



The study found polling is the most efficient and easy-to-implement method for re-establishing damaged orchards and attaining optimum yield, regardless of fire type, proven by the results of post-bushfire polling of the Woodside Farm grove in the Adelaide Hills.

Manual guides bushfire response and recovery

It's been another tough summer for farmers in Australia, with bushfires ravaging agricultural properties across most states. Victoria was undoubtedly the worst affected and unfortunately, olive groves were among the losses.

There's a lot for growers to deal with post-bushfire - emotionally and practically - and among the most important is the assessment of damage to your affected grove. It's the starting point for the next crucial step: best-practice management for optimal recovery.

But how do you go about these vital tasks, especially when you're still reeling from the shock of a bushfire?

Hort research project

The Hort Frontiers project *Developing management strategies to enhance the recovery of horticulture from bushfires (AS19002)* aimed to answer those questions. Commencing in the summer of 2020, shortly after bushfires devastated horticulture production regions in NSW and SA, the five-year project was a partnership between Hort Innovation, NSW DPIRD and the South Australian Research and Development Institute (SARDI). Its aim was to understand the immediate and long-term effects of bushfires on perennial cropping systems, provide information on the best recovery options, and develop strategies to minimise the damage from future bushfires.

Although most of the studies were conducted in apple orchards, the results apply to many other horticulture tree crops and have relevance for olive growers.

Best practice post-fire manual

One of the key project outputs was a grower-focussed bushfire recovery manual, which condenses practical research findings into one accessible publication.

Published in November 2024, *Bushfires in orchards: a guide to preparedness, response and recovery* was developed as a best practice post-fire manual on effective assessment and management.

It focuses on bushfire damage to orchard trees and infrastructure, and recovery options for the two main types of fire, radiant (blow torch) and smouldering (slow cooker).

It also describes the annual preparations required in orchards before the start of the bushfire season, and longer-term orchard improvements to increase resilience. Grounding the information are case studies from producers affected by bushfires, sharing their experiences and what they could have done differently.

At 59 pages, there's a lot of information, so here's a synopsis of the sections most relevant to olive growers. The full detail is invaluable, though, so please access and read the entire report - [and put the guidance into action in your grove.](#)

Study methodology: Developing management strategies to enhance the recovery of horticulture from bushfires (AS19002)

Monitoring and experimental sites with differing levels of fire damage were subject to a range of remedial pruning and crop reduction treatments. Vegetative and reproductive recovery parameters were collected for 3-4 growing seasons after the bushfire and fruit quality at harvest was assessed.

Other assessments included perennial tissue non-structural carbohydrate (NSC) levels and tree nutrient status.

In a controlled experiment, different heat loads were applied to potted apple trees to represent a smouldering fire, allowing tree assimilation and whole tree NSC balance to be measured.

Apple trees affected by radiant fire had fully recovered by the second growing season post-fire, while trees badly damaged by smouldering fires did not recover and eventually died. This was reflected in NSC levels in roots, which did not differ in trees damaged by radiant fire but declined significantly in extremely smouldered trees in subsequent growing seasons.

As expected, cutting the trees back to the trunk took four growing seasons to attain full canopy recovery. Tree polling was the most efficient and easy-to-implement method for re-establishing damaged orchards and attaining optimum yield, regardless of fire type.

The controlled experiment showed how increased heat load in smouldering fires affected apple tree physiology and NSC dynamics by reducing assimilation and NSC root reserves.

This work provides important information on tree recovery strategies and ways to build bushfire resilience in orchards.

The work initially resulted in the first in-depth scientific review internationally of the effect of bushfires on horticulture and options to minimise damage from extreme fires that are predicted to increase in frequency.

Understanding fire types

The two most important fire types resulting in immediate and ongoing fruit tree losses are:

- **blow-torch** - intense flame and wind-driven scorching heat from a fuel source external to the orchard. The orchard rows closest to the fire source will be the most severely affected, with a gradient of reduced damage moving away.
- **slow-cooker** - fire sustained by dry matter under the trees or in the inter-rows that directly affects the trees as it travels along the rows. The variable fuel load and fire intensity typically results in a random patchwork of tree losses.

The report provides in-depth detail about the varying effects, recovery strategies and prevention/mitigation strategies for each type of fire.

Effects of fire on pests and pollinators

The effects of bushfire on pest and disease populations and the associated damage to fruit crops are not well understood, however we know that stressed or injured plants are more vulnerable to insect attack and disease infection.

Observations since the Black Summer bushfires suggest growers should monitor for increased pest activity in fire-affected trees, with elevated pest populations and damage noted in the studied orchards.

Data from apple orchards also showed there were fewer flower visits by introduced honey bees and native stingless bees in the spring following the bushfires, along with increased visits by flies in the same period.

Assessing fire-damaged trees

Assessing visual damage to tree foliage, limbs and the main trunk in the initial period post-fire can help growers understand the type, distribution and severity of fire damage in their orchards.

Assessments can help determine where most tree losses are likely to occur. The information can then be used, along with regrowth responses, to gauge the ongoing potential for tree mortality or recovery.

Example: researchers in the Adelaide Hills assessed tree damage in a blow-torch fire-affected apple orchard and a slow-cooker fire-affected cherry orchard

immediately post-fire, and repeated the assessments biennially over several years. A comparison of the initial visual assessment and scorch rating for each tree with a mortality assessment conducted three seasons later showed that almost all trees with an initial rating of 'low/moderate to high' leaf scorch, and many with an extreme damage rating in the blow-torch affected apple block, successfully recovered. It is likely that leaf scorch was the predominant type of damage in these trees and that vascular tissues were largely undamaged.

