NRFABCON PROJECT FINAL REPORT	
Project	**Implementation of SoS Actions, Ettrick Site: *Owenia cepiodora* (Onion Cedar)**
Client	Dept Planning Industry and Environment
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1. Introduction

The Saving Our Species *Owenia Cepiadora* project (Site ID 43) is located on Mr Don Durrant's property, accessed through 126 Vidlers Road, Ettrick, approximately 13km west of Kyogle in northern NSW at Latitude 28° 36' 57.93" Longitude 152° 52' 3.59" (AMG 487063/6834539) Map Datum WGS8.

The vegetation has been well documented by both Floyd (1982) and Hunter (undated –mid 1990's). It is primarily Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast. (*Drypetes – Araucaria* Alliance, Sub-alliance 22 - *Flindersia* spp. – *Araucaria*, Floyd 1990); 2). Grey Gum - Grey Ironbark open forest of the Clarence lowlands of the North Coast; and, Flooded Gum - Tallowwood - Brush Box moist open forest of the coastal ranges of the North Coast.

Formerly the Peter Finn Conservation Reserve, the property has increased in size with the purchase of a second dry rainforest remnant block by Mr Durrant creating a protected area of more than 600 acres under inperpetuity covenant.

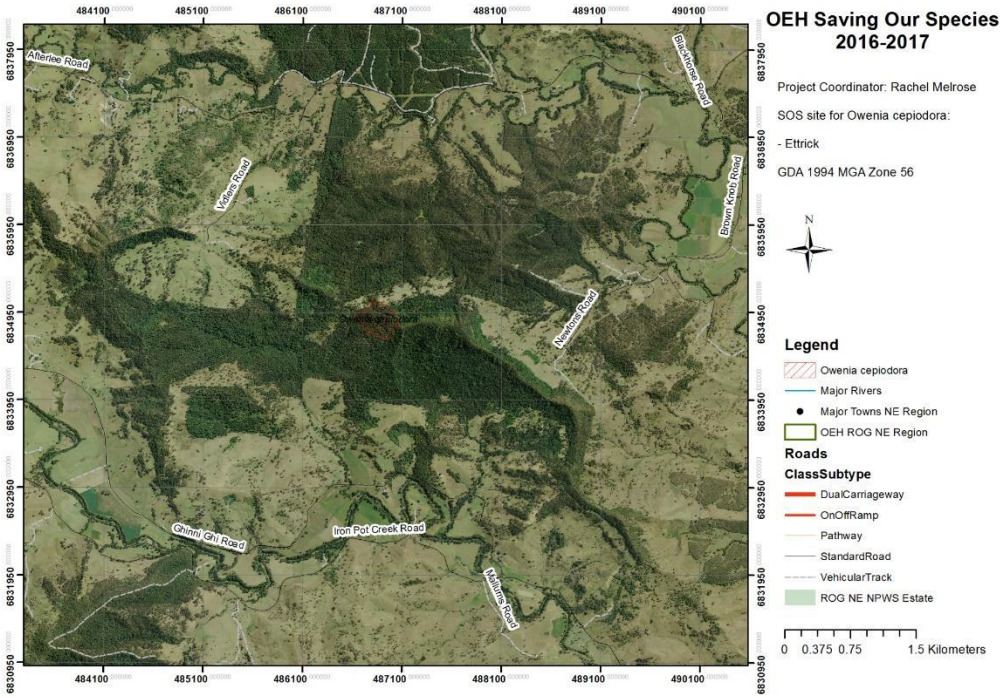

Figure 1: Maps of SOS Ettrick Site for Owenia cepiodora.

The extent and distribution of Onion Cedar across its range has been significantly constrained by historical and contemporary land clearing, logging and burning practices. Other threats to its future include Climate change and Weed invasion, primarily *Lantana camara*. Activities to assist this species include:

- Support local Landcare and bush regeneration teams protect known populations.
- Protect rainforest areas from fire.
- Fence areas of known habitat to protect seedlings from grazing stock.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of rainforest habitat from clearing or development.
- Expand and connect remaining remnant patches of habitat.
  (https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10579)

The Ettrick site contains the largest remaining population of Onion Cedar in Australia.

