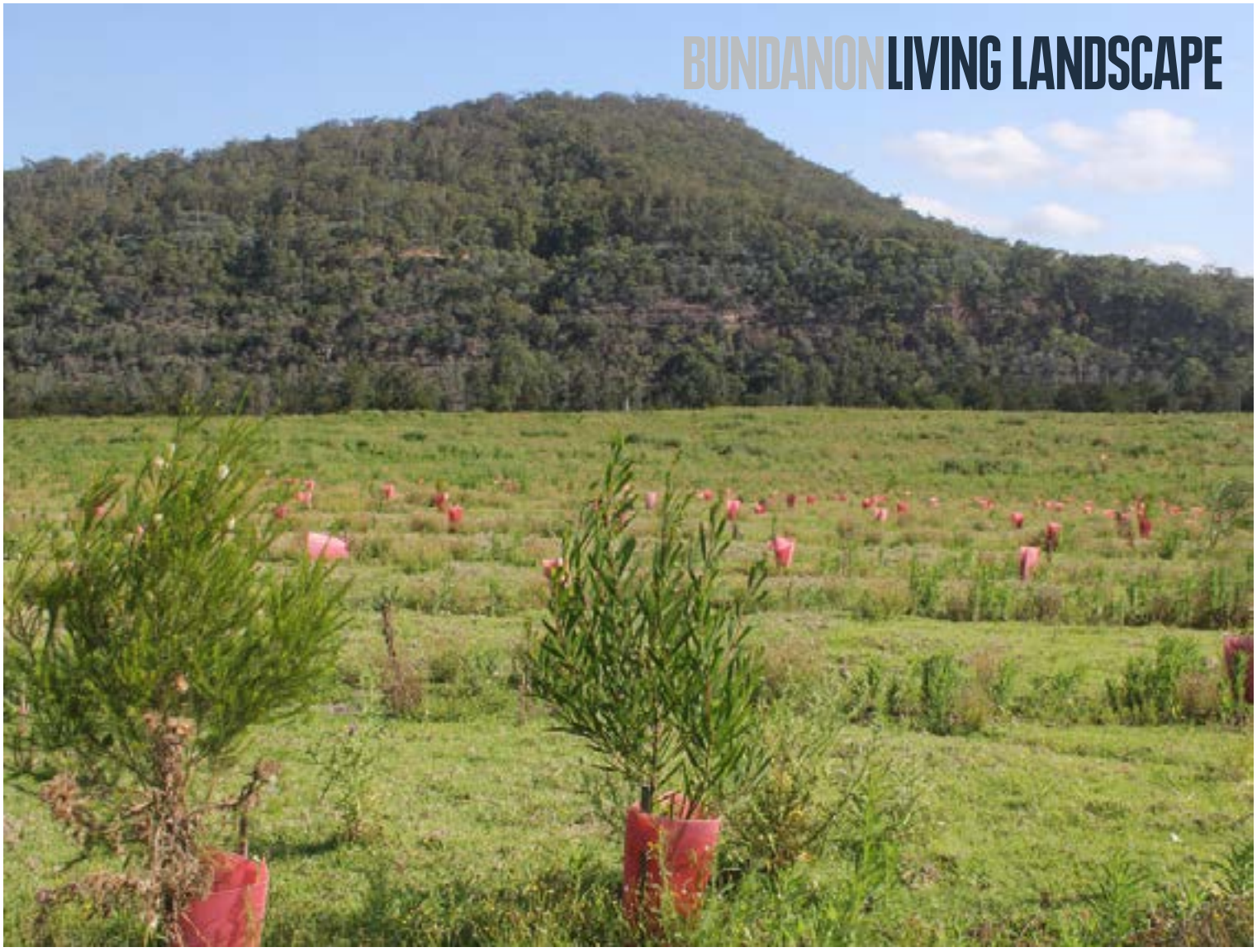


FACT SHEET 9

Landcare Australia

REVEGETATION AND REGENERATION

The scale of the revegetation and regeneration management program across the Bundanon Trust properties is defined as a catchment landscape scale project. All facets of habitat reconstruction need to be considered as a whole to ensure successful outcomes for the duration of the program.

Image: Eearie Park revegetation area, with over 25,000 trees planted.

OVERVIEW OF THE REVEGETATION PROGRAM

The primary aims of the habitat reconstruction program for Bundanon Trust properties are to:

- Treat and reduce the current area of exotic weed species invasion within the native remnant bushland vegetation communi ties, degraded riparian zones, and ex-agricultural/grazing lands.
- Implement strategic revegetation works within all treatment areas including; reforestation of historically cleared lands under the CFI Environmental plantings methodology for carbon sequestration, generation of carbon credits, biodiversity and water quality improvements.

Legislative frameworks

Legal and regulatory issues such as land ownership, NSW State legislation, Federal legislation and planning policies must be understood and clearly defined. Project managers (ie. Bundanon Trust and other partners) need to check with relevant Local, State and Commonwealth authorities prior to commencing any works. There are a large number of State Acts, regulations, planning instruments and other government policies and guidelines that can affect the land and any activities on it. Examples include; NSW Environmental Planning and Assessment Act 1979, State Environmental Planning Policies (eg. SEPP 14 Coastal Wetlands), Native Vegetation Act 2003, Regional Vegetation Management Plans and Local Government Environmental Plans (eg. Illawarra Regional Environmental Plan Wildlife Corridor), Water Management Act 2000, National Parks and Wildlife Act 1974, Threatened Species Conservation Act 1995, Noxious Weeds Act 1993 and Rural Fires Act 1997.

Monitoring and evaluation

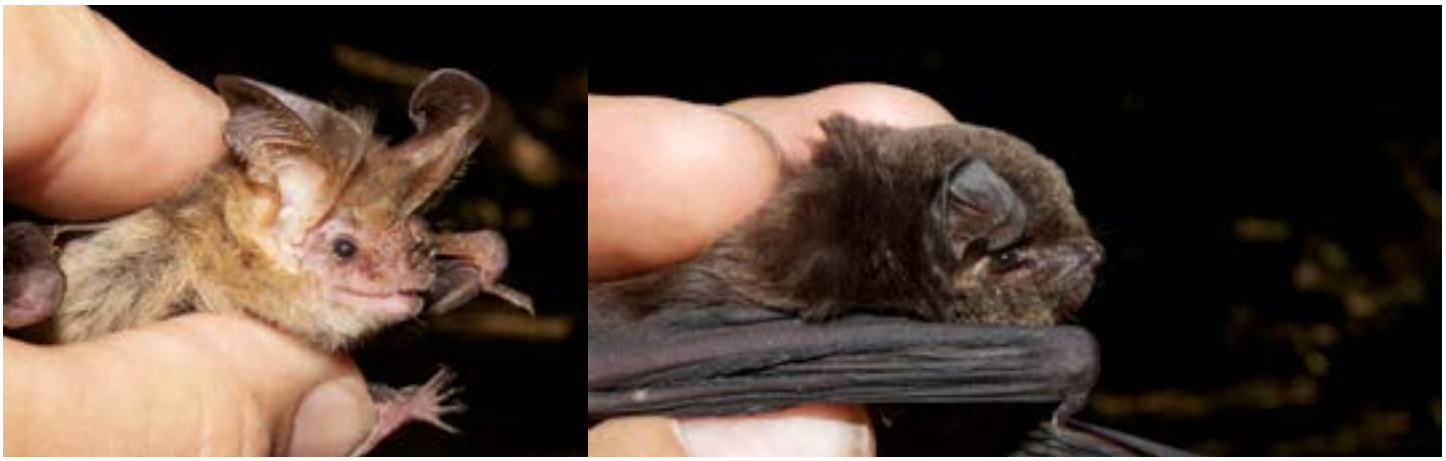
The establishment of monitoring and evaluation for all rehabilitation works implemented within forest remnants, riparian lands and ex-agricultural lands is critically important. Monitoring includes the following factors;

- Collection of baseline site data including; weed cover, native species cover, soil type and soil erosion
- Establish transects and or plots and photo-points
- Collection of site input data including; treatment for weeds, planting preparation, observational data (including rainfall), plant species and number and planting methodology

Evaluation of the project works is the process of examining the habitat reconstruction process as a whole (including information gathered and analysed during the monitoring program) to see whether the aims of the program have been achieved and to identify lessons for future projects. Examples of monitoring include Garry Daly's survey of Haunted Point in 2013.

