The strategy focused on four main components which were:

- Identification of priority environmental weeds and their management;
- Identification of priority bushland reserves and road reserves and their management;
- Strategic approaches for improved weed management; and
- Financial and human resourcing.

The priority invasive weeds identified through this process were: Spiny Rush, *Juncus acutus*; Geraldton Carnation Weed, *Euphorbia terracina*; Pyp Grass, *Erharta villosa*; Victorian Teatree, *Leptospermum laevigatum*; African Boxthorn, *Lycium ferocissimum*; Watsonia species; African Lovegrass, *Eragrostis curvula*; Cumbungi, *Typha sp.*; Caltrop, *Tribulus terrestris*; Golden Wattle, *Acacia pycnantha* and other eastern states Acacia species.

In 2006 a survey of Roadside Conservation Value in the Shire of Esperance, was completed by the Esperance Wildflower Society funded by the Shire of Esperance. This report covered the surveying (from 1999 to 2002) of the weed infestation level and other attributes of vegetation conservation values for all Shire of Esperance roadside reserves in the rural zone (townsite areas excluded, both sides of every road in the Shire). This data was also mapped into a GIS system and is held by DBCA and the Shire of Esperance, and has been recently incorporated into the 2020 updated Esperance Weeds database used by a variety of land managers and not for profit organisations. In the 2006 report the occurrence of specific weeds along roadsides in the Shire of Esperance was found to be:

- African Lovegrass - 4990km
- Veldt Grass - 1 605km
- Victorian Tea Tree - 751 km
- Bridal Creeper - 420km

- African Boxthorn - 91 km
- Other Weeds - 2821km

This report (although the data is now 20 years old) shows the high extent of infestation of some weeds. The only priority invasive weeds that have reduced in extent over the 20 year period is African Boxthorn, *Lycium ferocissimum* and Caltrop, *Tribulus terrestris* as well as Watsonia and Cactus. This is due to targeted control programs undertaken by the Shire of Esperance, Esperance Weeds Action Group and South Coast NRM.

Bridal creeper rust fungus *Puccinia myrsiphylli* was introduced to Australia in 2000. The Shire of Esperance Environmental Officers distribute the rust to uninfested areas during the winter months. Most infested areas now have the rust fungus present and the rate of spread of this weed and the vigour in which it competes with native vegetation has been dramatically improved throughout the shire through this program.

The extent of Victorian Teatree, *Leptospermum laevigatum* and some of the grass weeds has increased substantially over the last 20 years. The Shire of Esperance rural slasher that slashes road verges has only had an air compressor on the slasher ute since around 2009 (approx. 12 years). This clean down device has since reduced the rate of spread of these weed seeds being spread by slashing operations which was one of the main spread vectors.

The weedy eastern states Acacia species, have substantially increased in distribution in the Esperance Shire over the last 20 years, mostly due to distribution of seeds by birds and farmer roadside vegetation burning. The Shire of Esperance is a key project member on the Esperance Weeds Action Group State NRM Weedy Wattles project, currently mapping extent and prioritising control of these woody weeds.

All of the project areas under CPS 9524/1, apart from Site F, are adjacent to farmland in road reserves ranging from 20m to 200m wide. As a result, agricultural weeds in adjacent paddocks occur in these project areas spread from rural machinery and agricultural operations.

Gravel and limestone for most of the Shire of Esperance Projects is also sourced from on-farm supplies. Apart from Site A Cascade Rd, (which gravel is planned to be extracted from the gravel pits proposed) all other projects under CPS 9524/1 will have gravel or limestone sources from nearby on farm pits. To reduce the spread of agricultural weeds from these pits to the project areas the Shire of Esperance follows the following protocols; topsoil (containing the majority of weeds) is removed first and placed in a separate pile, gravel or limestone is then pushed up onto clear ground and is used within a few months (maximum) of being pushed. This reduces the amount of weed seed in the gravel to almost zero. In the rare case that gravel piles exist on farm land that have been pushed up longer than 4 months prior, and windblown weeds have blown into the stockpile, the Shire of Esperance will spray the stockpile with herbicide prior to transporting to the project area.