2. Background

Onion Cedar is a tall evergreen tree, up to 30 m, with a dense glossy dark-green crown. Its bark is dark brown with vertical fissures. If the bark is cut, a pink-red underbark is exposed, and the tree exudes a red sap with a strong onion odour. The leaves are composed of 13 – 19 glossy dark green leaflets 10 – 15 cm long. Flowers are white, in clusters at the ends of branchlets. The globular red fruit are 15 – 20 mm wide, with white pulpy flesh surrounding a stone with one or two seeds. The timber resembles that of Red Cedar but has a characteristic onion odour. Conservation status in NSW and the Commonwealth is Vulnerable.
(https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10579)

The species is slow growing and recruitment in smaller populations is very limited. Seedlings and saplings are shade tolerant, with one seedling (ca. 1m tall) known to have survived for more than 40 years in deep shade (Minyon Falls valley), without growth. In larger populations such as this one at Ettrick, seedlings and saplings are more common, and are often in relatively close proximity to adults. This results in a patchy distribution and suggests some level of dispersal limitation. Seed crops can be irregular, but most large stems produce a decent crop once every two years. Germination is known to be difficult but the property owner (on this site) has successfully collected, germinated and grown Onion Cedar as part of rainforest restoration actions.

3. Work plan and activities

The Border Ranges Alliance under auspice with the Northern Rivers Fire and Biodiversity Consortium inc, was engaged by DPIE to deliver SoS Recovery Actions at the Ettrick Site. The objectives of the three-year SOS project were to:

1. Monitor species abundance and condition over time
2. Monitor and reduce weed densities at low levels
3. Expand and connect remaining remnant patches of habitat.
4. Remove weeds where they threaten adult plants or regeneration, or where they increase risk of fire.
5. Protect from threats: inappropriate fire regime, disturbance (gazing stock), weeds.
6. Protect areas of rainforest habitat from clearing or development.

Recovery actions are tabled below:

Action ID	Method	Methodology	Delivery period
535	Monitoring habitat condition	Assess the condition of the species / species' habitat and evidence of the effects of degrading land use practises Repeat and assess change	Year 1 Year 3
2413	Flora monitoring	Identify and mark known mature trees; map using differential GPS; determine whether flowering/seeding is occurring. Assess level of recruitment and density of different size/age cohorts in the landscape. Repeat and assess change	Year 1 Year 3
3357	Site-based weed control	Conduct targeted spraying at 1m intervals using splatter-gun; avoids harming vegetation underneath lantana. Undertake bush regeneration (infill planting) to restore degraded areas.	Year 1, 2,3 Year 3
3360	Negotiate land management agreement/s	Liaise with landholder(s) about entering into a voluntarily management agreement to maintain or enhance the species and its habitat.	Year 1
533	Map Lantana	Map Lantana density and significant thickets for targeted fauna survey and for targeted spraying.	Year 2
22577	Fauna Survey	Carry out a fauna survey (4 trap nights) to establish whether potoroos inhabit significant stands of lantana thickets targeted for weed eradication each year to inform staged removal of lantana for this year and into the future	Year 2
22578	Translocation Plan	Develop a translocation plan for seedlings from Ettrick SOS site (private land) to be planted at the National Park site at Minyon Falls.	Year 2
3359	Fire Management	Maintain fire breaks to prevent fire from encroaching from adjacent properties. Mapping of fire history and investigating existing control lines and fall backs on neighbouring properties.	Year 3
2413	Flora monitoring	Identify and mark known mature trees; map using differential GPS; determine whether flowering/seeding is occurring. Assess level of recruitment and density of different size/age cohorts in the landscape. Follow up from 2016-2017.	Year 3
001	Reporting	Compile final report in format negotiated with OEH contract contact. Final reports may include written reports and spatial data as required. In addition to the final report you are required to complete a spreadsheet supplied by the OEH Species Coordinator for Saving our Species end of year reporting in the SoS Database	Year 3