Haunted Point Survey 2013

Garry Daly from Gaia Research completed the report *Fauna Surveys at Haunted Point* in May 2013. Fauna surveys were conducted from 28 April to 1 May 2013 to provide systematic data and build on the inofrmation gathered in 1995 (Daly and Leonard 1996) on the property. The surveys included trapping for small and medium sized mammal, spotlight surveys for aboreal mammals, harp trapping for microbats, bird surveys and reptile searches. The study reviewed the draft Land Rehabilitation Works Plan and made reccommendations to ensure proposed revegetation works are consistent with existing vegetation communities and include species appropriate to fauna nesting and food requirements. The report on this survey can be found in the additional resources section of the Case Study web page.



Garry Daly used special harp traps to monitor the presence of microbats

REVEGETATION METHODS

Bush regeneration is the recovery of naturally occurring ecological communities that have degraded: soil, water, floral and/or faunal elements. Soil can be degraded by changing its chemistry, structure or profile arrangement. Water can be degraded by changing its chemistry, volume and rate of flow, period of flow, frequency of flow, depth, turbidity, biological oxygen demand and more. Flora is degraded by altered soil and water, pests and diseases, competition from non-local plant species, absence or change of frequency and heat of fire events, changed light levels and lost symbiotic relationships with fauna. Fauna are most profoundly affected by the loss of core habitat and the creation of disjunct habitats. This loss and separation are caused by vegetation clearing, development, roads, fences, water harvesting, and predation by and competition from feral animals. Stopping the causes of degradation is the first step in regenerating bushland.

All treated project sites require revegetation works post disturbance reparation, and different levels of revegetation works are implemented depending on:

- the density and composition of weed species
- the extent and type of native vegetation community
- the recovery potential of the landscape

In the first year of rehabilitation, direct seeding of cover crop and native species mix (determined by vegetation community present/absent) and post earthworks/herbicide control/manual control may be undertaken. This stabilizes the landscape and initiates the recovery process. In some cases follow-up planting revegetation works may not be required with good recovery achieved from direct seeding and soil stored seedbank.

In the second year, post initial rehabilitation works, all sites are treated for regrowth of woody weeds. This is the most important stage of the rehabilitation program as the second year follow-up weed spraying will eradicate 90% of the woody weed biomass with appropriate and careful application of herbicide.

Revegetation works via the planting out of tubestock seedlings of appropriate diversity for landscape position is undertaken post follow-up spraying. At this stage all sites are monitored to assess the level of recovery from direct seeding and soil stored seedbank. Sites of low recovery are planted out with a mixture comprising 40% canopy, 30% understorey, and 30% groundcover species. Canopy species include trees and tall shrubs; understorey species include small to medium shrubs; and groundcover species include grasses, forbs, herbs and graminoids. Consideration of plant layouts across sites is given so that a diverse mixture is attained across rehabilitation sites relative to the identified vegetation community and position in landscape. All seedlings need to be planted using correct techniques to ensure maximum success.

Undertaking follow-up monitoring, weed control, and targeted replanting of tubestock over the subsequent 2-3 years post initial revegetation works will be critical to ensure ongoing success. See pages 9-10 for updates to revegtation methods.

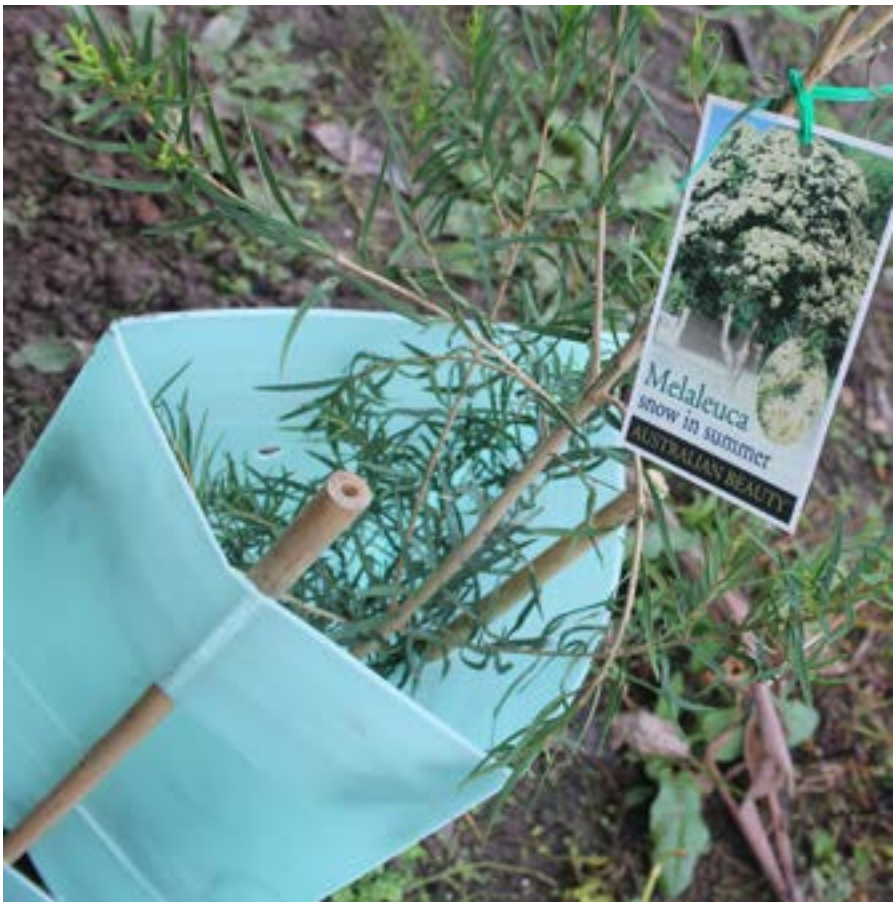
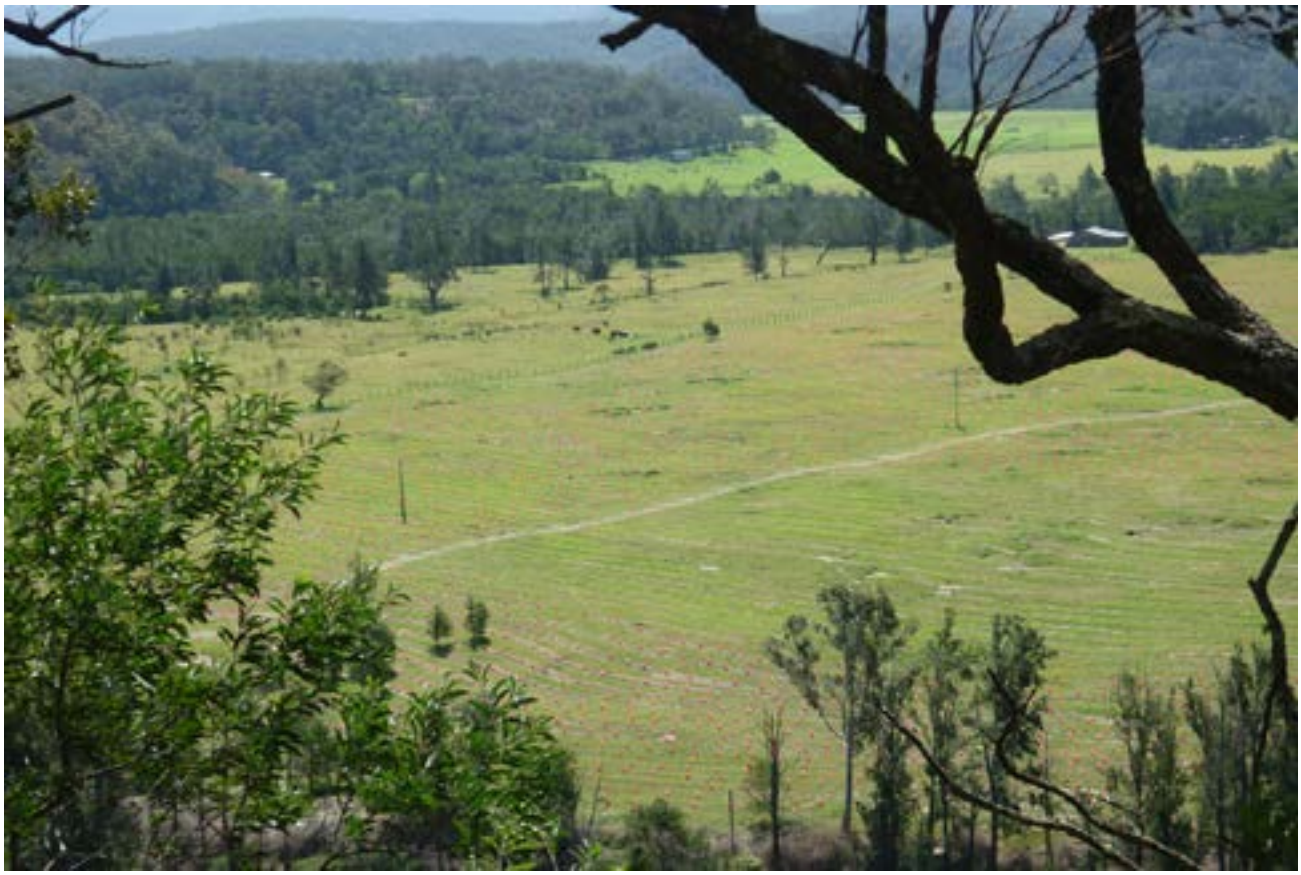


