

The Coast Redwood Science Symposium 2016

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Redwood harvest in US

Abstract

Travelling to the US in 2016 to attend The Coast Redwood Science Symposium was an opportunity to better understand the challenges the Pacific Coast redwood industry has faced since the last of the old-growth redwood was protected and modern indigenous forest management systems were implemented. Coast redwood is well known around the world and is iconic in its home range. There are a number of stakeholder groups involved in the management of coast redwood forests (ranging from federal government to concerned locals), and they have all had an influence on the formation of forest policy over the years, which has resulted in the current highly-regulated operating environment. The presentation of some recent New Zealand research findings to the symposium provided some insight into the relatively young industry being developed in this country. In New Zealand the management of an exotic softwood with a well-resourced plantation forest industry has given the opportunity to make rapid gains in breeding, management systems and wood quality in a relatively short time.

Symposium theme

The 2016 Coast Redwood Science Symposium was held in the Sequoia Conference Centre, Eureka, California in September 2016, the fourth symposium since it was first held in 1996. There were about 320 attendees from a wide range of disciplines, with foresters, landowners, managers, community and conservation groups, land trusts, scientists and policy-makers all present – sharing learnings on conservation, economics, science and the history of redwood forestry.

The theme of the symposium was ‘Past Success and Future Directions’. It was geared towards recognising that the policies and strategies that make up the licence to operate across the natural redwood estate need to be based on sound scientific information that is updated and reviewed in an objective manner. The symposium organisers noted that:

With changes in California’s demographic makeup, land ownership, and the regional economy, great interest has developed in areas such as forest sustainability and restoration, watershed assessment, fish and wildlife habitat conditions, and

new silvicultural strategies. This symposium is part of a continuing effort to promote the development and communication of scientific findings to inform management and policy decisions.

A range of papers

Around 70 papers were presented over the two days followed by a day in the field. The range of material that makes up a redwood forest manager's brief was somewhat overwhelming for a typical Kiwi forest manager: Growth & Yield, Fire Ecology, Engineering, Watersheds & Aquatic Ecology, Genetics/Restoration, Silviculture, Wildlife/Native Plants/Habitat, Policy Economics, Community Forestry and Ecology.

Attending the symposium was made possible by the NZIF Chavasse Travel award and NZ Forestry Limited, providing an opportunity to share some of the New Zealand redwood story with the US and further develop relationships on the other side of the Pacific. My contribution involved presenting a paper on the 'Rapid Assessment of NZ Coast Redwood Heartwood Durability Using NIR Spectroscopy' and another on the 'Growth and Productivity of NZ Growth Coast Redwood'.

California – New Zealand comparison

Approximately 25% of the original natural range of coast redwood in California has been converted to other land uses over the years. Nearly all the remaining forest has regenerated from the cut stumps and much has been cut a second or third time. The rapid harvesting of the old-growth redwoods natural range down to about 5% of the original cover over a very short period holds similar parallels to the New Zealand native logging history. Where this country was fortunate enough for the plantation radiata industry to develop and provide a sustainable yield of fibre and so step away from some of the issues of operating in a 'native' environment, redwood forestry in the US still involves the management of uneven aged, indigenous forest stands. Many of these stands are highly modified with unique social, ecological and economic challenges.

Public and private ownership

There were many research papers organised under each of the 10 session topics and poster presentations. The introductory paper set the scene for the symposium, describing some of the key historical events that have led to the challenges the industry faces today. For instance, 625,000 ha of industrial redwood land has changed from public to private ownership under various structures. At the same time 121,000 ha of this industrial forest land has been taken out of production, placed into reserves or given back to indigenous ownership, with about 20% of the natural range now protected. On a smaller scale there has been further loss of productive redwood forest by subdivision for rural development, and more recently for conversion to large-scale medicinal cannabis cultivation.

With this increase in private ownership and a reduction in productive area there have also been significant changes to the infrastructure across the region. An 82% reduction in the number of operational mills between 1986-2016 has impacted on log transport costs, the viability of pulp/biomass facilities, as well as the ability of smaller towns to retain skilled labour. During this time there have been large fluctuations in the market for timber, with redwood prices still not yet recovered from the global financial crisis (GFC).

Management goals and regulatory environment

Management goals have also shifted as owners look to improve productivity, with more intensive silviculture systems targeting higher timber inventories, a shift to more productive cable logging systems, and the installation of the roading networks required to support these changes. The transition to 'young-growth' (second or third rotation) forest has required an adjustment to the management systems required to achieve a sustained yield of a valuable product.

With both federal and state laws being developed during these times of change, the challenge facing the industry in 2016 was to create the regulatory stability that would allow the industry to operate under such intense public scrutiny. Despite the extremely challenging regulatory environment, it appears the industry continues to provide the watershed, wildlife biology and botanical science required to operate in a sustainable manner, while satisfying the requirements of those stakeholders in redwood ecosystems.