Reporting requirements on completion of the project include:

- Summary of each completed action with reference to Site ID and Action ID, and GPS coordinates where relevant and outputs achieved, quantitative (numerical) measurements of work undertaken, maps, site photos, a brief site summary, site successes and site limitations.
- GPS coordinates of individual plant locations using GDA94 Datum, UTM Zone 56 projection.
- GPS coordinates of areas where weed removal was carried out, with description of the site.
- Limitations and recommendations for future work including monitoring and threat management.

4. Project performance

Monitoring habitat condition (Site 43 Action ID 535)

This action required the assessment of the condition of the species / species' habitat and evidence of the effects of degrading land use practises in year 1, repeated in year 3.

Both assessments involved site visits and consultations with the landowner regarding current land management practices and potential risks to the Owenia population. The property is isolated (no public access) and is managed for conservation which significantly reduces the likelihood and opportunity for damaging land management practices. A potential land-use related threat identified in the year 1 was the possibility of fire escaping into the dry rainforest from neighbouring properties, particularly via the north facing dry ridges. Inclusion of an action to understand and address wildfire risk was recommended as part of the year 2 project. The impact of lantana removal on dependent native fauna was also flagged as a potential threat given the number of wallaby tracks observed on the property and consultations with the landowner about wild dog and dingo activity in the area. A recommendation was made for both a fauna survey and lantana mapping exercise in year 2 to evaluate and prioritise future lantana control work and approach.

The year 3 assessment identified two new issues for the property which are a legacy of prior landuse. The first is the establishment of a Bell Miner colony and associated dieback of grey gum, Ironbark and other eucalypts on the southern side of the property in the 'Laneway' – a 100m wide vegetated strip leading from the reserve down to Iron pot creek. The second is the ingress of Cats Claw Creeper at the bottom of the Laneway where it meets Iron Pot Creek. While neither is a direct threat to the Onion Cedar, both issues have the ability to degrade habitat and biodiversity of this important vegetated corridor. Landuse practices and habitat condition are addressed in the year 1 and 3 population survey reports (provided).

Flora monitoring (Site 43 Action ID 2413)

This action required the identification and marking of known mature Onion Cedar trees; mapping of individual stems using differential GPS; determination of whether flowering/seeding is occurring, and assessment of the level of recruitment and density of different size/age cohorts. The survey was delivered as a baseline assessment in year 1 and repeated in year 3 to assess change, if any, to the population.

Early discussions with DPIE resolved that use of a differential GPS was not necessary given the trees were numerous and widespread throughout the property. The landowner has intimate knowledge of the site and the location of most mature Owenia trees. Rainforest Botantist, Rob Kooyman, was engaged to undertake the population assessment and recommended the use of three survey plots and extrapolation of the results across the site. The initial survey established and measured the plots and the follow up survey examined if any change had occurred, which was found to be extremely little. Fruiting occurred during both year 1 and 3. Analysis of recruitment and density of size/age classes is provided in both the year 1 and year 3 reports (Population Reports provided).

Translocation Plan (Site 43 Action ID 22578)

The develop a translocation plan for seedlings from Ettrick SOS site (private land) to be planted at the National Park site at Minyon Falls was included as an action in the year 2 program. Rob Kooyman was engaged to prepare the translocation plan in consultation with SOS program officers and Royal Botanic Gardens, Sydney. The translocation plan was completed in year 2 and submitted to DPIE for implementation (Translocation Plan provided).