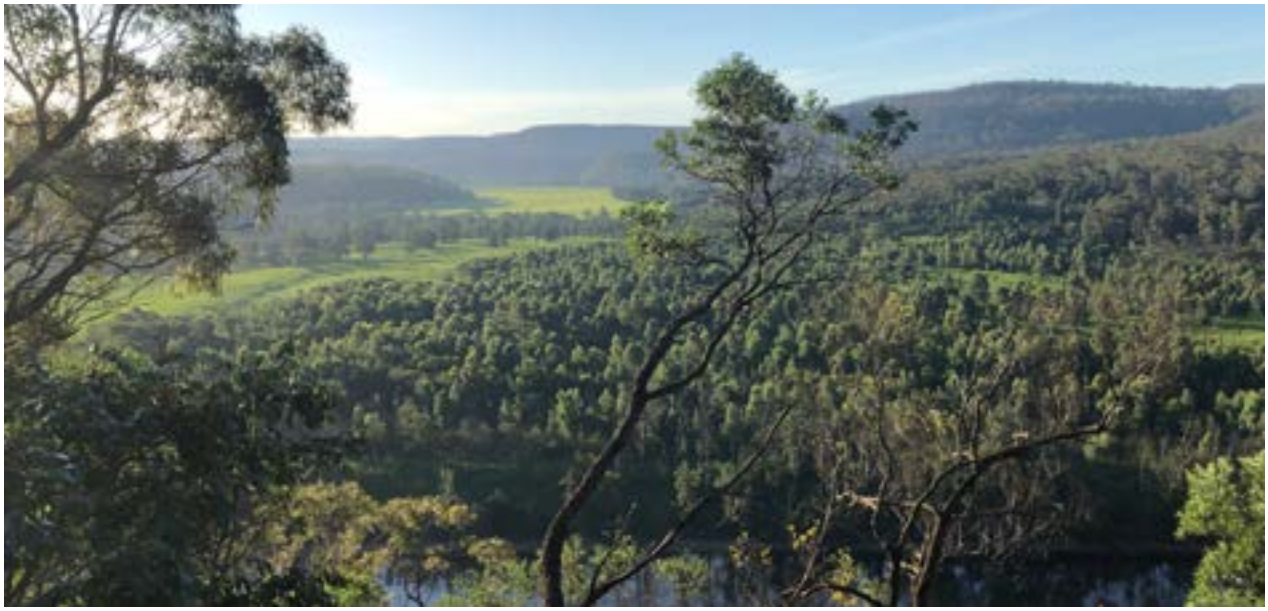
Image: Tubestock must be protected by adequate tree guards to prevent native fauna eating the stock.

EEARIE PARK SITE



Images: Eearie Park Major planting of over 25,000 trees, approx 2013-2015.

Eearie Park was grazed up until 2010. It was historically a farming property. The property was planted with trees in a revegetation program, from 2013 to 2015. At Eearie Park, rows were furrowed for mass plantings. The ploughing disturbs the soil thus creating the envrionment in which seeds sprout and weeds grow. Eventually when the trees grow larger and the bush becomes more established, shade cover is provided, less weeds will grow. Projects like this take many years and the application of significant resources to result in pristine bushland. The image below was taken in April 2020- revealing 7 years growth.



Images: Eearie Park, same location photographed in 2020

SOIL CONSERVATION MEASURES AND REVEGETATION

All treated sites of woody weed eradication works must be followed up with soil conservation works to ensure disturbed topsoil is not eroded down slope or soil sediment washed into riparian zones. Low level contour banks (swales) need to be constructed where rehabilitation earthworks are undertaken and native vegetation is absent (dense woody weed infestation zones).

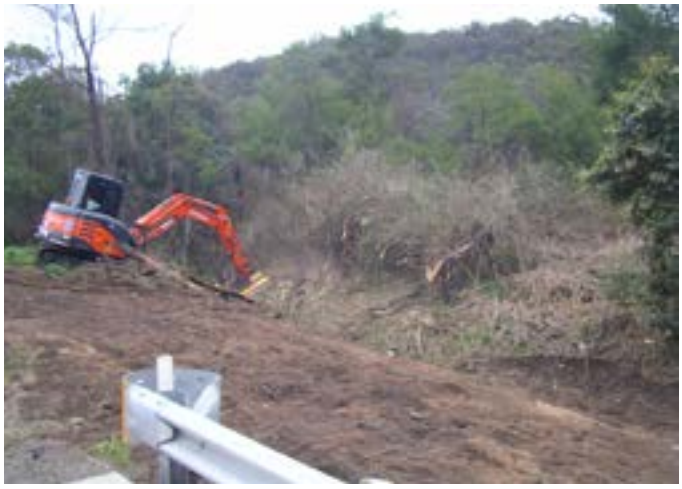
Works must include strategic placement of sediment traps to capture topsoil and weed seed runoff post intense storm events (heavy rains). The sediment traps are controlled soil and weed management zones reducing further weed infestation post rehabilitation earthworks. The erection of soil sediment filter fencing at intervals along swales is used to facilitate movement of soil sediment and weed seed into sediment traps and reduce flow velocity.

