TreeMatters

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In this issue

NZARB™

New Zealand Arboricultural Association Inc.

New Zealand Arboricultural Association Inc.,
PO Box 1193, Nelson, 7040, New Zealand nzarb.org.nz

Mission statement: *To encourage, foster, improve and educate members and others in all aspects of arboriculture throughout New Zealand.*

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Membership is open for professional arborists, tree managers, arboricultural trainees, and/or any person interested in amenity trees. To join NZ Arb contact any Executive Member listed on this page or you can find application forms online at the NZ Arb website: nzarb.org.nz

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TREE FELLAS, WELLINGTON CITY COUNCIL, ARBORLAB, BARK, ARB INNOVATIONS, DAVID JAMES TREE SERVICES, FRANKLIN TREE SERVICES, NELSON TREE SPECIALISTS, WELLINGTON CITY COUNCIL, ROBERTS CONSULTING

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Chair – Seth Thompson
Members – all Executive Committee members

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Please send all articles, photos, or advertisements to the Editor-in-Chief via the e-mail below. Alternatively scan the QR code below to contact us.
comms@nzarb.org.nz
021 117 0916

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For the 2017 Rate Card, with advertising rates & specifications, please visit nzarb.org.nz or email comms@nzarb.org.nz

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TreeMatters

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Myrtle rust in New Zealand


Auckland Regional Tree Climbing Competition


Root pruning

Prez Release

Winter is here, but industry continues to simmer

By Seth Thompson
President NZ Arb 2015-2017

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Photo: Treetools

It has been a bit chilly lately in my part of the woods. Leaves are falling and a cold blast is upon us, with the temperature gauge in my vehicle telling me it's been a fresh 1-2 degrees out there some mornings. If that's what it's been like in Auckland, I can only imagine the chills you've been experiencing in other parts of New Zealand.

A few weeks back, your NZ Arb Executive Committee had a very productive meeting in Wellington, with a number of initiatives and projects gaining positive momentum, as we reach the half way point of the NZ Arb year.

It's great to see a number of contracting companies signaling their intention to apply for Approved Contractor Status (ACS). These companies have been going through the process of putting portfolios together ready for assessment. Keep an eye on the ACS section of the NZ Arb website, where you'll find a complete list of current Approved Contractors, as well as any 'Notice of Intents' for companies anticipating applying in the near future. I'm looking forward to seeing both these lists expanding in the second half of the year.

A number of climbing competitions have been held around the country and I was lucky enough to make it to some of the NZ Arb Husqvarna Auckland Regionals. Wenderholm is a great venue and the event as a whole, had a really good vibe about it. I hung out at the NZ Arb 'Ask the Arborist' tent for some time and was able to talk to interested bystanders about the benefits of being, not just a member of NZ Arb but also an arborist.

Talking to other contractors out there, there still seems to be a lot of work to go around. With the fine weather we have been experiencing (amongst the odd weather bomb) the momentum and demand does not seem to slowing. The same operators however, are still crying out for more workers. It seems everywhere I go there is still a critical shortage of qualified arborists. There is no overnight fix for this situation, but an issue we need to consider together as an industry.

While it seems, there's more than enough to keep everyone moving this winter, I hope you manage to find a few minutes to take a breather and enjoy this quarter's edition of *Tree Matters*.

Arbor View

Editorial: Social wins

By Jon Redfern
NZ Arb Editor-in-Chief

Correspondence to
treematters@nzarb.org.nz

Up to recent times, social media was something on a device that gets me through snippets of life – sitting the car waiting for my kids, boring tv, traffic jams etc. Recently my household has taken to social media to get recommendations on jobs above my skill set and we have found some great, trusted tradies. I can't remember what I did prior to social media. It has gone from a grating bug bear to a handy entertainment and workplace tool.

This month it showed how it can make a difference in what seemed to be a total injustice. As we know, Auckland Council, thanks to central government, removed general/blanket tree rules that has brought about a curious paradigm. Fair Go interviewed a couple (couple A) who were trying to remove a large privately-owned tree that blocked 2% of their 180% seaview. The only issue standing in the way of unimpeded views of their portion of the harbour – the tree in question which was growing on another couple's property (couple B). Not perturbed by this minor inconvenience, couple A, who are in the legal industry, set about taking couple B to court. The aim was to legally enforce couple B to remove their tree. To avoid legal costs, couple B was in the process having the tree removed, however, following Fair Go and the outpouring on social media, couple B decided to retain the tree. I'm not sure if it was the angst of a tree was being removed for superfluous reasons or that some 'rich' lawyer was picking on an underdog; the fact remains that couple B has cancelled the chain saws and is going to court on the back of social media.

The use of social media is a great tool of growing influence. There are pages allowing a gathering of thoughts and commentary. Used as it is intended, this is proving to be a source of knowledge and entertainment for our industry. Topics such as the noted tree removal issue and the shortage of arborists are recent examples and, although often there are no easy answers, at least they are being discussed.

In this edition of Tree Matters we have started a new section on health and safety. This is designed to highlight lessons learnt from accidents and near misses. The first safety alert has come from Worksafe and, although the incident didn't occur in the tree industry, it could and it's good to be reminded. NZ Arb would like to make this section a permanent feature to help upskill the industry and these can be used for everyone's tool box discussions. Also featured in the health and safety section is an article by Pat Kerr around identifying the human factor in incidents. Although I don't think we will have many incidents with bears here in New Zealand as shown within this article, we can relate this often to dogs.

Also featuring, Andy Benson takes us through the beginning of his root pruning research that is part of his PhD, Mark Roberts discusses veteran tree management, there's information on Myrtle rust and calls for the Ron Flook nominations.

People

NZ Arb Climbing Committee Vacancy

Committee Job Vacancy
Job Title: Head Technician
Qualification: Certificate in Arboriculture level 4, or equivalent.

Job Description:
You will be in charge of technical gear as part of the NZArb Tree Climbing Competition gear trailers.

As part of the team running the National Tree Climbing Championship you will help identify the trees to be used, oversee how the trees will be set up for competition, run the climber and volunteer gear checks, and oversee any safety issues arising during the competition.

The National Tree Climbing Competition Committee meets several times through the year by way of conference calls, emails, and meeting face to face. Your presence at these is required.

The association runs four regional climbing competitions per year in conjunction with the national competition. The head Technician attends some of these events in conjunction with the Head Judge. Travel for this is funded.

Commitment:
Set up National Tree Climbing Championship trees;

Final judgement on equipment used at competition events;

Attend Regional Tree Climbing Competitions where possible;

Upskill technicians at competition events;

4X conference phone calls;

Attend one face-to-face meeting with committee per year.

If you are interested in this role please contact the committee chair with your expression of interest before July 15.

David James
david@davidjames.co.nz

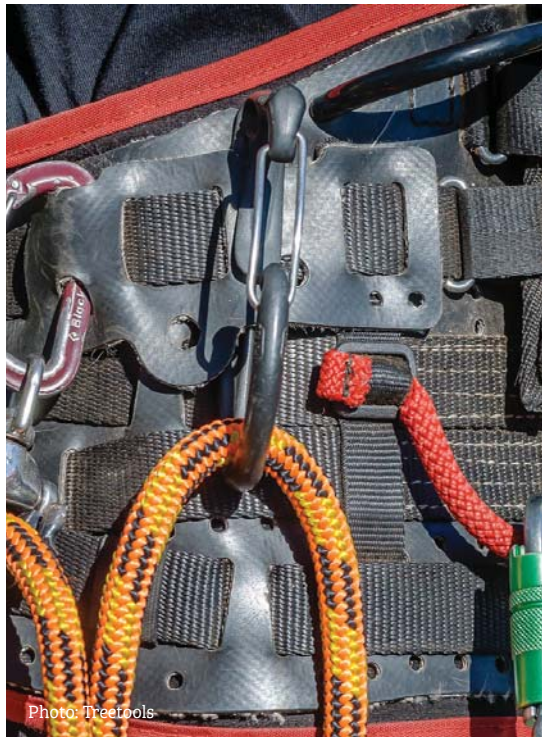


Photo: Treetools

People

Call for nominations

Nominations to administrator@nzarb.org.nz

Nominations are now being called for three high profile annual New Zealand Arboricultural Association awards:

2017 Ronald Flook Award.
2017 NZ Arb Innovation Award
And NEW for 2017, Volunteer of the Year

Nominations for 2017 Ronald Flook Award
This NZ Arb Award was established in 1993. The Award is to elevate and recognise high standards of practice in Arboriculture, including tree raising, tree health and management and amenity tree protection or design. The recipient will have demonstrated exceptional management of trees, whether functional or aesthetic in any stage of development.

NZ Arb have named this award after well-known Nelson based Landscape Architect Ron Flook for his tireless contribution to Arboriculture in NZ through the Notable Trees Scheme and the Development of the Standard Tree Evaluation Method (STEM). The award also recognises the high standard of his professional work and the way he used trees as significant features in his landscape designs.

Year 2013 is the 19th year that the NZ Arb Ronald Flook Award is to be presented. The successful nominee receives the gift of a bone carving and loan of the trophy for one year together with a cheque for $500 from Cindy Flook.

Closing Date for Ron Flook Award nominations is 30 August 2017.

Nominations for NZ Arb Innovator of the Year
The arboriculture industry has a history of innovative individuals and organisations, but it's often the case that these people need a little encouragement to step forward and be recognised for their hard work and pioneering spirit. We want to hear from you if you know of an individual or NZ company breaking new ground in or for the arboriculture sector.

Closing Date for NZ Arb Innovation Award nominations is 30 August 2017.

Nominations for NZ Arb Volunteer of the Year
A brand-new award for 2017, the Volunteer of the Year has been introduced to celebrate the dedication and tireless commitment some of the industry's long-standing volunteers. NZ Arb as an association is driven by the hundreds of volunteers, who donate many hours of their time through their passion for the industry. Without the hundreds of volunteers many NZ Arb events would not be possible, including but not limited to; tree climbing, conferences, workshops and seminars, and committees.

Tell us about someone you know of, who has demonstrated exceptional commitment to the arboricultural industry through their history and dedication as a volunteer.

Closing Date for NZ Arb Volunteer of the Year Award nominations is 30 August 2017.

All nominations should be sent by either post or email to:
The Administration Officer
(Name of the Award e.g. Ron Flook Award)
NZ Arboricultural Association
PO Box 1193
Nelson 7010
or administrator@nzarb.org.nz

2016 Ron Flook Award winner Andrew Harrison

Industry

Myrtle rust in New Zealand: the fast moving villain

By Karin van der Walt, Conservation and Science Advisor, Wellington City Council

Correspondence to Karin.vanderwalt@wcc.govt.nz

Background

Myrtle Rust (Austropuccinia psidii), also known as Guava/ Eucalyptus Rust, is a fungal pathogen which is native to South America. The rust has been spreading globally since 1900 and now consists of several "strains" and although these strains vary in host preference and severity, it is only found on Myrtaceae species (plants in the Myrtle family). Myrtaceae is the plant family which includes species such as Eucalyptus, Corymbia, Angophora, Agonis, Callistemon, Leptospermum, Metrosideros, Syzygium etc. In New Zealand, myrtle rust has the potential to severely affect native iconic species such as pohutukawa and rata, economically important natives such as manuka and exotics such as feijoa and gum trees.

In April 2010, myrtle rust was confirmed on a production property in Wyong, Australia and it has now established widely in coastal eastern Australia, including Tasmania where it was confirmed on Lophomyrtus early in 2015. In the history of the pathogen, there has never been a successful eradication of myrtle rust from a country it has arrived in.