Phytophthora dieback is one of the biggest threats to biodiversity in Western Australia and has now spread throughout the south-west from Eneabba to Esperance. Phytophthora have likely been established in the Shire of Esperance since the 1960's (Massenbauer, 2017). Phytophthora dieback is a deadly, introduced plant pathogen and is unusual as it has animal, fungal and plant characteristics. Scientifically known as the group of *Phytophthora* species, it is classified as a water mould belonging to the new ancestral kingdom Chromista. Strict hygiene and effective management are essential to minimise the risk of dieback spread. In most cases, removing all mud and soil from footwear, vehicles, machinery and equipment minimises the risk of spreading the plant pathogen.

Road maintenance, and construction carries a high risk of spreading Phytophthora dieback and the Shire of Esperance, reduces this risk by adhering to the following hygiene guidelines recommended by Project dieback:

Where possible, the Shire of Esperance will during road maintenance and construction activities:

- Schedule activities in high dieback risk areas for low rainfall months and avoid wet or muddy conditions.
- Be aware of Dieback Free and Infested areas prior to activities commencing.
- Clean all vehicles and equipment prior to starting works at a new location
- Regularly clean all vehicles and equipment, to keep in a clean condition
- Stay on established roads and tracks.

The Shire of Esperance uses a combination of dry clean and wash-down methods. Dry clean is where compressed air or a spade/brush is used to blow weeds and dirt from machinery. Wash-down is where pressurised water spray unit to remove any remaining soil, mud and plant material. Wash-downs need to be done on a hard, well drained surface in low lying areas (e.g. road, ramp or grate). Shire of Esperance Environmental Services staff and Operations Supervisors have completed Dieback Green Card Training.



Figure 1. Shire of Esperance Depot vehicle washdown bay



Figure 2. One of the Shire of Esperance’s fleet of mobile washdown facilities

All project sites are checked for the most up to date disease status using Project Dieback’s Dieback Information and Delivery Management System (DIDMS). DIDMS is a user registered web based platform for storage, viewing, basic mapping and sharing of spatial Phytophthora dieback information. Environmental Officers also inspect for visual signs of Dieback during flora surveys.

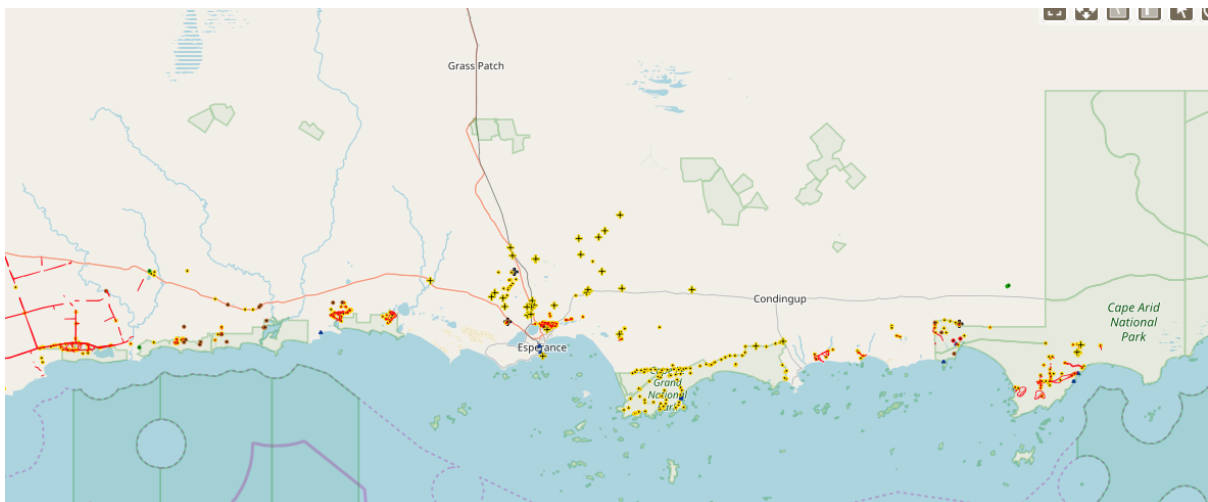


Figure 3. DIDMS map of known dieback occurrences within the Shire of Esperance

In 2017, South Coast NRM carried out the ‘South Coast Coastal Corridors’ Project. Amongst other threatening processes to remnant vegetation within the 15km buffer from the southern coast line, the project developed a Phytophthora Hazard Dispersion Model

