

Constructed 'habitat stacks'

for fauna recovery within vegetation offset projects

Introduction

Vegetation restoration is an important tool for habitat recovery worldwide and provides vital structure and resources for a diversity of biota and ecological processes. While vegetation restoration is a first step in ecological restoration and habitat recovery, in the short term it often lacks some of key biological resources that characterise an established and biodiverse natural ecosystem (Vesk et al., 2008; Munro et al., 2009).

The revegetation of degraded land has been undertaken now for several decades, nest box installation has developed which addresses lost arboreal habitat, though what's been missing and not often considered is the replacement of the on-ground habitat.

Coarse woody debris (CWD) is generally absent from woody ecosystems where restoration actions have recently been initiated because natural accumulation can be very slow (ranging from decades to centuries) (Sturtevant et al., 1997; Vandekerkhove et al., 2009; Killey et al., 2010), by definition, larger pieces of CWD are rarer than smaller pieces because they take longer to form (Sturtevant et al., 1997; Dahlstrom et al., 2005).

What we did

5 years ago Sunshine Coast Council commenced the delivery of broad-scale revegetation offset projects in response to the needs of various clients. These projects were typically undertaken on ex-livestock or sugar cane paddocks where full reconstruction of the reference ecosystem was required. The absence of CWD on these sites quickly triggered an opportunity to salvage the large root balls and stem material from other Council projects and install them as "habitat stacks" onto two offset sites. Two infra-red motion detection cameras were deployed on two stacks at different offset sites approximately 12 months post installation. The results were impressive with a range of mammals and reptiles being photographed.

Council's Natural Areas Offset Officer has trained a machinery operator to construct habitat stacks in a very specific way so the stack will provide the most beneficial and long lasting habitat possible. A wildlife ecologist has advised that in an open broad-scale paddock situation as many as one stack every 20 metres

in a random layout could be installed to mimic the natural CWD load of a woody forest ecosystem. This validates the results of Manning et al., 2011, Biological Conservation 157 (2013) 204-214 – the finding that 20 tonnes/ha clumped and 40 tonnes/ha clumped and dispersed had similar effects for both small skinks and all reptiles has important implications for conservation managers. It indicates the minimum levels of added CWD required in the future. As CWD can be difficult to source, and expensive to move, our results show that the addition of 20 tonnes/ha clumped could be a more cost effective treatment than 40 tonnes/ha for small skinks.

"it can take >1000 years for the complete decay of large individuals of some tree species"

Daniels et al., in prep

"planting trees is only one aspect of ecosystem restoration"

Course woody debris

- Large woody material contains very significant long term stores of carbon. The carbon is slowly released as it decays in the forest (Stevens, Victoria, 1997).
- A primary energy source is the foundation of an important forest food web and as large size material usually decays more slowly it therefore provides a more steady input of energy and nutrients and longer-lasting structures (Stevens, Victoria, 1997).
- Acts as refugia during disturbance and environmental stress (e.g. low moisture and temperature extremes); temperature moderation and moisture retention
- When course woody debris is added to the ecosystem at regular intervals and is well distributed, it represents a long term source of nutrients. (Harmon et al., 1994)
- Soil health is a result of the myriad of biological organisms and interactions that are part of the forest ecosystem we call soil. This involves soil arthropods, fungi, bacteria, animal waste and among other things, decaying wood. (Harmon et al., 1994)



Bearded Dragon



Eastern Brown Snake



Bluetongue Lizard



Red Bellied Black Snake



Yellow-footed Antechinus



Northern Brown Bandicoot

The issue

Bush restoration has few documented terrestrial examples of constructed ground habitat as an essential component to accelerate restoration and ecosystem recovery.

Most of the current literature on this topic describes the installation of coarse woody debris (CWD) and habitat pods in marine, estuarine and freshwater ecosystems.

Terrestrial habitat recovery is an essential emerging practice.

CWD can take centuries to develop on the forest floor.

Micro-organisms and insects use CWD as a substrate to enrich the soil and increase fertility, as well as building food webs for the new ecosystem.

The solution

Five years ago, Sunshine Coast Council started delivering vegetation offset projects onto ex-livestock or sugar cane paddocks devoid of CWD.

Salvaging large tree stumps and stem timber from civil works projects has now been identified as having immense ecological value.

SCC moved on to constructing "habitat stacks", using a 6 tonne excavator with a log grab, to artificially construct a useable habitat.

Infra-red motion detection cameras were installed to monitor the stacks.

The results

The cameras have captured a large range of fauna within 12 months of construction.

This method very quickly increases the biodiversity of an area and accelerates fauna establishment compared to sites reliant on natural recruitment of native fauna.

Fauna use these "habitat stacks" as stepping stones to traverse and populate a previously open space.

This process is now often incorporated into council's delivery of broad scale revegetation projects and vegetation offset projects as an important element of advanced habitat restoration.

Conclusion

Sunshine Coast Council's results have shown that installing CWD has immediate benefits for wildlife. This supports the suggestion of others in the field of ecological restoration that by installing CWD we could short cut the 100 - 200 year restoration timeframe that might otherwise be required to achieve the same outcomes and that reptiles in particular have been shown to respond rapidly to CWD augmentation (Manning et al., 2013).

The need to incorporate coarse woody debris (CWD) into broad-scale offset and revegetation projects is now thought to be a critical element in ecosystem recovery. The Sunshine Coast Council recognises that salvaged CWD holds immense value in accelerated habitat restoration and now seeks to salvage and store this unreplenishable resource for future use in offset revegetation sites.

"if you install the habitat the animals will find it"