All sites of high disturbance with low biodiversity recovery potential should be direct seeded with a recommended native species seed shotgun mixture and cover crop of ryecorn (sown February-September) and/or millet (sown October-January) to ensure topsoil is maintained prior to revegetation works.

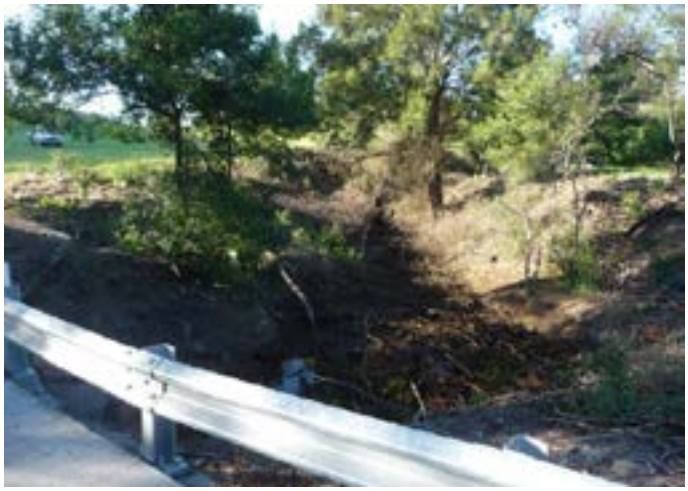
Buffer zones of 10 metres need to be established adjacent to drainage Lines (low to mid order flowlines) where manual and/or chemical control methods only are undertaken to minimise soil disturbance and sediment entering riparian zones.
Within the dense woody weed infestation zones the works along the riparian buffer should be undertaken by bush regenerators.

RIVERSDALE RIPARIAN ZONE

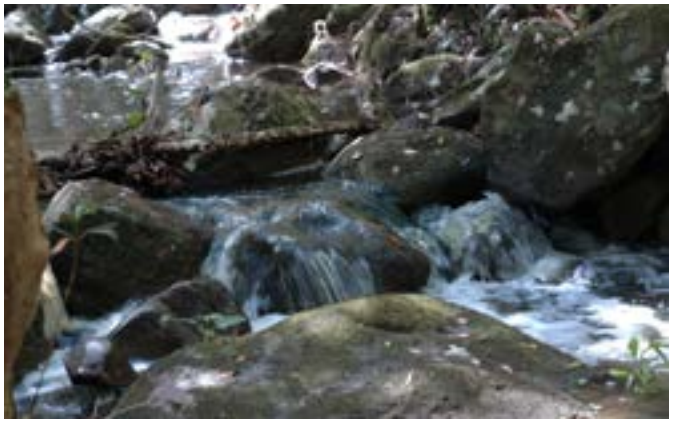
The riparian zones at Riversdale have undergone repair and bush regeneration from 2008-9. The work was initially funded by Southern Rivers Cathment Management Authority (now South East Land Services) grants. The Living Landscape project continued this work and members of Bundanon's Bushcare volunteer team have also worked on specifc areas at Riversdale.



Broadscale lantana clearing at the culvert at Riversdale by heavy machinery, prior to revegetation. Below the culvert April 2009.



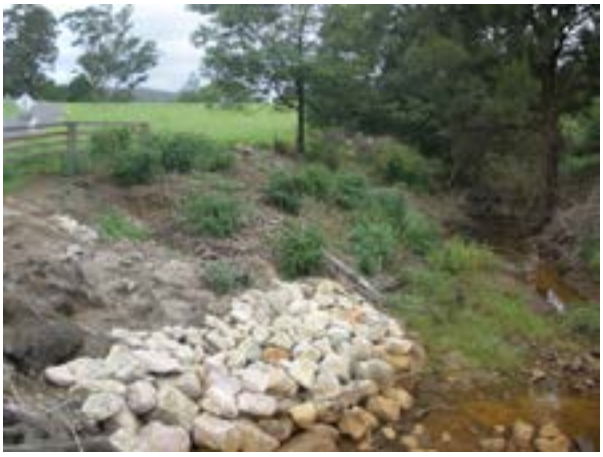
Works at the culvert at Riversdale, near where two creek lines merged into the Shoalhaven River, have involved laying boulders, creating swales for draining, bush regeneration plantings and raising the height of the road. These measures assist in creating a more permanent, stable creek edge which can recover more quickly from flood events. Below flood creek flows at the culvert.



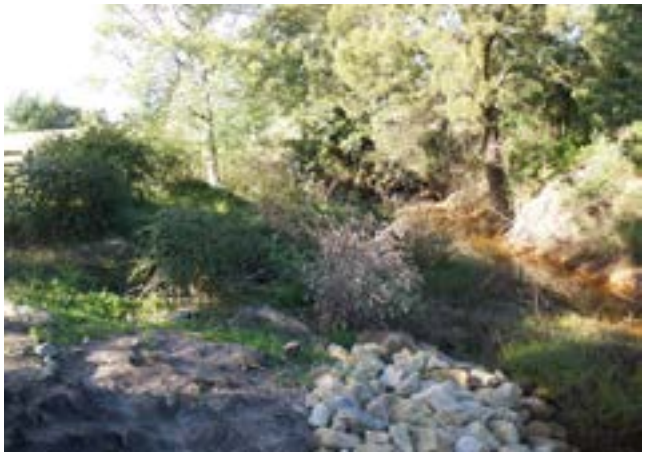
RIVERSDALE CULVERT WORKS

June 2010

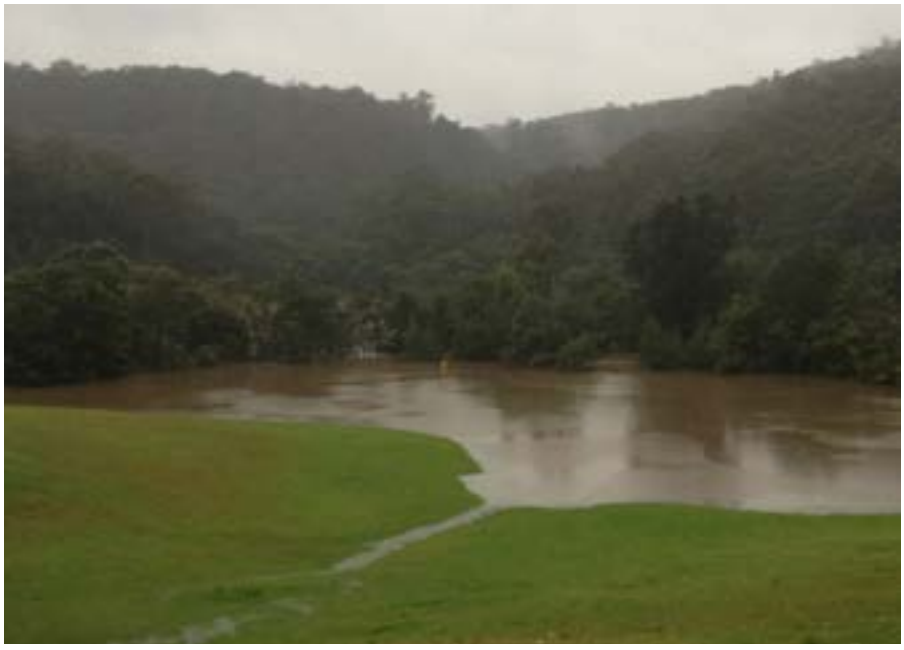
February 2012



March 2011



May 2012



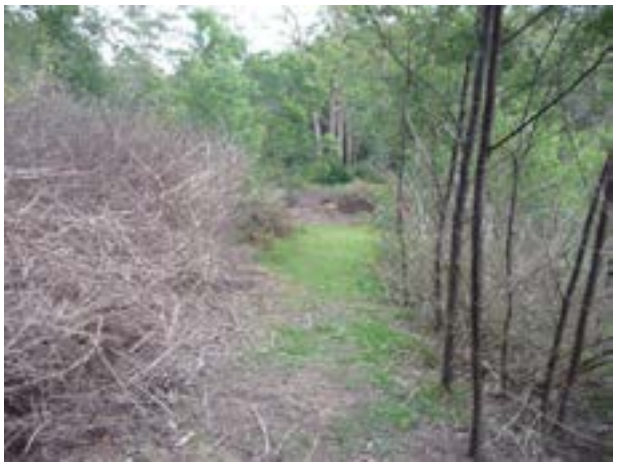
June 2013

The stablisation and revegetation works at the Riversdale culvert have had a great impact on the site. The images on this page indicate a variety of improvements made and some of the challenges of this site.