as part of Project Dieback. This GIS soil borne Phytophthora Hazard Dispersion tool was developed to help quantitatively and qualitatively link hazard spread pathways of a known plant disease occurrence to a susceptible biodiversity value. The model is not a biological disease occurrence model, but a scenario hazard assessment tool. The hazard dispersion tool estimates areas geographically linked to a known soil-borne disease point via spread pathways over time using a cost distance method.

The 15 km buffer Coastal Corridor study area is susceptible to the spread of various species of soil-borne Phytophthora. About 20 per cent of the study area is a Phytophthora dispersion hazard and 88 per cent of the existing road, track, and trail network are linked to a known disease point. Of these roads, tracks and trails 82 per cent are unsealed which poses a major hygiene risk to susceptible vegetation types. The Phytophthora dispersion hazard roads are mapped in DIDMS and this provides a useful reference tool to plan operation risk reduction measures.

Table 1. CPS 9524/1 project areas assessed against the Phytophthora dispersion hazard model

Site	PC infested within 50 years as per model	Dieback susceptible vegetation
Site A – Cascade Road and Gravel Pits	Outside PC dispersion model boundaries	yes
Site B – Cascade Rd Bend	Outside PC dispersion model boundaries	yes
Site F - Wharton Road	Dieback already present adjacent to project area. Extreme	yes
Site G – Neds Corner Road	Outside PC dispersion model boundaries	yes

Based on these risk ratings, if there are dieback susceptible vegetation types within a project area and only moderate to no risk of dieback getting there, extreme caution should be taken not to introduce dieback into the site.

Sites with extreme risk, may already have dieback within them and extreme caution regarding moving vehicles and equipment out of that site needs to be implemented.

Regular training is carried out by Environmental Officers to rural maintenance and construction teams on invasive weed and dieback management and risk reduction.

Specific site weed and dieback management at each CPS 9524/1 site is detailed below.

Site A - Cascade – Rollond Gravel pit

There is a very low level of weed invasion across the entirety of the proposed 'Site A – Cascade Road and Gravel Pits areas. Overall only, 7 invasive species were identified within the project area (Table 1). Of these, the most extensive and of serious concern were Golden Wattle (*Acacia pycnantha*) and African Love Grass (*Eragrostis curvula*). As previously detailed in the rehabilitation plan for this pit, the single *Acacia pycnantha* tree within the previously disturbed section of the Rollond road pit, has been removed and the site will be monitored to ensure no germination from the soil seed bank. If *A. pycnantha* plants are present post-rehabilitation then they will continue to be removed, either manually or chemically. Additional weed issues are unlikely to be a problem due to the use of weed free gravel supplies and cleandown prior to works starting at this site.

Table 2. Invasive weeds present in Site A – Cascade Road and Gravel Pits

Family	Genus	Species
Fabaceae	<i>Acacia</i>	<i>pycnantha</i>
Casuarinaceae	<i>Casuarina</i>	<i>glauca</i>
Poaceae	<i>Eragrostis</i>	<i>curvula</i>
Brassicaceae	<i>Heliophila</i>	<i>pusilla</i>
Solanaceae	<i>Solanum</i>	<i>nigrum</i>
Fabaceae	<i>Trifolium</i>	<i>subterraneum</i>
Asteraceae	<i>Ursinia</i>	<i>anthemoides</i>

Within 'Site A – Cascade Road and Gravel Pits', vegetation type A is most susceptible to Dieback due to its relatively high proportion of proteaceous species which are highly vulnerable to the disease. Vegetation type B is also susceptible to Dieback due to still containing several proteaceous species.