Complex redwood industry

The complexity of the redwood industry was well illustrated during a presentation by Steve Smith of the Usal Redwood Forest Company. The challenge the company faced was trying to find solutions to the issues of bear damage, herbicide use, management of invasive species (such as scotch broom and barred owls), unbalanced recruitment of non-crop species (such as tan oak), and the effects of climate change on reforestation, including seed zones and redwood clones.



US redwood logs



US redwoods



Tended New Zealand redwoods

All this from a forester managing a community forest with a number of stakeholders with varying objectives, needing to meet federal and state regulations as well as following Forest Stewardship Council (FSC) guidelines. The range of issues a redwood forester faces every day made my head spin – hitting budgets, maximising TRV and improving percentage recovery of higher value logs seemed to be quite far down the list of things to do.

Fire issues

The session on Fire Ecology and Effects covered a wide range of research looking at how fire history affects current stand composition and how the many types of fire impact on seedling survival and recruitment, stand structure and regeneration. It was a refreshing reminder about just how important natural disturbance events are for foresters who are manipulating the species composition and age classes of the natural forest ecosystems to achieve their management objectives. However, nearly a century of fire suppression in the US has changed what is essentially a ‘fire forest’ to more of a rainforest with large proportions of undergrowth, making those fires that do occur much greater in scale and intensity.

The USDA Forest Service Pacific Northwest Research Station gave a provocative talk about the redwood forests being perceived as ‘rainforests’ in their natural state, when in fact they are victims of fire exclusion, with much of the natural range suffering the same fate as many other forests across the US where fuel build-up leads to unnaturally infrequent, high-intensity fire events. Redwoods evolved with fire: highly flammable leaf litter, fire-resistant bark and the only conifer with the ability to resprout after a fire event. This left me wondering if these traits should be considered when establishing a new forest in any fire-prone areas of New Zealand, or areas that are modelled to become hotter/drier as climate changes.

Inbreeding

The session on Genetics and Restoration covered a range of material, with that on Outbreeding and Crossing being particularly relevant to New Zealand. With the dodgy seed records surrounding many of our earliest plantings, and the high chance of stands (such as the long mile at Rotorua) being closely related and their progeny therefore inbred, the findings from various trials (some set up as early as 1965) were concerned with assessing the impacts of inbreeding by looking at inbred, outcross and standard clones. Some of the findings prove that inbred redwoods had poorer rooting and mortality when cloned, survived at lower rates and grew slower than non-inbred redwoods, particularly on harsh sites or as competition or other stresses intensified.

Interestingly it was observed that when pruned, inbred clones had more and larger epicormic shoots than standard clones, while stem form and several branch characteristics seemed unaffected by inbreeding.

This session showed that the small group of redwood foresters who have been combing New Zealand and collecting material from plus trees over the past 15 years were right to avoid any stands without robust seed records and to be highly suspicious of possible inbreeding.

Black bears and kaka

Wildlife, Native Plants and Habitat – wandering salamander, long-tailed frogs – I was way out of my depth here! Bear damage, not really applicable to New Zealand – or so I thought at first. One of the main reasons Pacific Coast foresters look at you strangely when you say we prune all our redwood is that thinning or pruning their redwood in the US is like unwrapping a sweet for the local black bear community. Opening up the bole allows the bear to scrape back the bark to feast on the sugary phloem, creating occlusion scars and downgrading logs.

Redwood grown in New Zealand enjoys the reputation of having very few pests or diseases to contend with. However, there are a few and the native parrot kaka does have similar tastes to the black bear. A flock of kaka can do a huge amount of damage to the upper stems of conifers, including redwood, stripping the bark in big sheets to feed on the sap. Controlling kaka populations using traditional pest management techniques is not really an option, and fortunately for redwood growers their population numbers are fairly low. However, the potential for this sort of mechanical damage should be kept in mind if considering any afforestation where kaka numbers are high.

Two presentations

I was armed with two presentations to address some of the recent challenges facing the New Zealand redwood industry and discuss the research findings that a small group of dedicated stakeholders have continued to carry out. The first was made up of a general introduction to the New Zealand plantation forest sector:

- A history of sequoia in this country
- A summary of the past 15 years of redwood research about site selection and productivity, provenances and genotypes performance and interaction with the environment across various sites
- Some sawing study results on the production of high-value timber grades
- A look at the outputs of various silvicultural trials.

This was followed up by a more detailed analysis of the two-year Sustainable Farming Fund project I was chairing at the time where we had set out to develop a rapid and cost-effective methodology to assess coast redwood heartwood resistance to fungal decay with near-infrared (NIR) technology. We were only one



New Zealand sawmill

year into the project in 2016, but there were some preliminary results to present which were met with some interest.

The study has now been published and conclusively shows that the influence of genetics on durability is strong and the heartwood durability characteristics from the same genotype will perform similarly across different sites. It was also found there was no significant difference between the durability of New Zealand-grown redwood and 80-year-old second-growth Californian redwood. The New Zealand redwood sector now has a method that can be used to rapidly screen coast redwood heartwood for durability. The research findings will help provide the evidence that New Zealand-grown redwood is a high-quality product and comparable to timber sourced from second-growth forests in the US.

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