Spread and Dispersal

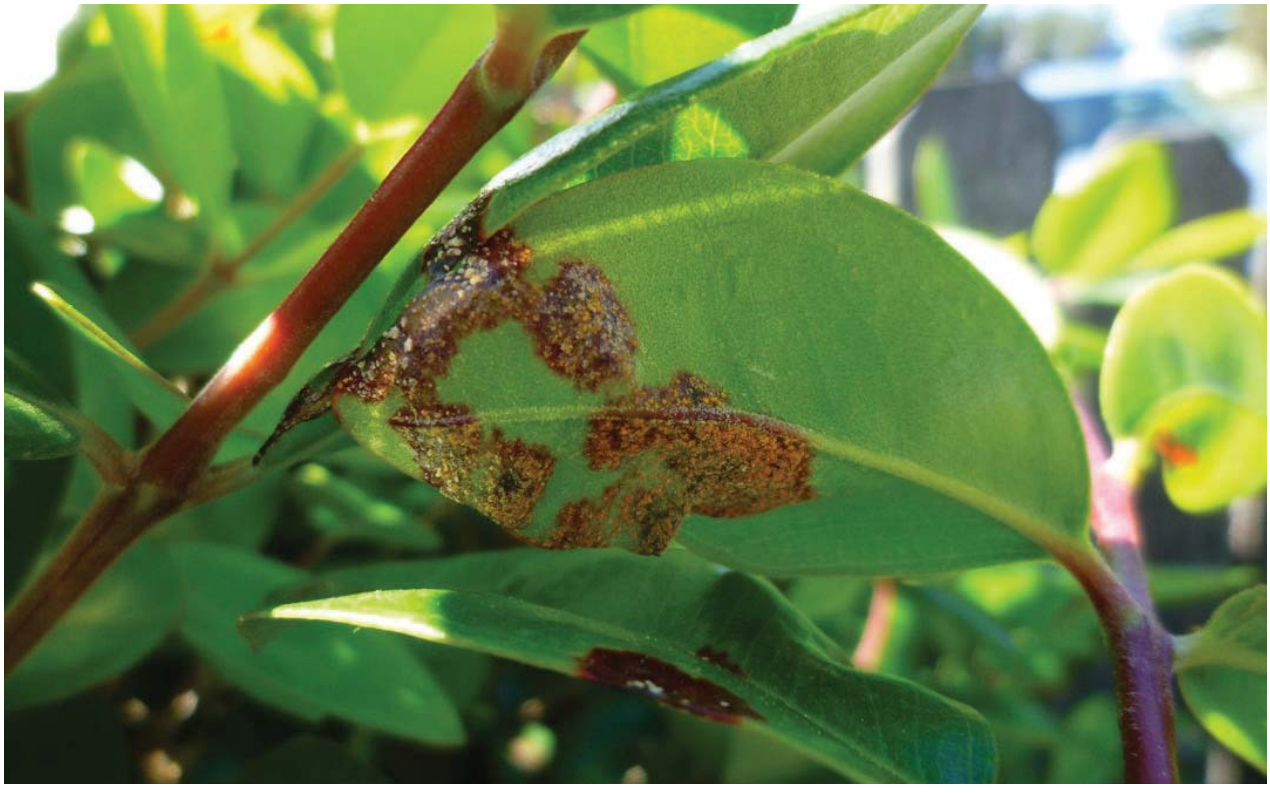
Myrtle rust spreads rapidly through highly mobile spores which can be dispersed by wind, animals (including insects), humans (on clothing or equipment) and movement of infected plants. Spores can remain viable for up to 90 days at 15°C and 35-55% relative humidity, with shorter lifespans expected at higher temperatures. The spores can also survive cold storage conditions, and still be viable after 150 days at up to -190°C (Salustiano et al., 2008). It is suspected that the arrival of myrtle ust in New Zealand (Raoul Island and North Island) happened during a major wind event (NIWA, 2017).

Current status

Myrtle rust was confirmed in Kerikeri on 3 May 2017 (two sites) and in New Plymouth on 17 May 2017 (10 sites). At the time of publishing there are 46 known infected properties in New Zealand - 4 in Northland, 2 in Waikato, 39 in Taranaki and the 1 new find in Bay of Plenty. Although the Ministry of Primary Industries (MPI) is attempting eradication, infected plants within these areas were already releasing spores at the time of detection, making it highly unlikely that myrtle rust can be contained.

Response actions

The response to myrtle rust presents a complex biosecurity challenge since it impacts on primary industry (i.e. honey, forestry, nurseries, Feijoa) and natural sectors (all native New Zealand Myrtaceae species), it involves multiple regions across New Zealand and there are no known large-scale controls for myrtle rust. Fungicides are highly ecotoxic and can only be used in highly controlled environments such as isolated plants in a nursery.



Information on susceptibility/resistance of New Zealand floral species is extremely limited. This makes it difficult to predict what the possible impact of the rust will be as some species or even genes within a species might be resistant to myrtle rust.

Collaborations between MPI, Department of Conservation, Botanic Gardens, Massey University, New Zealand Indigenous Floral Seed Bank, Scion, Plant and Food Research and many more people and organisations, are focusing on the following aspects:

National seed and germplasm collection to establish ex situ collections of New Zealand Myrtaceae species;

Research into storage behaviour to inform seed banking;

Alternative germplasm conservation (tissue culture and cryopreservation) options for species which are likely to be recalcitrant (seed can't be dried out and frozen), or species not producing viable seed such as the nationally critical Metrosideros bartlettii;

Determining susceptibility and/or resistance of New Zealand Myrtaceae species to inform better surveillance and germplasm collection. Trails are conducted in Australia and South Africa.

The role of NZARB

Despite the unlikelihood of eradication of myrtle rust, surveillance remains one of the most important aspects of managing this pathogen. Since arboriculturists spend most of their workday surrounded by trees, they are in an ideal position to inspect Myrtaceae species for any sign of myrtle rust. Although field recognition in the early stages of infestation can be difficult, the sporulation stage is almost unmistakable (Photograph 1; Photograph 2). If myrtle rust is suspected, clear photographs should be taken and MPI contacted immediately.

Due to the risk of spread, it is important that no plant material is collected. More information can be found on MPI's website (www.mpi.govt.nz/protection-and-response/responding/alerts/myrtle-rust).

Karin will speak at the NZ Arb 2017 Conference (26 – 28 October Trinity Wharf Tauranga). For more information on Karin and other speakers visit www.nzarb.org.nz/events

LEFT PAGE Metrosideros kermadecensis with Myrtle Rust
THIS PAGE Syzigium jambos (Australia) with Myrtle Rust pustules on the fruit Photos: Bob Makinson

Moving fast

Myrtle rust moves fast. Soon after its first notification in Northland in early May, infected sites were being reported in Taranaki and the Waikato. At the time *Tree Matters* went print, there were 46 known infected properties in New Zealand in the four provinces and authorities feared that the spores would soon reach other areas.

The affected properties were a mix of nurseries, private gardens, retailers or distributors and an orchard, the Ministry for Primary Industries (MPI) said. Myrtle rust had been found on pōhutukawa, lophomyrtus, eucalyptus and a single instance each of mānuka and Syzgimum smithii. It has not been observed on feijoa as yet MPI is receiving unprecedented support from members of the public, with more than 450 reports of suspected symptoms to its 0800 number. It is working closely with the Department of Conservation DOC in the effort to manage the situation.

The Ministry of Primary Industries list of myrtle rust susceptible host species has 103 entries (www.mpi.govt.nz). The list includes both exotic and native species.

Of the critical trees, the susceptibility is unknown at this stage for the kunzea species rawiri manuka, Great Barrier Island kanuka and Three Kings kanuka and for one variety of manuka or kahikatoa (Leptospermum scoparium var. incanum). Susceptibility of the threatened, nationally critical rata moehau or Bartlett's rata (Metrosideros bartletti) is unknown but the at-risk, naturally uncommon Kermadec pohutukawa (Metrosideros kermadecensis) is considered moderately susceptible.

Industry

NOTABLE TREES NOTES
Lesser-known old-growth kauri

by Matt Smillie

Correspondence to nzntt@paradise.net.nz

In each edition of Tree Matters we will feature a tree or trees from the New Zealand Tree Register, highlighting a specimen or group with outstanding attributes and/or an especially interesting history.

Old-growth kauri trees (Agathis australis)often stand in the shadows of more highly profiled trees such as Tane Mahuta NR/0800 and Te Matua Ngahere NR/0802 but still reward the efforts of anyone that takes the time to seek them out. Greater detail of their measurements and their locations can be obtained from the New Zealand Tree Register.

COR/1364 The Square Kauri Coromandel Forest Park

Situated just off the Tapu-Coroglen road, the Square Kauri is one of the most well-known and photographed trees of the Coromandel Peninsula. The "square" appearance of the bole seems to be due to compression wood flanges extending below the first branches, to well below the midway point of the 12.8 m bole. The tree has a spectacular crown, extending more than 30 m above the first branches. A full view of the tree is obtained further up the road from the start of the short and steep track leading to the viewing platform immediately adjacent to the tree. The view from the start of the track is somewhat foreshortened.

NR/1365 Rakaunui Omahuta Forest

Rakaunui was the fourth largest tree in the Omahuta kauri sanctuary when it was formed in 1951, but is now the second largest tree, after Hokianga (NR/0803), since the fall of the Kopi and Taniwha trees. The neighbouring lower Ngatuahine "Sister" tree has also recently fallen, clearing out some of the forest in front of Rakaunui, providing an impressive view of the tree, but exposing it to further risk of wind-throw.

The name of the tree is a back-translation of "rākau nui", or "big tree". "Rākaunui" in Te Reo actually translates to "full moon".

NR/1366 Tane Moana Tutukaka Forest Conservation Area

Named Tane Moana in 2008, this tree is described as the largest remaining kauri on the east coast of Northland, with a girth of 11 m. This may be true if the Hori Wehi Wehi tree in Russell Forest, reported in 1945 to have a 45 ft (13.7 m) girth, and described by Halkett and Sale as "half dead with considerable rot" in 1986, has succumbed since then.

The tree is sited in a small Department of Conservation reserve in the hills behind Tutukaka, the renowned scuba-diving destination east of Whangarei. Just off a section of the Te Araroa Walkway, between Clements Road and Waitoi Road, the tree is a survivor of the modification in the surrounding land, from native forest to plantation forestry.

The form of the tree may explain its survival: a short (6.8 m) tapering oval bole with two large open scars, the tree would have been considered a high-effort, but low-yield timber source. The tree was not directly wrapped for girth, and provides a challenge to measure without straying from the viewing platform.Doak reported a taped measurement of 11.16 m (equivalent diameter 3.6 m) at one metre above ground level in 2010. This measurement likely includes a large basal swelling at that height. Digital image analysis reveals an apparent diameter at 1.8 m above ground (the height of the surrounding fence rail) of 3.8 m in one direction, but only 2.5 m in the perpendicular direction, for an average diameter of 3.15 m, or a nominal girth of 9.9 m at 1.8 m.

The best feature of the tree is the crown, emerging above the regenerating bush. With some dead wood, it does show the age of the tree, but it is an impressive structure nonetheless.

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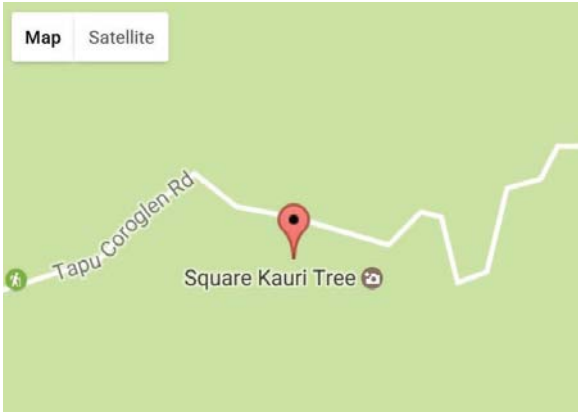
8) Sale, E.V. (1978). Quest for the kauri. A.H. and A.W. Reed Ltd., Wellington.
9) Tane Moana Walkway (Giant Kauri): www.tutukakacoastnz.com/tane-moana-walkway-giant-kauri

NEXT PAGE CLOCKWISE FROM TOP RIGHT
Tane Moana; Map1; Map2; Map3; Rakaunui; Square Kauri

CONTRIBUTE

The New Zealand Notable Trees Trust (NZNTT) welcomes anyone who would like to contribute to expanding the New Zealand Tree Register (NZTR) database. It's simple – just follow the straightforward standard method described in step-by-step detail on the NZNTT website (www.notabletrees.org.nz). Whether you're an experienced tree recorder or a first-timer, your effort is appreciated. Your record may make a genuine difference – and it all helps to build a comprehensive database of New Zealand's notable trees.