Table 3. Vegetation types present in Site A – Cascade Road and Gravel Pits road pre-clearing

Veg type	Description	Area (ha)
A	Open <i>Eucalyptus pleurocarpa</i> and <i>Banksia media</i> dominated mallee woodland with <i>Acacia</i> , Proteaceae and Goodeniaceae understorey	4.27 ha
B	Mixed Mallee over Mixed <i>Melaleuca</i> shrubland with <i>Acacia</i> and Goodeniaceae understorey	2.22 ha

Concerns about scattered Dieback within Pit 1 at 'Site A – Cascade Road and Gravel Pits' were noted during surveys, with dead *Banksia media* and other Proteaceae species being observed. There were no signs of Dieback observed in Pit 2, which is likely due to the disturbed nature of the site from chaining. Due to the recent fire, in some areas at Pit 1 and 2 it was impossible to detect any signs of *Phytophthora cinnamomi* dieback disease. It is known to take at least five years for visual markers of Dieback to become apparent due to the tolerance of juveniles to the adverse effects of *P. cinnamomi*, A qualified dieback interpreter also cannot determine dieback presence for five years after fire. There were no signs of dieback along Cascade Road, the northern section which contained a high proportion of proteaceous species would be particularly susceptible to the spread of dieback.



Figure 4. Potential signs of dieback, which are likely to just be natural senescence, including dead *Banksia media*, observed in vegetation type A in Pit 1 at 'Site A – Cascade Road and Gravel Pits'.

Site B - Cascade Road Bend- (SLK) 12.95 to 14.67

There was minimal weed invasion across the entirety of the proposed 'Site B – Cascade Road Bend' area. Overall, nine invasive species were identified within the project area. Of these, the serious concerns were Bridal Creeper, Veldt grass and Victorian tea tree. The biological control bridal creeper rust fungus was spread at the site in winter 2021. This appears to have spread at the site. The Victorian tea tree at the site is currently minimal.

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2021) data shows neither positive nor negative *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the immediate area. There is dieback susceptible vegetation within the area but no areas that appeared to be infected by *Phytophthora* spp.

Table 4 - Weeds present in Site B pre-clearing

Family	Genus	Species	Common Name
Asparagaceae	<i>Asparagus</i>	<i>asparagoides</i>	Bridal creeper
Asteraceae	<i>Vellereophyton</i>	<i>dealbatum</i>	
Fabaceae	<i>Medicago</i>	<i>sp.</i>	
Fabaceae	<i>Ornithopus</i>	<i>sativus</i>	Yellow serradella
Myrtaceae	<i>Leptospermum</i>	<i>laevigatum</i>	Victorian Tea tree
Orchidaceae	<i>Disa</i>	<i>bracteata</i>	
Pinaceae	<i>Pinus</i>	<i>pinaster</i>	
Poaceae	<i>Ehrharta</i>	<i>calycina</i>	Veldt Grass
Primulaceae	<i>Anagallis</i>	<i>arvensis</i>	Pimpernell
Scrophulariaceae	<i>Zaluzianskya</i>	<i>divaricata</i>	Spreading Night Phlox

Site F - Wharton road widening

The majority of the site was in an excellent condition with little to no weed burden present. The only patch where vegetation structure has been significantly altered is outside of the caravan park and boat ramp. Significant plantings of eastern states Eucalypts, Acacias and Melaleucas have occurred in and adjacent to this area, historic clearing has also occurred outside of the built facilities.

Overall, 11 invasive species were identified within the project area (Appendix 8.1). Of these, the most extensive and of serious concern were *Leptospermum laevigatum* (Victorian Tea Tree) and *Melaleuca armillaris*, both of these weeds had spread out from the caravan park. Significant control of *Leptospermum laevigatum* has occurred within the road reserve over 2019, 2020, 2021 and 2022 with only small scattered seedlings present and ongoing follow up work part of the planned ongoing works for the reserve.