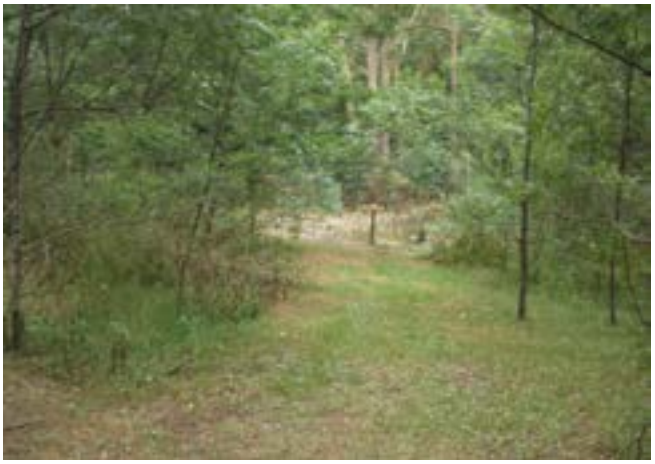
If the Shoalhaven River rises to minor flood level of around 3.2 metres, the culvert will be under water, and the Riversdale property can be cut off.

In June 2013, the Shoalhaven River rose to minor flood levels, about 3.2 metres, inundating the low lying floodplain areas at Riversdale, as seen in the image at left. Events such as this provide challenges for bush regeneration due to the loss of plantings, silt build up and encroachment of new weed species.

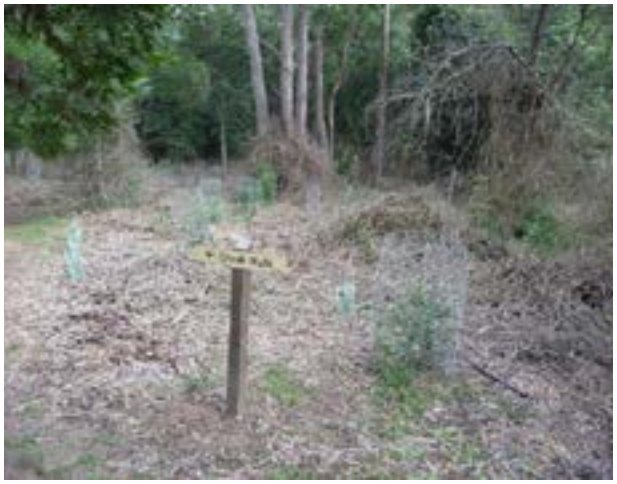
RIVERSDALE RIPARIAN ZONE REGENERATION 2009-2015



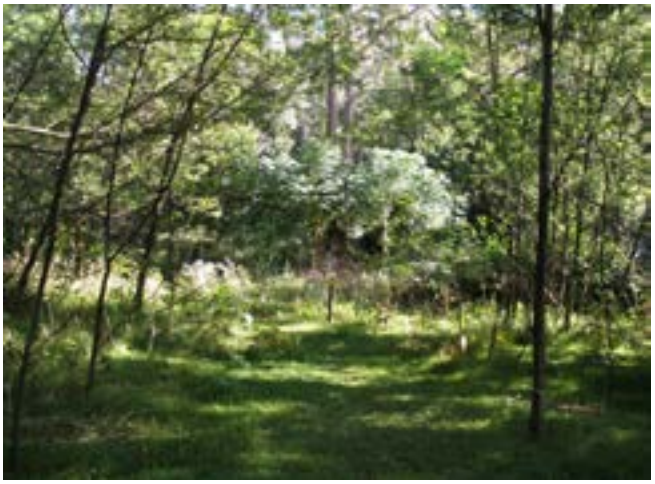
May 2009



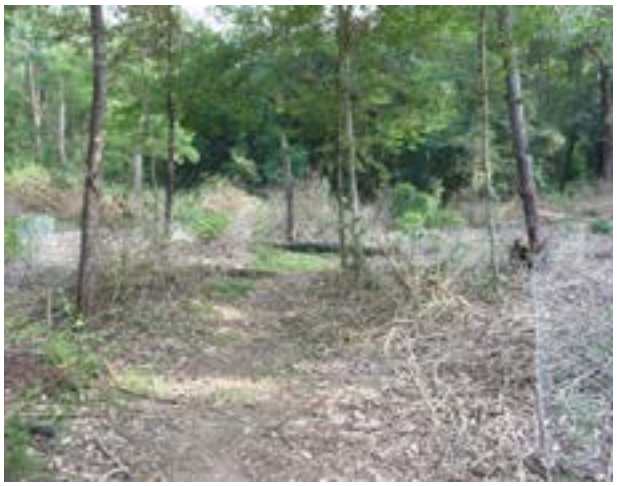
March 2011



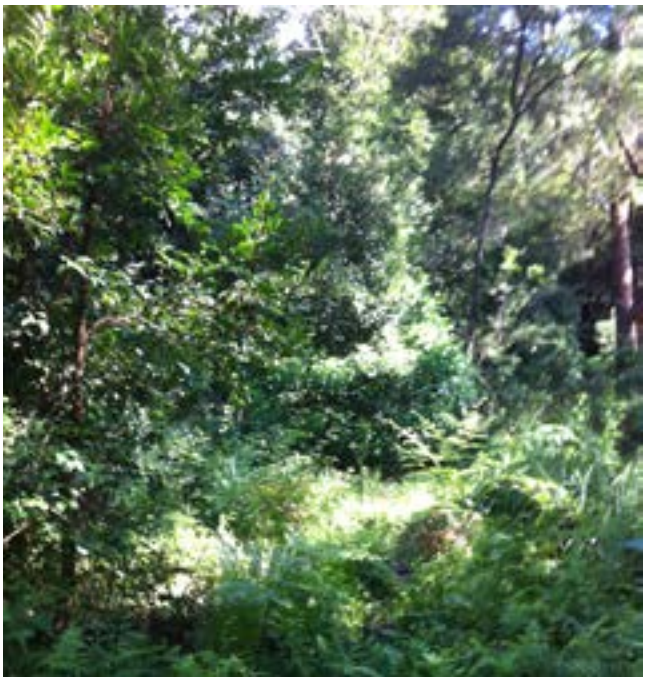
October 2009



May 2012



March 2010



March 2015

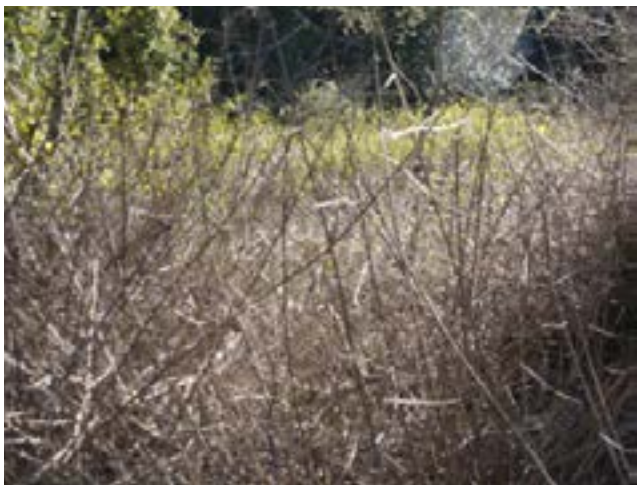
This series of images document a very successful treatment of an area close to the creek at Riversdale, by Bundanon's property team. From being heavily infested with lantana, this area is cleared and planted with seedlings. As the colonising species such as wattles grow, shade is created, rainforest species regenerate and gradually shrubs and groundcovers grow.