Map
Satellite
Tapu Coroglen Rd
Square Kauri Tree


Map
Satellite
Mangamuka
Umawera


Map
Satellite
Matapouri
Matapouri Rd
Tutukaka
Ngunguru
Ngunguru Rd

- advertorial-

STIHL delivers successful workshop series with Mark Chisholm

One part acrobat, one part expert rope climber, one part tree physiologist, and several parts competitor and thrill-seeker, Mark Chisholmis a third-generation, certified arborist with his family-owned Aspen Tree Expert Company in New Jersey. His expertise in tree care has made him a sought-after consultant and industry spokesperson for the world of arboriculture.

In early April, STIHL brought Chisholm to New Zealand, to host a series of workshops around Auckland and Hamilton. In each workshop Chisholm covered topics from 'Ascending Systems' to 'Forces in Rigging and How To Use that Data'. He also discussed 'Doubled Rope Work Positioning and Stationary/Single Rope Positioning.'

The response from attendees for the free workshops was extremely positive across all the STIHL SHOP venues. Seth Thompson of Tree Fellas attended the East Tamaki event and contacted STIHL to say, "Thanks for bringing Mark Chisholm over from the USA to present a free workshop on modern tree climbing techniques. Both myself and my team really appreciated the opportunity to attend,. We learnt a lot. Mark was both professional and informative. It is really great to see a company giving back to its clients; I look forward to more events like this in the future. Once again, thanks"STIHL."

Innovation

Root pruning PhD research update

by Andy Benson

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Severing a 35 mm root is a flawed approach

The practicing of root pruning is becoming more commonplace in the urban forest, especially with the scale of development in some of New Zealand's largest cities such as Auckland and Christchurch. But how many of us as practiing arborists (consultants, supervising work arborists), who deal with matters relating to root pruning and root protection as the backbone of our work, were taught about the intricacies and detail of this practice during our education?

As far as I can make out - and I'm happy to be proven wrong - the recommendations and work methods we all seem to adhere to are largely founded on what's been done in the past, with little or no empirical support. Specifically, I'm referring to the way in which we approach root pruning and the threshold which seems to have been accepted, in Auckland at least, as the current standard.

How many of us have made a recommendation which reads something along the lines of "No roots greater than 35 mm in diameter shall be severed...."? Those familiar with BS5837 will know that the threshold in the UK is 25 mm, and only with caution. It seems to have become the standard accepted by planners who now look for similarly worded phrases in supporting consent application documents, in order to condition readers of the report to think along these lines for completeness in their final planning report.

Flaws

This consensus gentium (the belief that something is true because it is generally agreed) among industry professionals has been precipitated into Auckland's latest version of the Unitary Plan. This now includes specific standards for working in the root zone of public trees and, within certain specific parameters, allows network utility operators to sever roots up to 35 mm in diameter, with no on-site expert advice from an arborist...Think about that for a moment.

Now, in my mind at least, there are a number of flaws with this approach. For example, the arbitrary diameter threshold fails to account for the size of the tree as well as the total numbers of roots being removed. A 35 mm root on a typical street tree may very well be doing a lot of work if the tree is small. Remember, utility operators can sever these roots now.

Conversely, on a much larger tree, perhaps a notable or scheduled tree, a 35 mm diameter root is probably contributing to a far lesser proportion of the tree's water and mineral uptake than the smaller street tree. If the method is to be adopted, it needs greater specificity. Use of the word "diameter" implies roots are circular in cross-section. However, this is rarely the case. Consider thigmomorphogenic eccentricities which produce roots of varying and irregular morphologies. Where is the "diameter" measurement made in these instances?

Experimenting

I've been pondering this for several years now and have failed to find an alternative approach anywhere, and so last year I decided to find out for myself. I enrolled as a Ph.D student at the University of Canterbury's School of Forestry and have spent the last six months researching and experimenting on a hundred or so trees in and around Hamilton.

Now, my experiment has been referred to by some as "tree torture", but you need to break a few eggs to make an omelette. Many root-pruning studies have been undertaken which have investigated the effects of root severance and tree stability; we've all heard of Tom Smiley of the Bartlett Tree Research Laboratory, I'm sure. Others such as Gary Watson have monitored growth variables such as the Diameter at Breast Height (DBH) increase, twig extension and height growth. In more recent times, modern analytical equipment has been used to look closely at the physiological response of root pruning to detect early stress symptoms, resulting from what is essentially simulated water stress.

" ...my experiment has been referred to by some as "tree torture", but you need to break a few eggs to make an omelette."

Traditionally, these studies quantify the extent of the root severance in one of several categorical variables, i.e. an indiscriminate trench on one, two, or three sides of a tree. As we would all expect, more trenching, or trenching closer to the tree, negatively affects the dependent variables such as stability, growth or physiology. The research I've been undertaking follows in a similar vein with the major difference being that I severed roots discriminately for later measurement. Countless hours on the end of an airspade (my hat goes off to anybody who operates one of these on a regular basis during their professional career) resulted in trenches which I was able to carefully sever and remove roots from.

Pipe model theory

Why would I do this you may wonder? Well, there is a little-known theory (at least seemingly so amongst arborists) called the pipe model theory of tree form, which was proposed in 1964 by a group of Japanese researchers. You can look this up and it's really very interesting, and when I stumbled upon it I wondered why this wasn't a part of our curriculum. It's similar tothe "core-skin hypothesis" which Dr Alex Shigo refers to in an article reproduced in the Techno Tree Biology Dictionary. He writes that "many researchers over a long period have contributed to what Dr R C Hardwick calls the core-skin hypothesis, which states that as

new growth increments or "new trees" grow over old increments or "old trees," the "young trees" become "skin" over the aging "core." As trees age, the ratio of "core" to "skin" increases." Shigo acknowledges that he has used many of Hardwick's ideas in his book "Modern Arboriculture."

Very briefly, the pipe theory states that the combined cross-sectional area of all the roots in each root-size class is equal to, or proportional to, the trunk cross-sectional area at ground level. Consider if you will the conductive sapwood as a collection of drinking straws held together by an elastic band in a cylindrical arrangement and imagine this as the trunk of a tree. Now, imagine each of those drinking straws splays out radially from the bottom of the bundle, perhaps in small groups at first and further separating the farther from the base of the bundle they extend. Consider this now as a rudimentary root system.

Now, if we knew how many straws there were in the bundle (the trunk) and we knew how many straws were in a particular root we wanted to cut, we'd know what percentage of the total number of straws we'd removed. Of course, we can't sit there and count xylem vessels all day, nor can we practically quantify conductive sapwood every time we need to prune a root. We can however measure its cross-sectional area, or at least estimate it to within a reasonable level of accuracy using the same measuring implements we carry with us all the time.

Threshold

This is why I dug my trenches with an airspade and carefully excised and removed all the roots, because the threshold I'm looking for where negative effects (growth and physiology) are (statistically) avoided, relates to the combined cross-sectional area of all roots removed as a proportion of the tree's trunk cross sectional area.To do this, I've been taking fortnightly readings of stomatal conductance (a measurement of stomatal aperture and water vapour leaving the tree) and chlorophyll fluorescence (a measurement of the quantum efficiency of the photosynthetic apparatus). Regressions can be undertaken for all measured variables against the continuous variable (root cross-sectional area ratio) to test for statistical significance and hopefully find an answer to my question.

Florida

The experiment I did in Hamilton has ceased for the winter outside of the growing season but I'll be monitoring the trees' progress again next spring and summer. For now, though, I'm dodging alligators and venomous snakes in Florida at the University of Florida's Gulf Coast Research Centre thanks to a grant awarded by The Tree Fund.

I'm replicating the research I've been doing in Hamilton but with some extra information thanks to the outstanding facilities here and the plethora of gadgets and resources available. I'm actually going to be working on trees planted by the venerable Ed Gilman at his research site in Gainesville, where countless tree pull tests, planting studies and root investigations have been undertaken. I'm here until the end of October and with any luck, I'll have some results by the time the Tauranga Conference comes around, so watch this space.

I'd like to thank you for taking the time to read this and close out by saying that the only way we, as an industry, will improve our understanding and reach better outcomes is by challenging current thinking when, or if, we think something is incorrect. I encourage you all to maintain a high professional standard and make the best and most informed decisions you can by relying on your training and education.

Talk to your peers, colleagues and friends and seek out experts who, I have found, are most accommodating and welcoming of queries which relate to their fields of expertise.

Support

I was fortunate enough to have received a good deal of support, both financially and otherwise for my research. I'd like to acknowledge the following people/entities who have made this research possible by providing financial support, donating their time, giving advice or lending equipment.

The Tree Fund. Tāmata Maples. Hamilton City Council. Arborlab Consultancy Services. Christchurch City Council. Hamilton Infrastructure Alliance. Treescape. NZArb. Wellington City Council. Stuart Barton. David Spencer. Gerald Collett. Sean McBride. Rick Jobbitt.

Innovation

Veteran tree management

The essential question: not why, but how a tree dies

by Mark Roberts

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The management of ancient and veteran trees has become very topical and this is not necessarily a bad thing. Managing venerable old trees requires a different mind-set and I quite like that. Sometimes it's best to throw the rule book away, do something drastic or sometimes it's best to do nothing at all.

But before we can consider saving something old, we need to know *why* it dies, not *how* it dies.

We humans die of old age – assuming we get the chance that is. The "how" differs but the commonality is that our chromosomes lose the ability to accurately replicate themselves. As we age, the copies start to get a bit faded and eventually, so do we. Trees don't have that issue. Trees don't die of old age. Trees can accurately replicate their cells for as long as they can get water and nutrients to where the copies are being made [the meristems]. In theory, trees could live forever; but in reality, they don't. So why do trees die?

One of the many theories is that trees die because they get to a point where they no longer have enough photosynthetic resources to support all their \"dead" tissue. As theories go, this one doesn't seem to make sense; why would a tree invest resources on dead tissue? Trees wouldn't; they are not emotional, they don't think and they wouldn't invest resources on dead tissue – unless that tissue wasn't actually dead So, we should re-word that theory to "trees die because they get to a point where they no longer have enough photosynthetic resources to support all their 'un-dead' tissue".

So, what is all this un-dead tissue? When most of us think of wood, we are thinking about the plant tissue called xylem. In older trees, most of the tree's xylem is heartwood, and we've been taught since ancient trees were young that heartwood is dead. Technically, depending on which definition you choose, heartwood is dead, the nucleus of the cell has stopped beating, it's dead. But there is still quite a bit going on in and around these dead cells, so much so that to call them dead is a bit of an overstatement; its more un-dead, than dead.

The heartwood is dead, long live the heartwood...
In real terms, what does this mean and what has it got to do with the management of ancient and veteran trees?

When a tree gets to a point where it has too much bulk, too much tissue to maintain with the resources that it has available, it must shut down and/or shed some of that bulk. In the natural environment, some trees will retrench; they will retreat into themselves. They will stop supporting some of that un-dead tissue, let it fall away and channel water and nutrients where they are getting a better return on their investment. Google the "Arthur Clough Oak" and you will see 100 years of this in action.