Site-based weed control (Site 43 Action ID 3357)

This action required chemical control of lantana to remove thickets and promote regeneration of forest canopy, structure and diversity. Glyphosate was applied at targeted 1m intervals using splatter-gun mix of 10:1 of 450gm glyphosate and Protec surfactant. The splatter gun approach avoids harming vegetation underneath and around the lantana. Lantana Master was engaged in year 1 to undertake primary weed control work over a 6ha site and has undertaken follow-up and expanded that site in year 2 and 3. The site was identified as a priority for treatment given it was on a north facing fire-prone slope. The lantana is legacy of disturbance created by wildfire in 1968. The thickets in this area are supressing natural regeneration. Enabling site capture through the establishment of pioneer species will create conditions that are less conducive to weed growth. This quote from Mr Durrant was provided in Lantana Master's works progress report in December 2018:

"Recently, Grant Gibson was engaged to do some splattering of lantana on my property at Afterlee. I allowed time for the lantana to die and then went for an inspection, to see how far he had progressed and how effective his work had been. As I drove along the perimeter, I found I couldn't stop grinning. Before treatment, I couldn't even see far into the trees because of the thick lantana. I was able to walk up through where Grant had sprayed. I was very impressed by the obvious care he had taken to not spray emerging trees and by how far he had pushed into supposedly impenetrable lantana. I was also pleased to see the huge number of young trees that were suddenly appearing now that the lantana is gone. His work has exceeded my expectations and hopes. There are always a few lantana survivors, but Grant has not missed many. There are virtually no weeds such as crofton or tobacco weed occurring because of the existing canopy cover, just more trees. This whole area was burnt in 1968 and the rainforest was mostly killed hence all the lantana. Now the regrowth is so prevalent, and the lantana gone, I can once again class this area as rainforest."

Don Durrant, Landowner

The landowner collects and propagates seeds from the dry rainforest for revegetating smaller canopy gap throughout the forest as part of a long-term, ongoing, self-funded regeneration project. Infill planting was included as a year 3 action to assist the landowner with this work however the planting did not go ahead given the extended hot summer and dry conditions during year 3 of the project. The funds were used on additional weed work. (Lantana report provided)

Negotiate land management agreement (Site 43 Action ID 3360)

This action provided for liaison with landholder in year 1 about entering into a voluntarily management agreement to maintain or enhance the species and its habitat. At the same time, NPWS had approached the landowner to update his existing VCA to cover his now larger area of remnant forest. An in-perpetuity convenant has been established for the entire 600 acre site and is being managed by the Biodiversity Conservation Trust (Shape file provided).

Fauna Survey (Site 43 Action ID 22577)

This action provided for a 4 trap-night fauna survey in year 2 to establish whether potoroos inhabit lantana thickets to inform staged removal. Rather than a 4 night approach, the survey was undertaken as a longer program of camera trapping to improve coverage and results. Ecologist, David Charley, was engaged to undertake the study. The survey included a total of 600 camera trap-nights and bird and bat census. Medium-sized and small mammals and nocturnal fauna occurring in areas of forest undergoing habitat restoration (mostly Lantana control) were targeted. A total of seven reptile species, five amphibian, 71 bird and 16 mammal species were recorded with 8 threatened species listed under the NSW Biodiversity Conservation Act 2016 were recorded. These were: Rose-crowned Fruit-dove (Vulnerable), Wompoo Fruit-dove (Vulnerable), White-eared Monarch (Vulnerable), Little Lorikeet (Vulnerable), Brush-tailed Phascogale (Vulnerable), Koala (Vulnerable), Black-striped Wallaby (Vulnerable) and Red-legged Pademelon (Vulnerable).

The diversity of fauna, particularly mammals and birds, is indicative of the high quality of the forest habitats of the property. The Ecologist found the dry rainforest communities of significant conservation value and that the long-term rainforest restoration works undertaken by the landowner had enhanced these conservation values and been critical to the survival of the remnant - without this work the site would be significantly degraded by Lantana, Mist Flower, Crofton Weed and exotic vines. The Potoroo, which was of particular interest, was not recorded.