REVEGETATION PLANTING

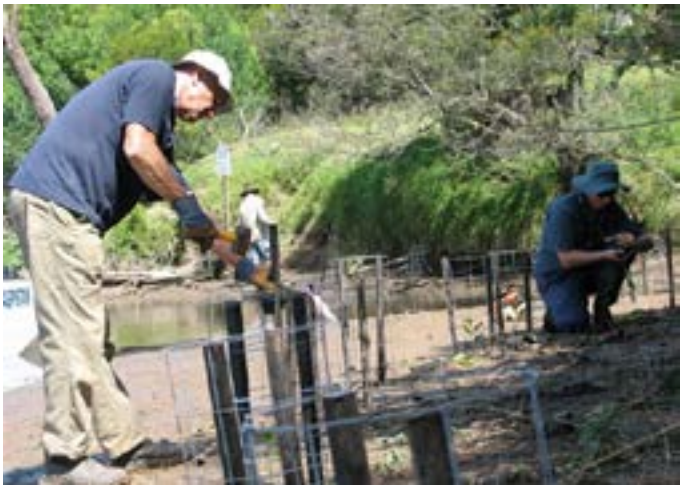
All revegetation sites require the layout of native seedlings according to soil type, landform elevation, soil edaphic conditions, community vegetation structure and specific native species alliances. Other factors influencing plant layout include; landscape character, form, natural values, colour, habitat enrichment, shelter, shade, and watershed flows (flooding risks). This revegetation of plant layouts is the responsibility of experienced professionals who understand both the cultural and environmental values of Bundanon Trust assets and have extensive field knowledge of large scale native revegetation works.

Planting layouts must include a biodiversity ratio of canopy species/understorey and ground cover species of 40/60 with a minimum of 6-8 canopy species, and a minimum of 12-16 understorey and ground cover species utilised for revegetation sites. The plan also recommended the following:

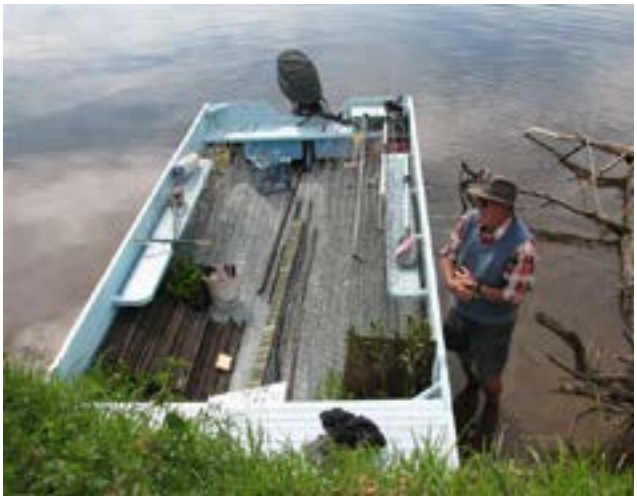
- The establishment of a native seedling holding nursery to coordinate the extensive revegetation program to be undertaken across Bundanon Trust properties. This nursery was established in a sheltered location at Eearie Park.
- Contracting of native seedling growing by experienced native plant nurseries and delivery to Bundanon Trust for hardening off and managing revegetation works is the most cost effective, and logistically practical method of sourcing the native plant material required. Seeds were collected by Richard Scarborough.
- Utilise programs already established within the plant nursery industry and landcare movement
- Education and extension in forest conservation management, environmental reforestation and habitat rehabilitation is where information transfer and guidance is required.
- Collection of native indigenous plant seed will be a key factor in the success of the revegetation works proposed and the responsibility will rest with Bundanon Trust and project partners involved, as well as contracted plant nurseries to provide the necessary native seed resources.



Infestation by lantana along creeklines and river edges is hard to treat due to the inpenetrable growth habit of lantana thickets



Volunteers and Bundanon staff planting river mangroves on the shore line at Riversdale.



Planting operations along the banks subject to erosion at Riversdale

Phragmites reeds grow in a creek area previosuly infested with lantana at Riversdale.

STUTTERING FROG PROJECT PLANTINGS AT RIVERSDALE

Shoalhaven Landcare and Bundanon Trust have partnered to reintroduce the locally extinct Stuttering Frog into the Shoalhaven. This page will provide updates on the project. The project was launched at Riversdale on 1 December 2017. The project is supported by an Environmental Trust grant.

Previously widespread throughout eastern NSW, the species is no longer found south of Sydney. The Stuttering Frog was wiped out in southeastern NSW by the highly infectious Chytrid Fungus, an introduced disease which has decimated populations of Australian amphibians over the past 30-40 years. To establish disease-free populations, chytrid-free individuals will be released at two sites in the Shoalhaven – Bundanon Trust's Riversdale property and a private property along the Cambewarra Range. The project is led by Garry Daly, Director of Gaia Research P/L and a member of the Declining Frogs Working Group.

The project intends to re-establish the southern species at three sites in the Shoalhaven Local Government Area in the suburb of Tapitallee, namely the headwaters of Tapitallee Creek, Bengalee Ck and the unnamed creek at Riversdale. This action will work towards increasing the number of populations/individuals of this species, re-establish the pre-European biodiversity of the receiving area and help restore ecosystem function. The aim is to provide a planned, comprehensive program for the translocation of captive bred tadpoles and disease free metamorphlings into a portion of the species historic range to assist the recovery of the species and ecosystems in the area.

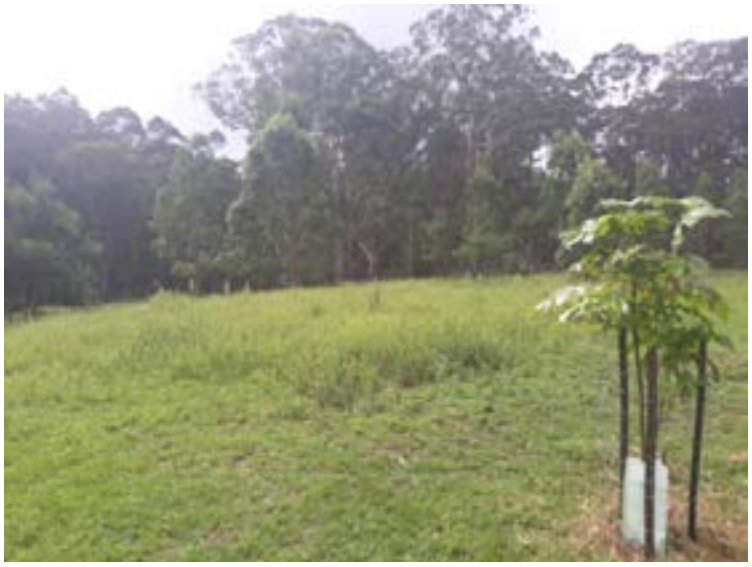
The project involved revegetation of a significant area of the creek at Riversdale, with many volunteers contributing their time. This project extended the extent and effectiveness of revegetation through this area, aiming to re-establish rainforest vegetation. More on this project here.