We need to keep this process in mind when we consider managing veteran trees; in fact, we need to keep this process in mind when we manage all our trees, if we ever want any of our trees ever to become veteran trees. For a tree to retrench or retreat into itself, it needs to have somewhere to go back to. If we keep thinning our trees, and removing all the epicormic growth, then we reduce the options available to the tree. Many of our current management practices could well shorten the life of our trees.

So how to manage veteran trees? There isn't a rule book when comes to veteran tree management, although the UK's David Lonsdale and Ancient Tree Forum (ATF) do have some fantastic resources. The key point (which the ATF make several times) is that every tree needs to be considered as an individual; the position, condition and importance of each tree needs to be considered. And then, whatever you do (or don't do) needs the investment of time. If you have a structure that could live forever then you need to adjust your time scale; five, ten, fifteen years maybe. If you are going to do it, then commit to it for the long term and know that if it is done well, it could outlive you and many generations to come.

ATF: www.ancienttreeforum.co.uk

" In theory, trees could live forever; but in reality, they don't. So why do trees die?"

Taranaki Cathedral Oak

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Innovation

Understanding tree responses to abiotic and biotic stress complexes

by Daniel A. Herms, Department of Entomology, Ohio State University

Abiotic factors, such as nutrient availability, soil moisture,temperature, and pollution interact with biotic factors, such as insects and disease, to form stress complexes that impact tree health. The idea that rapidly growing trees are the most pest resistant and stress tolerant is highly ingrained. But is that always true? Although clearly true in some cases, a large number of studies show that, in many situations, rapidly growing trees are less resistant to pests and less tolerant of stress. The same cultural practices generally thought to enhance insect resistance, such as fertilization, often increase tree susceptibility to insects and other stresses. Effective use of fertilization and other cultural practices in a tree health care program requires a sound understanding of their effects on tree physiology.

This article discusses physiological responses of trees to stress factors, the natural defences of trees to pests, and how environmental stress factors and cultural practices can interact with tree defences to affect the long-term growth and survival of trees in the landscape. The purpose is to help the reader understand the complex interactions that occur among trees, stress, and pests, and the implications of these interactions for effective plant health care in a low-maintenance landscape.

What Is Environmental Stress?

Through the process of photosynthesis, light energy is used to produce sugars from carbon dioxide obtained from the atmosphere. These simple sugars are then used to manufacture the complex carbohydrates, lipids, amino acids, proteins, defensive compounds, and other biochemical building blocks of cells, leaves, bark, branches, and roots. All trees need the same basic resources to sustain photosynthesis: water, essential nutrients, and light.

Environmental stress can be defined as an external force (stress factor) that limits the ability of the tree to acquire these essential resources from the environment. Stress occurs in two general ways: 1) when there are shortages of essential resources in the environment, including water during drought, nutrients in deficient soils, and light in the forest understory; and 2) when environmental factors limit the uptake of resources that are otherwise present in adequate supply. Such factors include air pollution, which limits photosynthesis because of toxic effects on plant cells, and soil pH, which can limit nutrient uptake for some species.

Stress factors (e.g., excess or inadequate soil moisture, inadequate nutrient availability, defoliation, ozone) and their effects (e.g., decreased growth, limited photosynthesis) can be measured and vary in intensity, from weak to strong, and in duration, from short-lived to chronic.

Over time, a species evolves to adapt to stress factors. Hence, in the same environment, one species may be stressed and another not. For example, baldcypress (Taxodium distichum) grows well on flooded sites where most other trees would not survive, and rhododendrons (Rhododendron spp.) experience nutrient deficiencies in alkaline soils where other species perform well. Flowering dogwood (Cornus florida) and sugar maple (Acer saccharum) exist quite well in the same shaded forest understory where the intolerant paper birch (Betula papyrifera) would decline rapidly.

Trees Operate on a Tight Budget

A key point in understanding how trees respond to stress is to recognize that trees and other plants have limited resources to support their physiological processes. It has been widely observed that the shoot growth of trees decreases in years of heavy fruiting, and that significant root growth and accumulation of storage carbohydrates do not occur until shoot growth slows. Just as a family must budget its limited income across food, clothing, shelter, and other essential categories, a tree has limited income that must be budgeted across various competing processes, such as growth, maintenance, reproduction, storage, and defence. If, for example, more income is allocated to growth, then less is available to support storage and defence.

Trees are programmed to respond to increased availability of nutrients, water, and light by increasing their growth rate. Trees are capable of extremely rapid growth when nutrients and water are plentiful, and if given the opportunity, will overindulge, growing so quickly as to be physiologically out of balance with their environment. This phenomenon is demonstrated in the extreme by the accelerated growth regimes sometimes used in nursery production. Because the processes (e.g., protein synthesis) necessary for growth require substantial resources, rapidly growing trees have fewer resources available for the production of support structures. Laden with succulent growth, such trees must be staked until growth slows, until bark, lignin, and cellulose are produced and the trees harden.

Baldcypress (Taxodium distichum) grows well on flooded sites where most other trees would not survive. Photo taken at the Mingo National Wildlife Refuge (Puxico, Missouri, U.S.).

Tree Responses to Environmental Stress?

To obtain carbon from the atmosphere, a tree must intercept light from which it can derive the energy necessary to drive photosynthesis. All other things being equal, the greater the total surface area of leaves on the tree (dependent on both the size and total number of leaves), the more light the tree can intercept and the more carbon it can capture from the atmosphere during photosynthesis. Hence, the growth rate of trees is a function of the tree's total leaf area, as well as the net rate of photosynthesis of each leaf.

The production of new leaf tissue requires a generous supply of nutrients necessary to drive protein synthesis; as such, growth is sensitive to nutrient stress. Nutrient stress decreases tree growth both by decreasing the total numbers of leaves per tree and the area of individual leaves. Photosynthesis, which can continue in already existing leaves, is much less sensitive than growth to nutrient stress and does not become limited until stress becomes severe. Severe nutrient deficiency limits photosynthesis because nitrogen, phosphorus, iron, manganese, and other essential elements are required for the productionof photosynthetic enzymes and chlorophyll.

The nutrient status of the soil determines the potential total leaf area and carbon acquisition a tree can achieve on a particular site. Soil water content determines the degree to which a tree will reach that potential during a particular year. Tree growth can be extremely sensitive to water stress when it occurs at critical times during the growing season. High turgor pressure is necessary for cell expansion, and the presence of water is necessary for all biochemical processes upon which growth depends. Therefore, growth can be limited by even mild water deficits. As mentioned previously, photosynthesis is much less sensitive to water stress than is growth, becoming limited only when drought stress becomes more severe. As water stress increases, photosynthesis becomes limited by closure of stomata, which conserves water by decreasing transpiration. At the same time, however, stomata closure prevents uptake of carbon dioxide from the atmosphere. Severe water stress can also directly damage photosynthetic machinery, sometimes irreversibly.

Deciduous trees often refoliate. Refoliation depletes stored energy reserves, but carbohydrates are replenished by the new canopy. Photo: Minnesota DNR Archives; forestryimages.org

Evergreen conifers, on the other hand, can be killed by one severe defoliation because they have much more invested in their canopies. Photo: Minnesota DNR Archives; forestryimages.org

Because fertilization stimulates shoot growth to a greater degree than root growth, fertilization can simultaneously increase a tree's water demands while decreasing its ability to acquire water during drought. Consequently, fertilized trees that are not irrigated may be especially susceptible to drought stress. Indeed, a number of studies have shown fertilization to decrease the tolerance of trees to drought stress.

Recognizing that water and nutrient availability have different effects on growth than they do on photosynthesis is key to understanding how trees respond to stress. Growth is more sensitive to stress than is photosynthesis, and as a result, can be severely limited by stress that has little effect on photosynthesis. Growth is usually defined as the processes of cell division and cell enlargement, and it leads to an increase in the number and/or size of tree structures, including leaves and meristems. However, it is important to realize that trees under moderate nutrient and/or moisture stress can increase their biomass substantially through carbon acquisition via photosynthesis even when they are not "growing." The tree accomplishes this by increasing the density of existing cells (for example, by producing thicker cell walls and cuticles, and by accumulating storage carbohydrates and defensive compounds).

Severe stress limits carbon acquisition as well as growth. Shade limits photosynthesis in nonadapted species by decreasing available light. Severe nutrient deficiency reduces photosynthesis by limiting the plant's ability to manufacture photosynthetic enzymes and chlorophyll. Sustained drought limits carbon uptake by triggering closure of stomata, and in severe cases, by directly damaging photosynthetic machinery. Ozone, the most important air pollutant affecting tree health, also damages photosynthetic machinery.

Defoliation decreases carbon acquisition by decreasing total leaf area. Although trees tolerate mild defoliation (up to 50 percent) with few noticeable effects, severe defoliation decreases tree growth, energy reserves, rates of wound closure, and resistance to secondary pests, such as wood borers, root rot, and canker fungi. In severe situations, mortality occurs. Early-season defoliation, just as leaves fully expand and energy reserves are low, is particularly damaging. Some studies indicate that mid- to late-season defoliation can also be quite stressful.

Deciduous trees often refoliate following severe defoliation. Refoliation depletes stored energy reserves, but carbohydrates are replenished by the new canopy. Because of such compensatory mechanisms, deciduous trees with adequate energy reserves can survive several successive years of complete defoliation, although they will be severely stressed. Evergreen conifers, on the other hand, can be killed by one severe defoliation because they have much more invested in their canopies, which can hold several years' worth of foliage. Furthermore, conifers store a greater proportion of energy and nutrients in their canopy than do deciduous trees. The loss of the canopy and its stores of nutrients and energy represents an extremely severe stress for conifers.

Tree Adaptation Strategies

In most temperate forest ecosystems, tree growth is nutrient limited, and summer drought is a predictable fact of life. These stresses are a natural part of tree existence, and trees are well adapted for dealing with them. For example, as water stress develops, many tree species can maintain high turgor pressure in their leaves by increasing the concentration of certain dissolved substances in their cells, causing more water to flow into them. By maintaining high turgor pressure through this process of osmotic adjustment, trees prevent wilting from occurring, as stomata remain open, allowing water uptake and photosynthesis to continue as the soil dries. This response is generally stronger if water deficits develop gradually and if plants are preconditioned by previous exposure to drought.

Moisture stress and limited nutrient availability increase root growth relative to shoot growth. This response decreases leaf area but increases nutrient uptake and the quantity of nutrients available for existing foliage. As a result, high rates of photosynthesis are maintained, storage carbohydrates accumulate, and stress tolerance is enhanced by the increased root:shoot ratio.

Many trees also adapt to changes in light availability. Some trees, when growing in shaded environments, produce thinner but larger leaves than when growing in full sun; this allows trees to maximize the amount of intercepted light. The trade-off between increased leaf area and decreased photosynthetic rate is of little consequence because high rates of photosynthesis are already constrained by low light intensity. Furthermore, the photosynthetic machinery of plants adapted to the forest understory is designed to take full advantage of transient light flecks that penetrate the canopy. Plants adapted to full sun are unable to respond quickly enough to take advantage of this fleeting resource. However, when placed suddenly in full sun, shade-adapted plants can be injured by their inability to dissipate excess photosynthetic energy. Several factors interact to affect the

Tree resistance to insects and disease results from the interaction of multifaceted physical and chemical defenses. These natural defenses may include toxic chemical compounds, thorns and spines, or foliar pubescence

How does tree stress affect pest resistance? Research indicates that an understanding of the effects of stress on insect and disease resistance requires understanding the effects of stress on the relationship between growth and photo-synthesis. Photo: Steven Katovich, USDA Forest Service; bugwood.org

A major challenge facing practicing arborists is defining, measuring, and maintaining tree health. Equating rapid growth rate with tree vitality may not be consistent with the long-term health and survival of trees in a low-maintenance landscape.

ability of the tree to acclimate to stress, including response time of the plant trait. The duration and intensity are also key. Stomata can respond to transient drought stress within minutes, while leaf morphology adjusts to chronic shade over months to years. The predictability of stress is probably also important, although few studies have addressed it. It would be interesting to know, for example, how fertilizing in some years but not others affects traits such as root:shoot ratio. Could trees be "confused" by unpredictable environments, such that their ability to acclimate to stress is impaired?