Map Lantana (Site 43 Action ID 533)

This action looked at mapping Lantana density and significant thickets for targeted spraying. The first attempt to map was using available free satellite imagery however currency and resolution were issues. The second attempt trialled the use of drone with an operator engaged for a day, however the footage was unviewable. Jane Baldwin bought a

drone to trial its use further. While there is free-wear that can stitch images well to render good aerial imagery, the height, variation in topography of the site, emergent trees, up and down draughts proved too much of a challenge and the method was abandoned after a couple of trials. The need to fly at consistent height above the vegetation to ensure the images are the same scale and the size and shape of the property created a really complex flight path which would ordinarily be pre-plotted before flying, but was just too complicated to even approach.

On recommendation by the Alliance, DPIE funded a high-resolution aerial imagery run of the site. Aerial Acquisitions was engaged and undertook the run in June 2019 when weather conditions were optimal. The resulting high resolution image is useful for visual assessment, however, ground truthing is still required. Hyperspectral imagery would have been better in terms of being able to possibly identify a signature for lantana using GIS, but that option was not available from the provider at the time and would have been vastly more expensive given its requires a denser run of images and more processing time. It is possible though that the RAW files of the RGB run could be manipulated to remove shadow and enhance vegetation types but that work is outside of the remit of this project. The imagery was used to identify likely sites of lantana infestation and cross-referenced with landowner knowledge, then ground-truthed for presence / absence. Three untreated areas of thicket were identified with simplified cover assessment undertaken for each based on a 50 x 50m plot (attached). In consultation with the landowner the sites were prioritised for treatment with one selected area to remain as a hide adjacent to a water hole known to have high visitation during dry periods of a range of a species. The remainder of the lantana patches are scattered and small in size growing in tree fall areas. The landowner targets these areas through his regeneration program. (ECW files provided)

Fire Management (Site 43 Action ID 3359)

This action requires the maintenance of fire breaks to prevent fire from encroaching from adjacent properties, mapping of fire history and investigation of existing control lines and fall backs on neighbouring properties. Rob Kooyman and Lantana Master were engaged to assist in the preparation of a fire control plan for the property and the establishment / maintenance of key control lines. The fire history was mapped and consists of two unplanned burns entering the property from landholders to the north and north east in 1968 and 2012. These are now the areas infested with lantana. 10km of tracks have been reopened or access maintained through removal of blockages and debris. Neighbouring properties were assessed for access and water points and a map prepared which can be used by RFS and adjoining landowners in the event of fire. (Trail map provided)

The removal of lantana on the northern flank is an important strategy in reducing fire risk. A fire planning report was prepared by Rob Kooyman which identified key assets and infrastructure including roads, trails, water storages, and access points. The recommended management strategy for fire on the property is based on the expansion of rainforest vegetation into surrounding areas of pasture and eucalypt forest, and the control (removal) and replacement of Lantana with rainforest regeneration and plantings. In combination those actions have, and will, improve protection and buffer the core rainforest areas from fire. (Fire Plan provided)

5. Conclusion and recommendations

The initial area identified by DPIE as containing Owenia Cepiadora turned out to be much larger with mature and juvenile Onion Cedar found through the dray rainforest parts of the 600acre property. Mr Durrant has for many years been harvesting Owenia seed, propagating and replanting vegetation gaps on the property along with a range of other endemic species. Threats to the Owenia are limited on site with wildfire the only significant threat at the present time. Baseline and repeat surveys found the Owenia population to be stable with good diversity of other plant and animal species present on the site. Future projects should continue to focus on the remove of the three large lantana infestations on the property, with ongoing monitoring of fauna movements in these areas. Newly established Cats Claw Creeper and Bell Miner Dieback in the southern Laneway corridor to iron Pot Creek should be treated to prevent either becoming a greater issue. Mr Durrant should be commended for his commitment to

conserving this important remnant and his dedication to replanting work which is now in the order of thousands of stems across the site.

Jane Baldwin

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21/08/2019

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