PLANT PROTECTION IN REVEGETATION AREAS

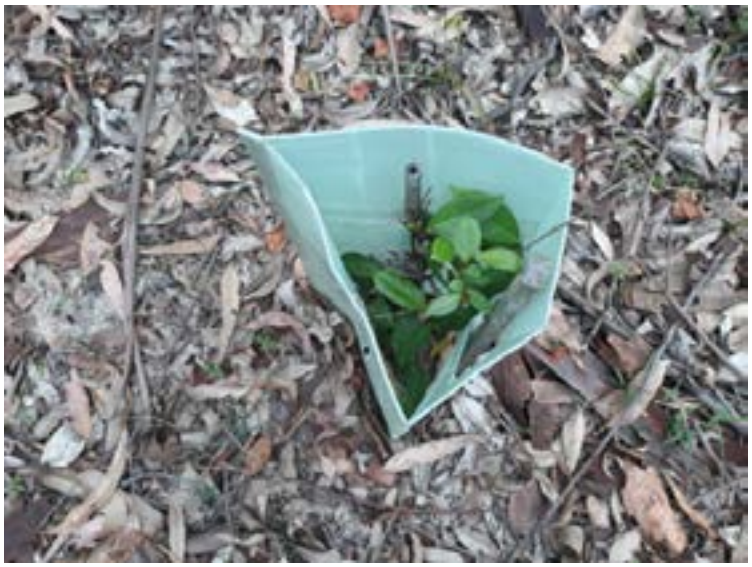
Corflute tree guards such as those shown in the photo opposite can provide good protection for young plants from wind and some browsing animals. They need to be removed once the plant is established because they are manufactured from soft plastic which does not biodegrade.

They pose a great risk of polluting waterways if they are affected by flooding or blown around.

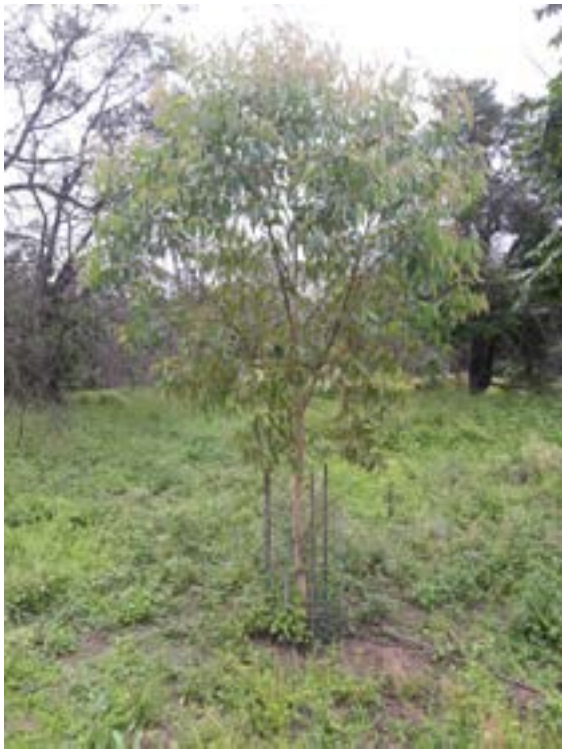
Removal of many thousands of corflute tree guards at Bundanon and Eearie Park has been a very labour-intensive process.



In areas with high populations of browsing animals however it is common for young plants to be continuously nibbled as some as they grow above the top of the tree guard. This can result in a multi-stemmed bonzai, such as in the image opposite.

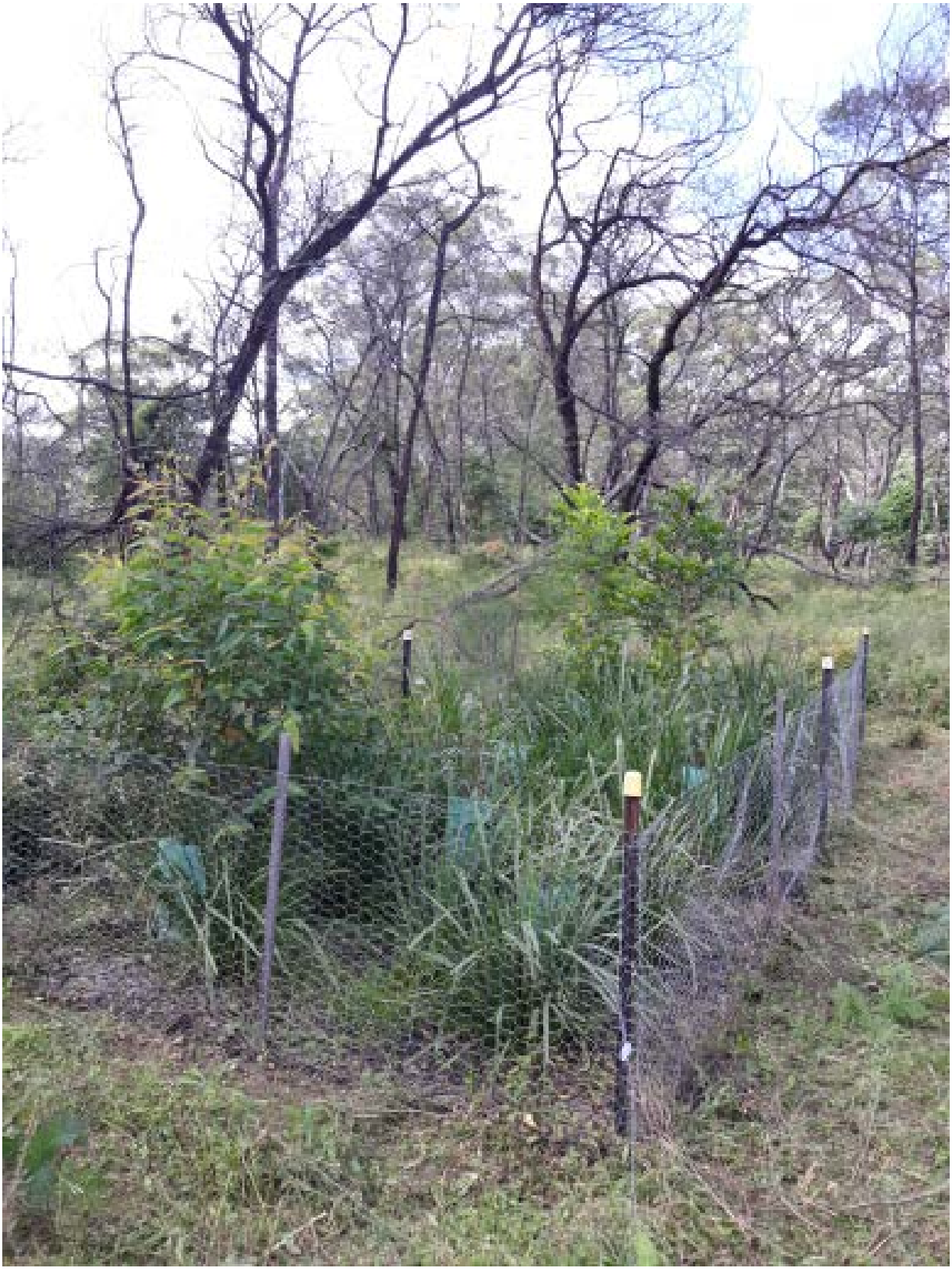


In these areas we have been using larger **firmly staked wire tree guards,** such as in the image below, which provide good protection from wombat, kangaroo and wallaby. The guards are however much more expensive, in terms of both materials and labour.