"It has been widely proposed that environmental stress decreases tree resistance to insects and disease by weakening natural tree defences. This view has proven to be a dramatic and often erroneous oversimplification."

Natural Defences of Trees to Insects and Pathogens

Tree resistance to insects and disease results from the interaction of multifaceted physical and chemical defences, including thorns and spines, foliar pubescence, toughened cuticle, indigestible structures (e.g., cellulose and lignin), and perhaps most important, the toxic and deterrent effects of allelochemicals.

Allelochemicals (also known as secondary metabolites) are chemical substances produced by plants (and other organisms) that, among other functions, protect them from their natural enemies. Thousands of such compounds have been isolated from plants, including tannins and other phenolic compounds, terpenes (e.g., pine resins, the essential oils of mints, the anti-cancer compound taxol), alkaloids (e.g., nicotine and morphine), cyanogenic compounds (cyanide-producing chemicals), and many others. The defensive role of these compounds against insects, pathogens, and mammals is well documented. Indeed, several such compounds have been used as natural insecticides, including nicotine, pyrethrin, rotenone, and pepper extracts.

It has been widely proposed that environmental stress decreases tree resistance to insects and disease by weakening natural tree defences. This view has proven to be a dramatic and often erroneous oversimplification. Many studies have found that concentrations of allelochemicals and insect resistance actually increase in response to nutrient limitation, drought, defoliation, and other stresses. In other cases, stress does weaken tree defences to insects and pathogens. Understanding how stress affects insect and disease resistance requires a basic understanding of how trees respond physiologically to stress and how tree defences are tied to these responses.

Abiotic Stress and Pest Resistance

Considerable evidence is accumulating that indicates an understanding of the effects of stress on insect and disease resistance requires understanding the effects of stress on the relationship between growth and photosynthesis. Moderate stress generally increases tree resistance to leafchewing and -sucking insects. Why? In rapidly growing trees, resources used to support growth are not available for defence. But as we have seen, photosynthesis is not as sensitive to stress as growth is. Thus, when moderate nutrient or drought stress limits growth, photosynthate can't be diverted to growth processes, and carbohydrates accumulate in the plant. The carbohydrates can then be used to produce the increased concentrations of allelochemicals and storage compounds that enhance tree resistance to insects and stress. Severe stress, on the other hand, by decreasing carbon assimilation, decreases the amount of energy to support defence, as well as growth, and has been shown to decrease tree resistance to insects and disease.

Fertilization and Pest Resistance

Numerous studies provide strong evidence that fertilization decreases tree resistance to both chewing and sucking insects. Highly controlled experiments with numerous tree species, including willow, birch, aspen, fir, and pine, have shown fertilization to increase growth and decrease concentrations of defensive chemicals and insect resistance. Plant resistance to disease is also generally (but not always) decreased by fertilization, again because fertilization diverts resources away from chemical defence.

When nutrient stress is severe, fertilization can increase tree resistance to defoliating insects. In two studies conducted on extremely nutrient-deficient soils, fertilization of pine trees increased tree growth, concentrations of defensive compounds, and insect resistance. On such sites, photosynthetic rates of conifers often increase in response to fertilization, which would result in an increased pool of photosynthate available to support both growth and defence.

Drought Stress and Pest Resistance

While the results of drought stress studies are more varied than those of fertilization studies, there is little data to support the widely held idea that drought stress triggers outbreaks of defoliating insects by weakening tree defences. Some studies have shown drought stress to increase levels of allelochemicals and tree resistance to leaf-feeding insects. In many cases, drought stress had little or no effect. Aphid and spider mite populations often increase during drought, perhaps because the higher temperatures often associated with drought allow these pests to grow and reproduce at a faster rate. Decreased mortality resulting from drowning and dislodging the pests by rain may also play a role.

Shade Stress and Pest Resistance

Most studies have found that when sun-adapted trees are grown in shade, their photosynthesis rates decline dramatically, as do their concentrations of allelochemicals and their resistance to insects and diseases. Conversely, shade-adapted plants growing in full sun may

be stressed. Flowering dogwood, which is native to the forest understory, lacks the adaptive mechanisms for tolerating the effects of midday water stress that is characteristic of trees adapted to full sun. Probably for this reason, dogwoods planted in full sun are more susceptible to attack by dogwood borer than those planted in at least partial shade.

Environmental Stress and Resistance to Trunk Invaders

Bark beetles, wood borers, and trunk diseases are devastating to trees and therefore deserve special attention. These organisms disrupt transport of water and nutrients in the xylem and phloem, often with fatal consequences. Bark beetles and wood borers feed on phloem tissue, thus girdling the tree. Girdling disrupts the translocation of carbohydrates from the canopy to the roots, resulting in root mortality and decreased nutrient and water uptake and eventually leading to tree death. Vascular-wilt fungi, such as Dutch elm disease, disrupt xylem transport, thereby disrupting water transport from the roots to the canopy, which can rapidly kill the tree.

"It is time to shift from the paradigm that rapid growth always equals a healthy tree."

Because a tree can tolerate little injury to its vascular system, it must have powerful defences against these organisms. Cells damaged by insect feeding or pathogen infection rapidly accumulate allelochemicals toxic to the invading pests. This response is accompanied by the production of wound periderm (callus) tissue, which isolates the wound, inhibits the spread of colonizing organisms, and reestablishes cambium integrity. Many conifers also have a network of ducts containing terpene resins that help repel bark beetles.

Strong defensive responses by tree trunks require substantial expenditures of energy, the supply of which is rapidly depleted in cells close to the point of attack. Hence, strong tree defences depend on high rates of photosynthesis and rapid translocation of current photosynthate from the canopy to the trunk. In particular, drought stress and defoliation decrease tree resistance to wood borers and canker fungi. However, evidence suggests that fertilization has little direct effect on tree resistance to bark beetles or wood borers. Because fertilization can increase the susceptibility of trees to drought stress, fertilization of trees that will not be irrigated during droughts may predispose them to attack by trunk invaders.

Implications for Tree Health Care in the Landscape

A major challenge facing the green industry is defining, measuring, and maintaining tree health. Traditional views have equated rapid growth with tree vitality. As a result, cultural recommendations have emphasized practices that maximize growth rate. However, fast growth may not be consistent with long-term health and survival of trees in a low-maintenance landscape. Rapid growth demands a high proportion of tree resources, which diverts those resources from storage and defence. In many cases, fast-growing trees are more susceptible to stress and less resistant to pests. As a result, fertilized trees may require regular irrigation and pesticide application.

In particular, the role of fertilization in low-maintenance plant health care programs needs to be reevaluated. Trees growing under conservative nutrient regimes with adequate soil moisture have high rates of photosynthesis and biomass accumulation, yet moderate rates of growth. Rather than maximizing shoot growth and leaf area, the tree uses this carbon to produce higher levels of stored carbohydrates and defensive chemicals, as well as more extensive root systems. With higher levels of stored carbohydrates, the tree also will be in a better position to recover from a pest outbreak, should one occur.

On the other hand, trees in landscapes that are regularly fertilized but seldom irrigated will produce vigorous shoot growth in the springtime, when soil moisture is plentiful, but will do so at the expense of root growth and the production of defensive chemicals. Such practices create a tree that is more sensitive to midsummer droughts and potentially more susceptible to wood borers and trunk diseases.

Fertilization programs should be applied only with an understanding of potential consequences for pest resistance and stress tolerance—and only when soil and foliar tests confirm that trees will respond to increased nutrient availability in the desired manner. Unless trees are showing visible symptoms of nutrient deficiency, fertilization will increase growth without increasing photosynthesis, and then only if other factors are not limiting growth. Fertilizers are most effective when foliar and soil testing reveal 1) which essential nutrient is causing the deficiency symptom and 2) clarify that the deficiency is actually caused by a shortage of the nutrient in the environment rather than by some other environmental factor (including soil pH, soil temperature, soil moisture, interactions among nutrients present in excess) preventing the tree from taking up nutrients otherwise present in adequate supply.

The use of drought-tolerant species in landscape designs and irrigation during periods of drought is an important component of a tree health care program. Intense drought stress decreases carbon acquisition as well as growth, which will severely stress the tree and decrease resistance to devastating trunk-invading insects and pathogens.

Consideration of the evolutionary history of a tree species when designing landscapes is also a critical component of a comprehensive tree health care program. Trees display great ability to adapt to stresses that are a predictable part of their natural environments. On theother hand, they often have little ability to adapt to stresses characteristic of environments to which they are not adapted. Early successional trees adapted to full sun, such as paper birch, show little ability to tolerate shade. Upland species, such as sugar maples, are sensitive to low soil-oxygen levels that are tolerated by lowland species, like red maple (Acer rubrum).

It is time to shift from the paradigm that rapid growth always equals a healthy tree. It must be recognized that rapid growth can also have its own consequences, and that moderate stress, resulting in balanced growth, has its benefits. It is clear that the stress tolerance and pest resistance of trees can be enhanced through properly utilized cultural practices. But their most effective use requires a sound understanding of the physiological responses of plants to the environmental factors being manipulated.

Daniel A. Herms is professor and chairperson of the Department of Entomology with The Ohio State University, and is associated with the Ohio Agricultural Research and Development

Thomas Smiley, Bartlett Tree Experts, bugwood.org

NZ Arb Annual Conference 2017

in association with Asplundh

Tauranga 26 - 27 October 2017

International arboriculture inspiration on your doorstep

Left to right: Paul Johnson (USA), Brian French (USA), Duncan Slater (UK)

NZ Arb is excited to announce the names of three big international personalities that will speak at this year Annual Conference in Tauranga

Keynote Speaker: Paul Johnson, ISA & Trees are Key (USA)

Paul believes that "Trees Are Key" to healthier and happier communities. Currently the urban and community forestry coordinator for the Texas A&M Forest Service. Paul is an International Society of Arboriculture (ISA) Board Certified Master Arborist®, an ISA Certified Arborist Municipal Specialist®, and is Tree Risk Assessment Qualified. He is past chair of the Southern Group of State Foresters' Urban and Community Forestry Committee and is a member of the ISA Board of Directors.
Paul is a Municipal Forestry Institute alumni, graduated from Oklahoma State University with a degree in forestry, and has been a radio talk show host, newspaper columnist, extension horticulturist, university adjunct instructor, and plant health care specialist

International Speaker: Brian French, Arboriculture International LLC (USA)

French founded Portland, Oregon-based tree care company, Arboriculture International LLC in 2013. He is a climbing ISA Certified Arborist and Qualified Tree Risk Assessor. Serving as coordinator for the Oregon Champion Tree Registry and Chair of the Portland Heritage Tree Program, he focuses on the preservation of significant, old trees and their associated flora and fauna. Brian facilitated various ongoing wildlife habitat projects including salmon habitat restoration, snag development, red tree vole surveys and developing urban wildlife guidelines. In Oregon, he is a rescue volunteer for organizations that rehabilitate injured birds of prey.

International Speaker: Duncan Slater, Senior Lecturer, Myerscough College (UK)

Duncan is the course tutor for the MSc in arboriculture and urban forestry, both on-campus and on-line at Myerscough College. As an academic, his PhD study was in the anatomy and biomechanical performance of branch junctions in trees, concentrating on the hazel (Corylus avellana) as a test specimen. Duncan has recently found the primary cause of bark-included junctions in trees, which is the result of 'natural bracing' - touching and rubbing branches that prevent a junction from experiencing normal loading. This finding informs important changes to tree surgery and tree assessment practices.