Table 7. Weeds present in Site F pre-clearing

Family	Genus	Species	Common Name
Brassicaceae	<i>Brassica</i>	<i>tournefortii</i>	Wild mustard
Geraniaceae	<i>Pelargonium</i>	<i>capitatum</i>	Rose Pelargonium
Myrtaceae	<i>Agonis</i>	<i>flexuosa</i>	Peppermint
Myrtaceae	<i>Eucalyptus</i>	<i>cladocalyx</i>	Sugar Gum
Myrtaceae	<i>Leptospermum</i>	<i>laevigatum</i>	Victorian tea tree
Myrtaceae	<i>Melaleuca</i>	<i>armillaris</i>	Bracelet honey myrtle
Orchidaceae	<i>Disa</i>	<i>bracteata</i>	South African weed orchid
Pinaceae	<i>Pinus</i>	<i>pinaster</i>	Maritime Pine
Poaceae	<i>Briza</i>	<i>maxima</i>	Blowfly grass
Poaceae	<i>Eragrostis</i>	<i>curvula</i>	African lovegrass
Poaceae	<i>Lolium</i>	<i>perenne</i>	Rye grass

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2021) data shows no positive or negative *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the immediate area. There was several confirmed samples of *Phytophthora* Dieback 3-4km from the proposed works, in addition the Dieback Hazard Dispersion Model (GAIA Resources, State NRM & SCNRM, 2021) indicates that the entire proposed works site is at risk of dieback infection. During the flora survey several patches with dead mature *Banksia speciosa* were observed, potentially indicating dieback presence within the site.

Based on Dieback Management Plans prepared for Shire of Esperance road construction and management projects. Proposed works will be conducted using appropriate hygiene measures to limit spreading of the disease, including mulching in dry conditions and clean down of vehicles and machinery before entering the site. However, there is always a possibility that proposed works will spread *P. cinnamomi* dieback along Wharton Road due to proposed works.



Figure 5. Dead *Banksia speciosa*, a species known for its susceptibility to *Phytophthora cinnamomi* along Wharton road

Site G – Neds Corner Road (SLK) 14.68 to 18.94

Vegetation was primarily in an excellent condition with little to no weed burden and disturbance. Areas that were degraded were typically around farm access crossovers with weed invasion and historic clearing having taken place.

There was variable weed invasion across the proposed 'Site G - 'Neds Corner Road SLK 36.85 – 51' area. A majority of the site had little to no weed burden however small sections had significant weed burden. Overall, 21 invasive species were identified within the project area (Appendix 8.1). Of these, the most extensive and of serious concern was African Lovegrass (*Eragrostis curvula*) and other non-native grasses. Evidence of dumping of garden waste within the road reserve by local landowners was evident, this has been referred to the Shire of Esperance's Compliance Officer and Rangers.

Table 8. Weeds present in Site G pre-clearing

Family	Genus	Species	Common Name
Asphodelus	<i>Trachyandra</i>	<i>divaricata</i>	Dune onion weed
Asteraceae	<i>Arctotheca</i>	<i>calendula</i>	
Asteraceae	<i>Cirsium</i>	<i>vulgare</i>	Spear thistle
Asteraceae	<i>Sonchus</i>	<i>oleraceus</i>	Common sowthistle
Asteraceae	<i>Symphotrichum</i>	<i>squamatum</i>	
Brassicaceae	<i>Brassica</i>	<i>napus</i>	
Brassicaceae	<i>Brassica</i>	<i>tournefortii</i>	
Brassicaceae	<i>Carrichtera</i>	<i>annua</i>	
Brassicaceae	<i>Lepidium</i>	<i>africanum</i>	
Brassicaceae	<i>Raphanus</i>	<i>raphanistrum</i>	
Fabaceae	<i>Medicago</i>	<i>polymorpha</i>	Medicago
Fabaceae	<i>Ornithopus</i>	<i>compressus</i>	
Fabaceae	<i>Ornithopus</i>	<i>pinnatus</i>	

Fabaceae	<i>Vicia</i>	<i>sativa</i> subsp. <i>sativa</i>	
Onagraceae	<i>Oenothera</i>	<i>stricta</i>	Evening Primrose
Poaceae	<i>Avena</i>	<i>fatua</i>	Common Wild Oat
Poaceae	<i>Bromus</i>	<i>sp.</i>	Bromus grass
Poaceae	<i>Eragrostis</i>	<i>curvula</i>	
Poaceae	<i>Lolium</i>	<i>multiflorum</i>	Italian Ryegrass
Poaceae	<i>Lolium</i>	<i>rigidum</i>	
Poaceae	<i>Parapholis</i>	<i>incurva</i>	

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2021) data shows negative *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the Cascades area. There was no sign of dieback seen throughout the site during the inspection.