FENCED PLANTING PLOTS

We have been using fenced planting plots. Each plot is mulched and encloses about 20 square metres. A mixture of trees, shrubs and ground covers can be planted into each plot, creating a mini forest. As the plants mature, they eventually produce fruit and seed which is distributed into the surrounding landscape. So, the fenced plots function as a seed orchard to help spread appropriate native species across the site.



IMAGES OF REVEGETATION AND REGENERATION

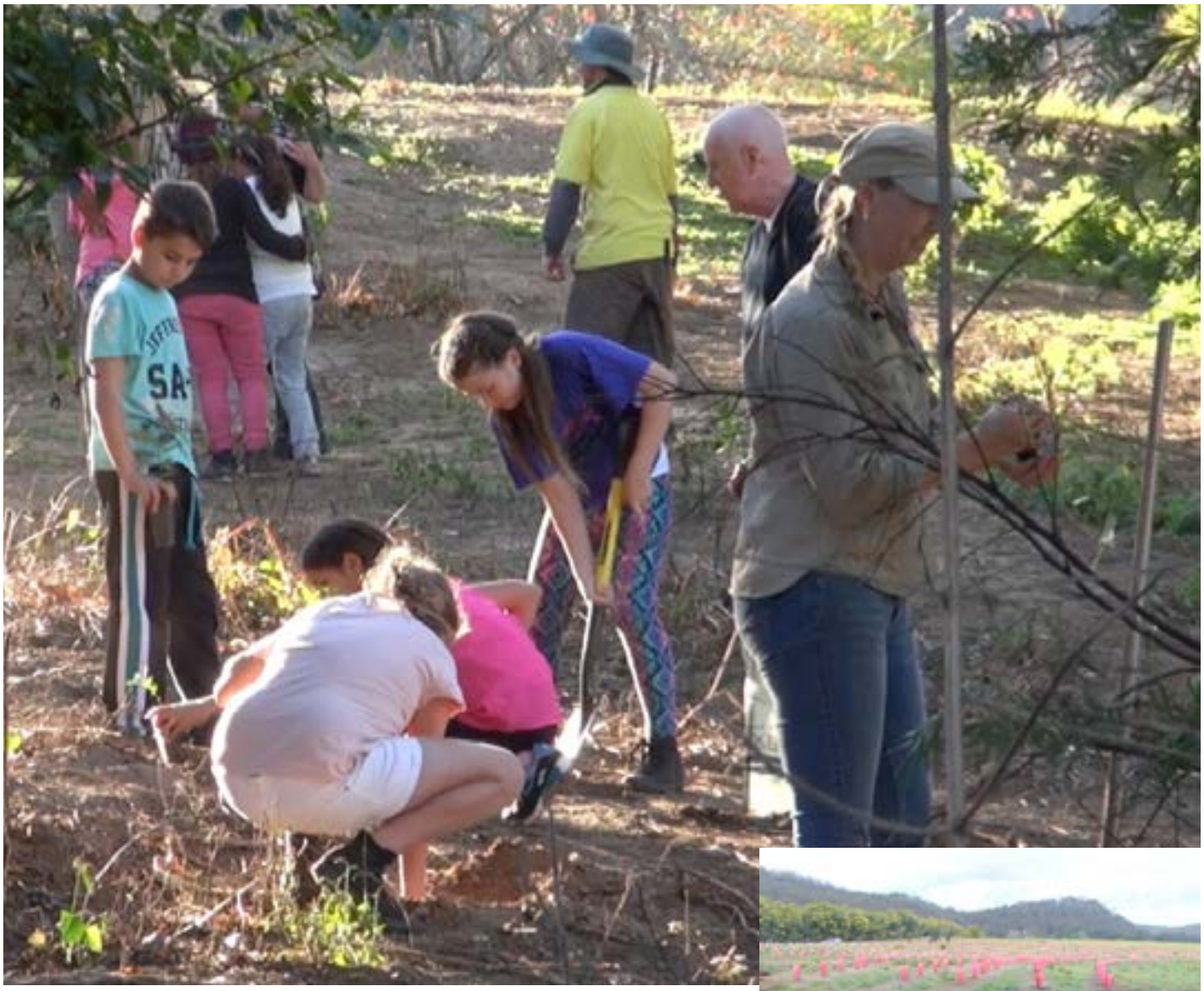


Image: Students from Nowra East Public School planting trees in a riparian zone revegetation area together with Mountain Echo contractors, and members of the Bundanon property team for National Tree Planting Day 2014.

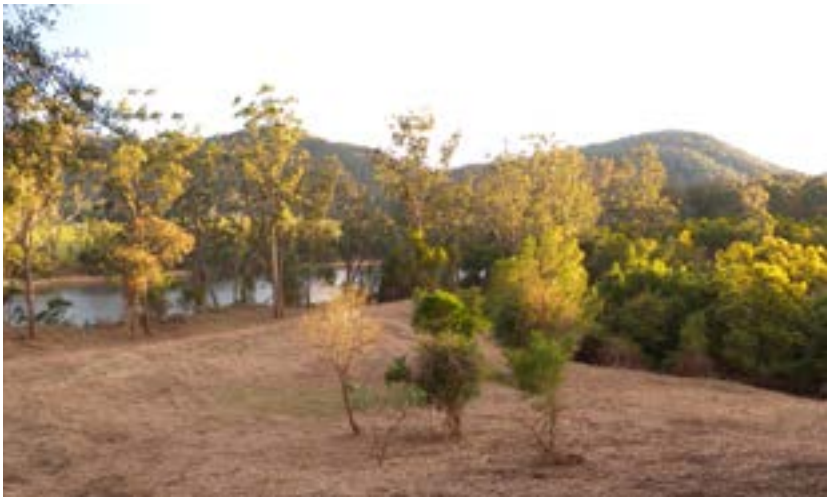


Image: Beweeree property immediately after broadscale clearing by machinery. Remnant species are left in place during this process.

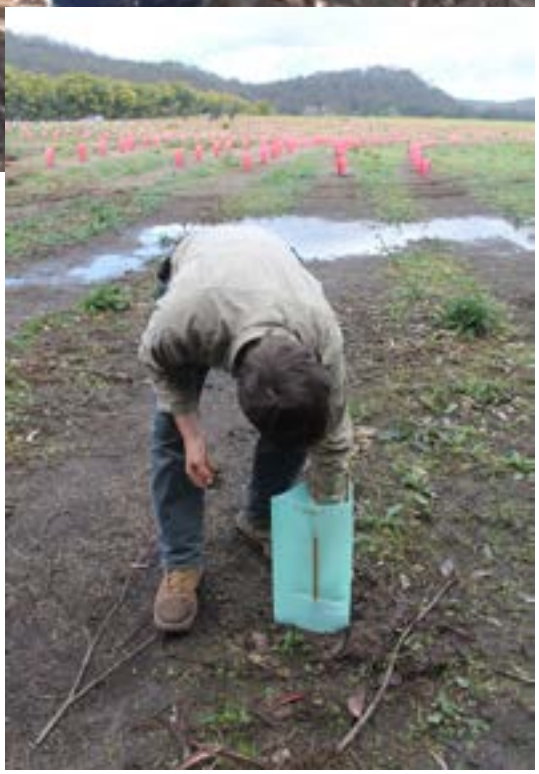


Image: Ryan Hogan of Mountain Echo establishes tree guards around young plants. One of the great challenges of bush regeneration on the Bundanon properties are the large populations of native fauna who are herbivorus.