Presenting three highly-regarded international speakers:
Paul Johnson
Duncan Slater (UK)
Brian French

Earlybird registration available online for a limited time on nzarb.org.nz
Earlybird registration deadline 21 September 2017

Events

NZARB / Husqvarna Auckland Regional Tree Climbing Competition

by Craig Webb, Consultant Arborist

21 May 2017. For the second time, the Auckland Regional competition went to the Regional Park at Wenderholm, with a two-day event. Day one is for the setup and a series of brief presentations and day two is the competition.

Massive thanks to all those involved in the setup of the events on Saturday and to the presenters of the four free-of-charge workshops. We had Andreas (Rossy) Ross talking about aerial rescue and specific details of some injuries. Matt Glen shared his knowledge of the Work Climb event, what to focus on and how to achieve the best possible score. The next workshop was presented by Gavin Donaldson who provided a brief description of the new tree protection rules in the Auckland Unitary Plan. The series was finished with a great talk about Myrtle Rust presented by Freddie Hjelm.

Unfortunately, due to Saturday's weather, the opportunity to stay the night at the camping ground was not taken up by many this year. Only the keenest, or those from out of town with no other option, braved the rain and wind. Well, it is May, so I suppose we should be prepared for the worst.

Fortunately, Sunday dawned calm and clear. It was cool but sunny, so the fear of having to contend with slippery London plane trees soon evaporated, like the morning dew.

The competition was set up in a magnificent row of London plane (Platanus X acerifolia) and one Norfolk Island pine (Araucaria heterophylla) for the Belayed Speed Climb event.

A great turn-out of 22 climbers, including four female competitors, registered for the competition. With the aroma of fresh coffee percolating through th e air (thanks to Treetools, sponsor of The Coffee Guy) the climbers set about their first events. Later this aroma was joined by the scent of sizzling sausages (thanks NZARB and Westmere Butchery). Thanks to the chefs, Leon Saxon and Adrian Lamont, who were also on hand to man the NZARB "Ask an Arborist" stand. As the sun started warming the scene, climbers went through the five preliminary events. Not far away, the next generation of arborists got a taste of tree climbing first-hand, with the NZ Arb Kid's Climb, sponsored by Treetools and managed on the day by the capable Freddie Hjelm.

A Young Arborist of the Year competition was run on the day by Craig Lamb. This was won by Dexter Brennan. Congratulations Dexter, you get to go to the national event to compete against young arborists from the other regions.

Following the preliminary events ,an unofficial Masters Challenge event was set up for three of the top men qualifiers to give them a chance to practise this event in a semi-competitive atmosphere. This was also a chance for apprentice judges to have a go at scoring this event under expert coaching from Zane Wedding. Tree climbing was the winner on the day.

Massive thanks to our major sponsor, Husqvarna. Huge appreciation also for our event sponsors: AB Equipment, Donaghys, KASK, Metrogreen, Silky Saws and to our gear sponsor Treetools.

Please continue to support the organisations that support our fantastic tree-climbing competitions.

Thanks also to all of the volunteers that made this event happen.

Competition coordinator – David Stejskal

Head Technician – Fredrik Hjelm

Head Judge – Craig Webb

Scorer – Erica Commers

Work Climb Judges – Shaun Hardman, Will Philips, Craig Webb

Work Climb Technicians – Hiro Ikeno, Jocke Hardisksson

Aerial Rescue Judges – Tony Bennett, Rhys Fransen, Matt Glen

Aerial Rescue Technicians – Guy Clark, Joshua Kerrigan

Footlock Judges – Zeke Fiske, Stephen Wilson, Jason MacDonald

Speed Climb Judges – Rick Jobbitt, Steven Krebs

Throwline Judges – Jawand Ngau Chun, Luke Beaumont

See you in Tauranga for the Nationals!

RESULTS

Men's Event Silky Saws Aerial Rescue

Note: Nicky Ward-Allen scored 38 points, placing 3rd in the aerial rescue standings overall.

Place	Name	Points
	Scott Geddes	41.00
	Dale Thomas	40.00
	Jed Copsey	36.33
	Mark Gistitin	35.33
1	Seb Bainbridge & Sam Smith	34.00

AB Equipment Belayed Speed Climb

Name	Time	Points
Mark Gistitin	19.00 sec	20.00
Scott Geddes	19.60 sec	19.40
Zane Wedding	19.95 sec	19.05
Dale Thomas	20.05 sec	18.95
Noel Galloway	20.79 sec	18.22

Donaghys Footlock

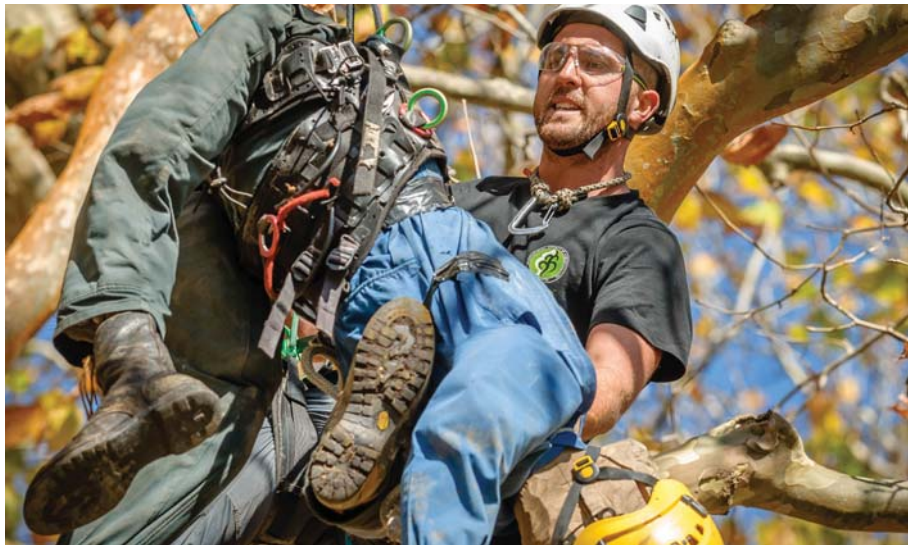
Name	Time	Points
Dale Thomas	19.31 sec	20.00
Scott Geddes	20.54 sec	18.77
Noel Galloway	22.00 sec	17.31
Mark Gistitin	24.94 sec	14.37
Arran Turner	27.78 sec	11.53

Top 10 overall

Note: Nicky Ward-Allen scored 109.54 points, placing 9th in the overall standings.

Qualfies	Name	Points
V	Dale Thomas	155.29
V	Scott Geddes	146.83
	Mark Gistitin	146.59
	Noel Galloway	130.67
V	Sam Smith	122.60
	Zane Wedding	117.51
	Callum Hay	111.28
	Jed Copsey	110.00
	Seb Bainbridge	104.89
	Arran Turner	103.91

Photography: Treetools



Metrogreen Throwline

Note: Stef White scored 16 points, placing 2nd in the throwline standings overall.

Place	Name	Points
	Seb Bainbridge	21
1	Arran Turner Zane Wedding	12
4	Scott Geddes	11
5	Mark Gistitin Noel Galloway Jed Copsey	10

KASK Work Climb

Name	Points
Dale Thomas	69.33
Mark Gistitin	66.88
Sam Smith	57.26
Scott Geddes	56.66
Noel Galloway	52.81

Women's event overall Placings

Name	Points
Nicky Ward-Allan	109.54
Stef White	67.43
Jess Hiscox	33.82
Chelsea Robertson	31.67

Events

Wellington Aerial Rescue Training Day

by Will Melville, Wellington City Council
Correspondence to William.Melville@wcc.govt.nz

In May arborists from the lower North Island spent a day practising aerial rescue techniques in Upper Hutt's Maidstone Park.

The day was organised by local companies with around 65 people in attendance. Approximately 15 local companies were involved in the day which shows the importance that employers are giving to safety training. They were from varied backgrounds including utility, residential and council workSome had been working in trees for many years and others had only just started.

This is the fourth year we have run the event in Wellington and each year we all learn something new. It is a really good opportunity for arborists from different companies to get together and share their experiences and ideas on how best to perform an aerial rescue.

Each year we have had someone from the emergency services with us at the event and they are always amazed at what we do for a living. The common theme across all of the rescue services that have spoken to us is that if they cannot get a bucket truck to you, you are on your own.

The rescue squad from Wellington Free Ambulance and the Fire Brigade will not carry out a tree-top rescue as "there are no certified anchor points and we are not familiar with the equipment you use or how it is applied."

This really stresses the significance of having someone with you who is capable of performing an aerial rescue, the need to practise these skills regularly, and the importance of understanding your co-workers' climbing system. With SRT (single-rope technique) and mechanical friction devices becoming more commonplace in the industry, arborists need to be aware that their workmates may not necessarily know how to operate and use these system and devices. There was some interesting discussion around this and the realisation that not everyone knew what system their colleagues were using.

This day devoted to practising aerial rescue techniques is a really good initiative and if you are interested in setting one up in your region contact NZ Arb administrator@nzarb.org.nz.

A French technique shown to us on the day


PETZL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PETZL

Events

NZARB / Husqvarna Waikato and Bay of Plenty Regional Tree Climbing Competition

by Andrew Harrison, Wintec

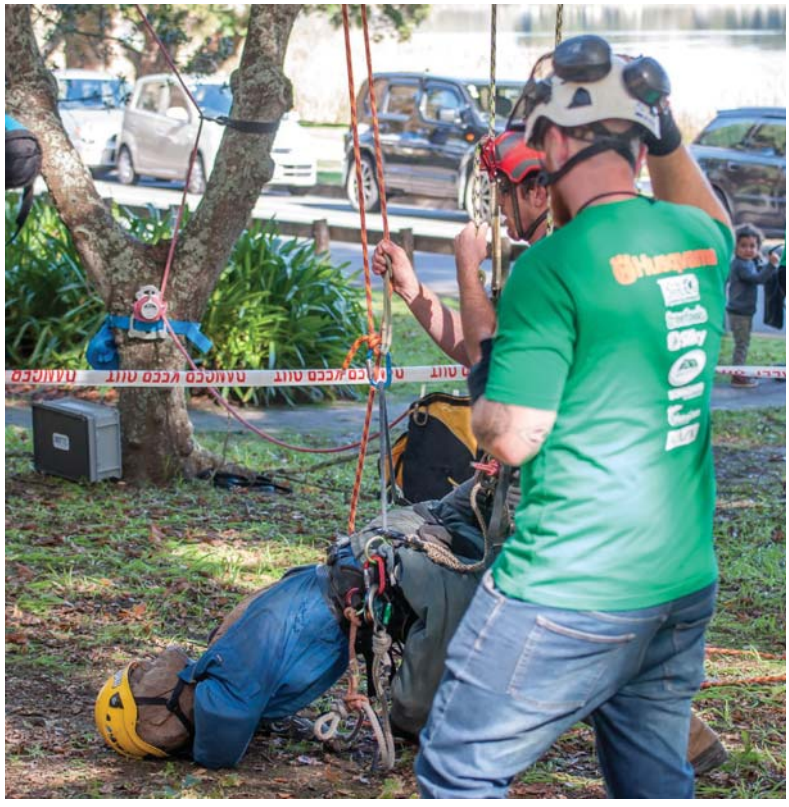
Saturday May 6 dawned crisp and clear on the eastern shore of Lake Rotoroa (Hamilton Lake). Thirty competitors and volunteers arrived early, ready and eager to challenge themselves against the trees and some top names from the New Zealand tree-climbing scene.

The trees had been set the day before by a small but dedicated team including Hiro Ikeno, Dan Benfield and a couple of others. The footlock was the footlock and may be one of the last if the proposed new ascent event replaces it this year.

Speed climb was in a cedar for the second year in a row. Rescue was in a large spreading Quercus that challenged a few. Throwline was also in an oak and was achievable for those that had the patience and technique. In the centre of it all was a very broad Platanus that was a great spectator event.

The highlights of the day were observing the comradeship and the professionalism of the competitors and judges as they went through the day safely and efficiently, caring for each other and the trees. It was great to see so many supporters, public and kids enjoying the show. A credit to all involved.

This year saw about ten or more Wintec students competing in the New Arborist of the Year (NAOTY) and main events. Some excelled, but all participated with a good heart and learned many lessons along the way.



RESULTS

Rescue
Craig Wilson
Matt Glen
Elliot Fitzjohn

Speed Climb
Eion Elliot
Matt Glen
Craig Wilson

Throwline
Seb Bainbridge
Bard Roach
Andy Neverman

Work Climb
Andy Neverman
Matt Glen
Noel Galloway

Overall
Matt Glen
Andy Neverman
Craig Wilson
Elliot Fitzjohn
Noel Galloway

Women's Overall
Stephanie Dryfaut
NAOTY
Seb Bainbridge
Stephanie Dryfaut
Josh Talsma
Yoan Willman

Events

Arbor Day Round Up

by Arbor Day event organisers

Otago

On Saturday May 27, in conjunction with the NZ Arb, the Otago Arbor Day Industry Project took place. About 20 arborists across Otago came together to prune five large redwoods at the Otago SPCA in Dunedin. Gear checks and aerial rescue practice was also on offer (followed be a few beers).

'Even though most of us work with trees every day, we don't often get to work on trees over a 100 foot tall, and to have five of them in the same place was kind of special', said Mark Roberts the on-site coordinator. 'The SPCA are a worthy charity and they were very pleased to get some much needed work done. Special thanks needs to go out to Delta for supplying the a lift truck and chipper and the Otago Polytechnic bringing along additional lines and aerial rescue equipment.'

Based on the success of the event and the number of worthy trees in Dunedin organisers plan to run something similar next year.

Hamilton

Arbor Day in Hamilton was acknowledged with a community tree planting event at the Waiwhakareke Natural Heritage Park. School groups and local community gathered together on Friday 2 June to contribute to the ongoing restoration project aiming to recreate an example of the Hamilton Basin's previously rich ecological diversity.

Organisers we delighted with the Arbor Day planting event, and said, 'Once finished, Waiwhakareke will draw native wildlife back into our city and be a resource for everyone to enjoy'

Christchurch

At 10am on a fresh Christchurch morning, a collection of keen Cantabs came together to celebrate Arbor Day with a morning of tree planting at Halswell Quarry Park.

It was a successful morning, contributing many new trees to the ongoing efforts to restore native wetland swales into the park.

Porirua

Spicer Botanical Park is an arboretum of exotic trees planted in species groups, such as Asian, American and Australian. "It's a bit of a hidden gem," says Mayor Tana. There are over seven different types of pines in the park, other conifers, and many species of eucalypts and wattle. As these trees have established shelter, more deciduous trees have been able to be established, including oaks, beech, and Liriodendron.

Many of the new trees selected for planting have been chosen for the autumn colour they will add to the forest.

Some of the specimens planted: Paper birch, Himalayan white birch, Magnolia denudata, Magnolia 'black tulip', Magnolia sieboldii (oyama) , Acer cappadoccicum, Acer palmatum "Senkaki" and others, Liquidambar, Sequoia, Nyssa sylvatica, Pyrus calleryana "Kea".

Auroa School Taranaki

The hard working community at Auroa School got in touch with us to let us know the student council team from Auroa School recently held a native tree planting session in honour of Arbor Day.

A total of 8 trees being planted by the students. The trees for the Arbor Day event were donated through the Paper for Trees Programme.

Trees that Count Online Arbor Day Campaign

This year, 'Trees that Count' launched a new Arbor Day initiative online. They asked New Zealanders to register a pledge to plant a tree themselves, or if unable to do so, pledge $10 for a tree to be planted in their name.

The pledge page closed at midday on Arbor Day with an impressive 14,806 plantings pledged for.

'Trees that Count' is funded by The Tindall Foundation, and delivered by the Project Crimson Trust in partnership with Pure Advantage and the Department of Conservation.

Auroa School native tree planting in Taranaki

THIS COLOUMN FROM TOP TO BOTTOM: OTAGO EVENT
Keeping it simple, local arborists practice aerial rescue at the Otago Arbor-day project; Delta fronts with trucks and chippers at the Otago Arbor-day project

THIS COLOUMN FROM TOP TO BOTTOM: PORIRUA PLANTING
Senior Horticultural Supervisor Malcolm Birch on the digger; Porirua City Council parks staff member Faleoso talking to a member of the public. Faleoso was on the original team who planted a lot of the parks trees in the 1990s; Megan Dymond and City councillor Ross Legget.; we were planting into an old river bed, so hard going in places with spades

Health & Safety

Identify Human Factors & Live Well: A Case Study Examination of Accidents from British Columbia

Pat Kerr for Ontario Arborist

The material featured in this article, was sourced from our friends at ISA-Ontario and their publication 'Ontario Arborist'. Whilst some of the examples are not situations that are likely to occur here in New Zealand (such as those involving bears) they do help to illustrate the concept of 'human factor' in workplace incidents.

Investigating incidents by considering the "human factor" is not a new idea. The aviation board has used it for years – and perhaps this is part of the reason why the aviation industry has a high safety record. Work Safe British Columbia (BC) investigates accidents initially considered caused by "human error" using the principals of human factors.

The three basic principals of human factor are:

1) People intend a safe outcome.
2) People believe they are safe.
3) The accident investigator considers what the victim was experiencing prior to the accident.

There are two questions to be asked in every accident or when reviewing a near miss:

1) Why did the worker take the action or make the decision?
2) Why did that action or decision make sense at the time?

Jenny Coleman of Work Safe BC explains it this way, "When you hear the term "human error" in an incident investigation, that should be your starting point. Ask, what was the context?"

Coleman spent a couple hours on the phone and via email reviewing some tree service accidents from around the world for the Ontario Arborist applying the principle of human factor. She highlights issues not investigated in the initial reviews or even the inquests.

Unfortunately, in most cases, we can't answer the human factor questions because the worker is deceased. The questions are raised in this article to encourage workers to ask the same questions when they face the same or similar circumstances in order to prevent another similar accident.

Please remember that many tree accidents are similar. Identifiers in these accidents were removed or changed to protect the families and secondary victims. These were all experienced workers, with good equipment, in good order. They were all trained with good safety records until their last day at work. A few did survive to explain the why and how.

Wrong Technique

A worker was cutting wind throw trees all day. Safety investigators reviewed the scene. All cuts were done in perfect order until the last cut. When he made the last cut, he altered his technique.

The obvious response here is that Olympic athletes don't perform optimally for eight hours. Neither do workers. What was this worker focused on at the time of the accident? Were the break periods and water available adequate for the worker's condition on that specific day?

There is no evidence to support the idea the worker was fatigued. The more likely horror is this worker died to protect his chainsaw blade. It appears that he altered his standard cut angle to prevent getting his blade from getting dirty.

Human factor investigators ask: Why did he make this decision? How far did he have to go to get his blade sharpened? Would his day have ended if the blade were dull? Was a back-up chainsaw available? Who owned the chainsaw? What was the consequence of a dull blade?

Other questions to be asked for those who want to learn from this event are: How can you reduce the cost of a dull chainsaw blade? Can you have a spare chainsaw available? Can you carry a sharpener? How can workers avoid being forced to choose between protecting their equipment and making a less then perfect cut?

Secondary Skills Lacking

The worker lacked the English writing skills necessary to complete the required paperwork for a permit to use a bucket truck in a municipality. While the bucket truck sat unused, the worker climbed a dangerous tree. This worker made a choice that in hindsight we all say we would never do, but human factor principals say we must ask why he made this choice.

For those reading this article, it may be challenging to recognize that 4 out of 10 Canadians struggle with literacy. Because you are reading this article, you are likely in the 60% category, but there are 9 million adults, right here in Canada, who will turn the page after reviewing the photos. Statistically, on a crew of five, two will have reading challenges. They can't comfortably read pesticide labels. They can't follow written safety instructions and it is statistically proven that they won't acknowledge this concern or ask for help. We also know this: if they passed the certified arborist exam without solid reading skills, they are highly intelligent with a strong memory.

Those with literacy challenges have options depending on whether the person is the "boss" or the "worker." First, make sure someone on the crew reads pesticide labels and safety instructions out loud. Have a secretary or number 2 who will complete forms and paperwork. Never assume your partner can read.

Seeing Grey

On bright sunny day, a climber trimming a tree cut his own line. Coleman stated the obvious – and something arborists should never forget – tree work above ground level is a highly complex task. It involves monitoring weather and wind, knowing chainsaw position, how the tree is shifting, where the branches are falling, and so much more. A novice will go through each step. An expert will focus on specific features. Extensive experience allows the expert to focus on the task and specific details will jump out at him. This type of accident usually happens to the experienced knowledgeable professional, not the novice.

What was the worker's context in this case? Was the line sufficiently different then the surroundings? Should workers wear two lines in these circumstances? How can the line be positioned so it will not be accidentally cut? How can safety lines be made more secure?

For those who want to understand how it is possible for a careful worker to cut his own line and how our attention resources work, there is a great YouTube video Work Safe BC uses: www.youtube.com/watch?v=vJG698U2Mvo.

There is another key factor to consider here. The eye can take from several seconds to several minutes to adjust to a change in lighting conditions. Think of the experience of walking in to a building on a bright sunny day. The timing of this change alters with age, Vitamin A levels and eye health.

During the delay as your eyes adjust, retinal (an aldehyde) and opsin (a protein) are recombining into rhodopsin, a pigment in the retina of the eye. During the period when a climber leaves bright sunlight and enters the shade of a canopy, the eyes cannot differentiate between the colour of a flame orange climbing line and a brown branch.

Equipment Failure

A worker was cutting a tree that was leaning in the "wrong" direction. The sledgehammer broke. He left the tree and continued working down the row. The first tree fell.

This is yet another case where a worker died because his equipment failed. Why did the worker believe the first tree was not a hazard? Was the worker aware of the wind speed and weather conditions? How far did he have to go to get his sledgehammer repaired or replaced? What was the pressure to get the job done?

In this specific situation, there was an eyewitness. There was evidence the witness tried to warn the worker but as the worker was correctly wearing ear protection and using a chainsaw, he did not hear the warning. Arborists must wear hearing protection. It is the law. Realizing that sound is a critical early warning sign in accidents, all must be reminded of this additional challenge to safety.

There are many examples of arborists continuing to work following some type of equipment failure. Looking at human factor, we again take the position that the worker believed the job could be completed safely. This is the cost of experience and confidence. Likely the worker had taken chances before and the outcome was positive.

Another example is a worker who experienced chainsaw failure. He chose to dig around the tree and attempted to push it over with a backhoe. He lived, but he lost his business and reputation.

Climbing "Danger" Trees

In forestry, it is sometimes said before an accident, "If you don't hear my chainsaw…." The statement implies that although something went wrong, the worker is safe. There is no cry for help. There is no emergency just a bland statement that implies: If you notice I have stopped working, come over and see if I need help to perhaps carry the equipment back to the truck. Urban tree workers have similar beliefs. Coleman says, "Workers believe they have the skills and equipment to overcome challenges."

One worker died because he didn't know the exact location of the tree rot. The tree broke below where he was tied. Did he have the equipment to accurately assess the severity and location of the tree rot? How was the tree assessed? Did more then one person assess it?

After a fatal accident, identifying the human factors that caused or contributed to it is a combination of playing detective and guesswork. Identifying the human factors that could contribute to an accident saves lives.

Site Survey

One of the best examples of a site survey going wrong occurred when a worker cut a tree in the approved manner and all was going well. He took a step back. A mother bear with cub appeared from a den behind where the worker was standing. She struck him behind the leg and he fell forward in to the path of the falling tree. (His injuries were minor.)

Why didn't this worker do better site survey? Because he believed he had done a good assessment of the area. Depending on the specific site, a complete survey can be next to impossible. Is there a red ant's nest? I know of workers who were "attacked" by hummingbirds defending a nest. Another worker was swarmed by Asian ladybeetles and too late he discovered he had an allergy to their bites. Site surveys are complex!

For interest sake, here is a list of British Columbia bear incidents:

Worker witnessed a bear attack colleague;

Worker was startled by a bear and twisted ankle;

Worker shot bear with pepper spray. Mist went into worker's eyes and he fell off the truck;

Worker strained knee turning to get away from a bear;

Worker tripped against a log and was injured when chased by a bear;

Worker was chased by a bear and jumped off a 10-foot cliff;

Worker tripped and fell backing away from a bear;

Worker fell running from a bear;

Worker was startled by a bear, lost his footing and fell;

Worker was chased by a bear, fell into ditch and landed on a large boulder.

Natural Threat Responses

Bears and other animals are not always the culprits. Another reported case occurred when a worker climbed a 5-foot folding ladder to do some minor pruning. He climbed just two steps when his head struck a wasp nest. He came down the ladder in a panic and was injured due to a trip and fall. He had no allergy to the stinging insects and no reaction to the two stings he endured. He was injured due to his natural response to a threat.

When the body perceives a threat or severe stress, many changes happen automatically. A threat can be anything from a branch cracking to a swarm of hornets. Mike Dennis is a retired OPP officer who in two separate occasions faced severe life threatening events and lived to teach others how to survive. These principles are also fundamental in flight training and road safety.

Dennis describes the process as "tachy psyche." Under severe stress you will have auditory exclusion or you will not hear sounds except those directly related to the threat. (In the case of hornets you will hear increased buzz but you will not hear a co-worker calling with help.) Your thought process will appear to slow down. Your outer extremities will go numb. Your heart rate will increase. You body will prepare to try to run away.

This response is the body's way of preparing you to survive. Training before the emergency starts is survival. Control the response and you increase your potential to win.

Dennis said visualization each and every time is key. Before you turn on the chipper or pull the cord on the chainsaw, take a moment to role-play in your mind how you will respond if an accident occurs. Professional downhill skiers shut their eyes at the gate. They imagine each twist and turn as they descend the hill. Then they start. If a branch cracks, if your glove catches, if a swarm of hornets appears, how will you react? "Always formulate in your mind a winning and reasonable response. If you haven't prepared, you will likely freeze under severe threat."

Under threat, "you will focus on the danger." Before you start to work, "practice moving your eyes scanning for options," said Dennis. If a threatening situation happens you must be prepared to shift your eyes from the danger and look for options and other potential problems.

More information on tachy psyche syndrome is available online with a quick google search.

The following rules for creating a safety conscious workplace were adapted from an article by Robert Baron in the AeroSafety World Magazine.

Arrive at work prepared to work.

Respect your peers.

Be part of the team to make safety number one.

Be assertive when necessary for safety.

Draw a line between right and wrong.

Do not follow unsafe practices.

Even if it is legal and technically "safe," is it morally wrong?

Don't compromise safety for speed.

As Transport Canada says to pilots: "Learn from the mistakes of others because you will not live long enough to make them all yourself."

Department of Conservation
Te Papa Atawhai

Ministry for Primary Industries
Manatū Ahu Matua

BIOSECURITY ALERT
MYRTLE RUST *Austropuccinia psidii*

Also known as guava rust and eucalyptus rust

PURPOSE

We need you to be vigilant, keep your eyes out for symptoms of myrtle rust in New Zealand and to know what to do if you see them. This is serious. Conditions for detecting myrtle rust in New Zealand are ideal now.

THE THREAT

Myrtle rust is a fungus which can have serious consequences on various species of plants in the myrtle family, including native plants such as:

- Pōhutukawa
- Rata
- Mānuka
- Kānuka
- Ramarama
- Rōhutu
- Swamp maire

A number of introduced plants are also susceptible to myrtle rust, including, feijoa, eucalypts and bottle brushes.

WHAT'S AT RISK, WHERE DO I LOOK?

Myrtle rust only effects plants from the Myrtacae plant family. This includes some of New Zealand's most iconic indigenous plants – rata, pohutukawa, manuka, kanuka and ramarama – as well as exotic myrtles like feijoa, guava and eucalypts.

It attacks new leaves on many plants and mature leaves on others. It can suppress lowering and seed development on some host plants. Repeated infections can kill the plant.

If it becomes widespread it will impact all of New Zealand's Myrtaceae to some degree and we are likely to lose some Myrtaceae in their natural state. Ecological integrity will be compromised in places where myrtles are a dominant species. It is also likely to affect commercial activities (e.g. manuka honey industry), tourism, recreation and landscape values.

WHAT DO I DO IF I HAVE SEEN IT
DO NOT TOUCH! DO CLEAN, DO REPORT

1. If you think you've spotted myrtle rust, don't touch the infection –this will spread the disease. Rust spores are windblown like talcum powder and if you're in the vicinity you'll be the biggest spread risk.
2. Take a photo if you can, without touching any plant material.
3. Mark site with a ribbon or similar, ensuing you can describe whereabouts.
4. Phone the MPI hotline **0800 80 99 66** immediately.
5. If you become contaminated you'll need to decontaminate yourself as best you can. Ideally:
   - Spray the garment with alcohol/methylated spirits or Sterigene.
   - Place the garment in a plastic bag, surface sterilise the bag and place into another bag. Leave it on the spot.
   - Spray and clean footwear.
   - Spray the site where you changed from the garment with alcohol/methylated spirits or Sterigene.
   - GPS the spot.
   - Notify MPI and your DOC office immediately.
   - If you cannot move from the site without spreading contamination stay put (but put your safety first) and radio for someone to bring equipment to decontaminate.
6. If it is a false alarm, it doesn't matter! Please be vigilant and err on the side of caution.

DO NOT TOUCH THE PLANT OR ATTEMPT TO COLLECT A SAMPLE.

If you have a camera or phone, take a photo of both the rust symptoms and the plant they are on. Make a careful note of the location of the affected plant/s. MPI will send investigators to the site to collect samples safely.

Remember, myrtle rust can be transported on clothing and equipment. If you think you've come into contact with myrtle rust, wash clothes and clean equipment such as tools and boots carefully.

MORE INFORMATION IS AT:

Ministry for Primary Industries: **www.mpi.govt.nz/alerts**

Department of Conservation: **www.doc.govt.nz/**

May 2017

New Zealand Government

Growing and Protecting New Zealand

Health & Safety

Safety alert: wedding ring de-gloving incident

by WorkSafe New Zealand Correspondence to comms@nzarb.org.nz

NZ Arb is looking to include a regular safety alert in each issue. The following alert has been sourced from WorkSafe and, although it occurred in another industry, it could happen in arboriculture. Readings and learnings from safety alerts are a crucial step in workplace safety management and improve the industry.
If you have a safety alert that you believe will assist with industry safety, please forward it to NZ Arb as we would be grateful to share it. NZ Arb will not publish names, dates or addresses.
Please send to comms@nzarb.org.nz.

Incident Report
Source: WorkSafe New Zealand, Extractive Industries (15 August 2014)
WorkSafe NZ has been advised of an incident this week in which a contractor suffered a 'de-gloving' of his wedding ring finger. The contractor was climbing an access ladder when his foot slipped and his ring and finger were caught on the ladder steps. This event was not life threatening, but was life changing and totally avoidable.

Response
The company has immediately instituted a sites-wide ban on wearing of finger rings by staff and contractors pending the results of their internal investigation. They will undertake a risk assessment and release a formal Jewellery Policy. WorkSafe NZ High Hazards Unit inspectors will be investigating the incident.

WorkSafe NZ advice
WorkSafe NZ advises site operators to consider the risk posed to their workers by the wearing of finger rings and to consider the wider risks around entanglement in machinery and equipment. Operators should assess whether a formal policy is required.
For those operators who have a policy on the matter, WorkSafe NZ advises that it should be re-stated to all employees and contractors.

Guidance
WorkSafe NZ provides guidance on entanglement risks (in general and specific to particular industries) in a wide variety of documents on its website.

Operators may wish to consult section 3.4.7 in the Best Practice Guidelines for the Safe Use of Machinery here: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/safe-use-of-machinery

Tony Forster
Chief Inspector, Extractives
WorkSafe New Zealand
www.worksafe.govt.nz

Vermeer

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- advertorial-

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The Vermeer HG4000TX horizontal grinder is built tough and offers a variety of configurations to suit large land clearing municipal waste and composting operations. The grinders feature optional length feed tables and Thrown Object Deflectors (TOD) that reduces the quantity and distance of thrown debris. Self-propelled track grinders are highly maneuverable and are controlled by a wireless remote, which enables it to work on uneven terrain jobsites and land-clearing projects.

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Vermeer, as an American industrial and agricultural equipment manufacturing company manufactures machines that have a real impact in a progressing world. Vermeer horizontal grinders, tub grinders, brush chippers and stump cutters allow contractors to quickly process wood waste into useful mulch, biofuel or compost. AB Equipment trained dealer personnel are with you all the way to provide parts and service throughout our 18 branches nationwide for the entire range of Vermeer products. These programmes include Planned Maintenance, Unplanned Maintenance, Major Overhauls and Refurbishment, Operator Training, and Total Fleet Management.
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APPROVED CONTRACTORS OF THE NEW ZEALAND ARBORICULTURE ASSOCIATION

An Approved Contractor is an arboricultural contracting business that has met, and maintains, a minimum stand of professional knowledge and practical ability with a certain level of client service – as required in the NZ Arb Approved Contractor Scheme.

Northland/Auckland			
Asplundh Ltd	Auckland	derekb@asplundh.co.nz	(09) 570 8041
Treescape Ltd	Auckland	info@treescape.co.nz	(09) 259 0572
Treescape Ltd	Kumeu	northern@treescape.co.nz	(09) 412 5017
Treesafe Arboriculture contractors	Auckland	nick@treesafe.co.nz	0800 754 042
Waikato / Bay of Plenty			
Treescape Ltd	Hamilton	waikato@treescape.co.nz	(07) 857 0280
Arbor Care Tree Services	Tauranga	arborcare@clear.net.nz	(07) 543 1776
Central / Wellington			
Bark Ltd	Wellington	enquiries@bark.co.nz	0800 227 558
Treetech Ltd	Wellington	office@treetech.co.nz	0800 873 378
Treescape Ltd	Wellington	central@treescape.co.nz	(04) 569 5813
Arb Innovations	Wellington	enquiries@arbinnovations.co.nz	(04) 2126 366
Wellington City Council Parks & Gardens	Wellington	william.melville@wcc.govt.nz	(04) 499-4444
Canterbury			
Treetech Ltd	Christchurch	office@treetech.co.nz	0800 873 378
Treescape Ltd	Christchurch	canterbury@treescape.co.nz	(03) 544 0588
Nelson/Tasman			
Treescape Ltd	Nelson	south@treescape.co.nz	(03) 544 0588

For more information on ACS, or to check latest 'Notification of Intent' companies, visit the NZ Arb website **www.nzarb.org.nz**

Upcoming events

30 July – 2 August	ISA Annual International Conference and Trade Show Gaylord National Resort & Convention Centre Maryland, USA
26 August	Husqvarna/NZ Arb South Island Regional Tree Climbing Competition Christchurch
26 – 27 October	NZ Arb Annual Conference 2017 Trinity Wharf Tauranga
27 – 28 October	Husqvarna National Tree Climbing Championships Tauranga Domain

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