Recover or remove?

The decision to recover or remove a fire-damaged orchard is complex. It requires understanding the type of fire that has affected the trees, damage intensity and distribution, initial and ongoing tree mortalities, the potential for recovery of damaged but surviving trees, the cost of returning trees to full production, and the economics of recovery versus re-establishment.

Focusing only on the tree health aspect, this suggested four-step approach may help decide whether to recover or remove an orchard based solely on the observable damage to the trees.

Step 1. Understand

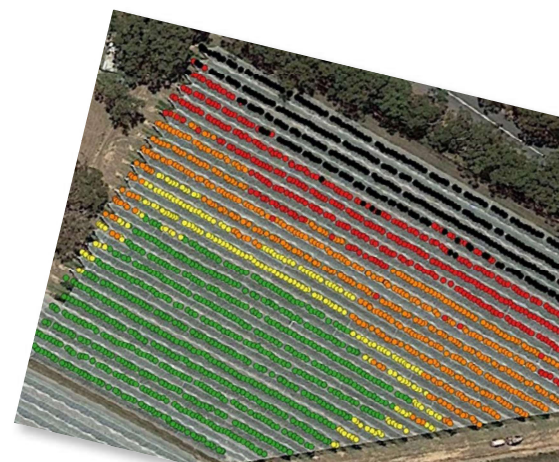
Take time to determine if your orchard has suffered a blow-torch fire, slow cooker fire or a combination of both by observing the visible signs of damage.

- **Blow-torch:** fire/heat came mainly from outside. The amount of scorched foliage reduces as you move into the block away from the edge.
- **Slow-cooker:** dry matter will be burnt around the trunks and foliage scorching will mainly be in the lower canopy. Damage will be random throughout the block.

Step 2. Assess and wait

Note the percentage of leaf scorch and its distribution for both fire types. Take photos or drone images (if possible) for later reference.

- Give the trees time to show their regrowth potential. In 2019-20, healthy regrowth between the fire in January and early Autumn (April) was a useful indicator of tree recoverability. In trees with significant leaf scorch, observe and note shoot regrowth in the weeks and months following the fire.



Step 3. Destructive sampling

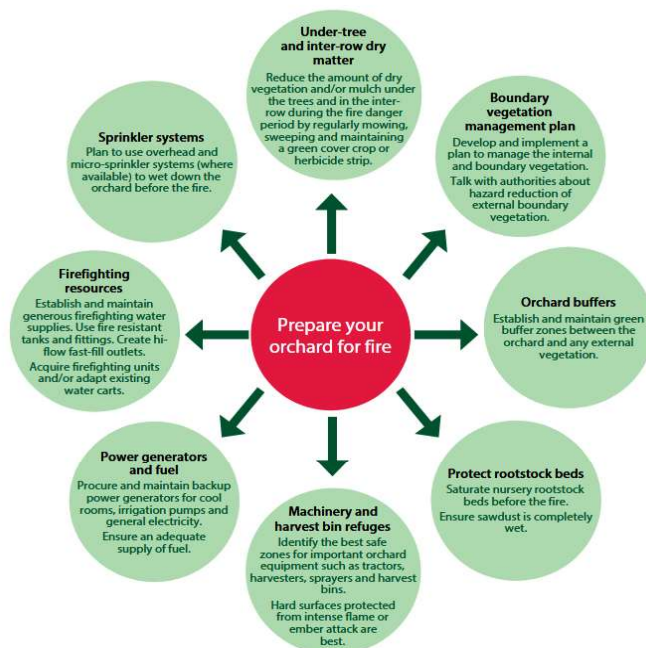
Remove the trunk bark of a sample of trees to expose the vascular tissues and determine the amount of damage.

- **Blow-torch:** work inward from the fire edge, sample a tree from each row until there is no obvious vascular tissue damage.
- **Slow-cooker:** sample a random selection of trees, including those with the most visual fire damage.

Step 4. Decide

Use these observations and assessments decide whether to remove or recover trees or blocks. Other important factors to consider (not covered in the guide) should include:

- age of the trees;
- productivity and profitability of the trees;
- available recovery funding (e.g. loans, grants);
- your financial capacity to cover the costs of orchard removal, new investments and ongoing development.



Pruning strategies for tree recovery

Following the 2019-20 bushfires, researchers applied several pruning and canopy management treatments to fire-affected apple and cherry trees in the trial sites, to investigate which would result in the best canopy recovery and fastest return to normal yields. The treatments included branch shortening, semi-polling, complete polling and complete canopy removal by heading.

At both sites, tree response to pruning treatments varied with the type of fire, the extent of damage and varietal production habits. Early findings suggest:

- Remedial pruning treatments were most successful for trees that retained vascular connection between the roots and the canopy. At all trial sites, there was a greater chance that pruning treatments would succeed if the dominant source of fire damage was blowtorch rather than slow cooker.
- For trees rated as having moderate to high damage (scorched leaves with regrowth from >50% of laterals and trunk), semi-polling pruning was the most successful.
- For trees rated as being extremely damaged (severely scorched leaves with poor regrowth from laterals and trunk), complete polling was most successful.
- Complete canopy removal by heading produced the slowest recovery and delayed the return to normal yields.

The success of any pruning treatment will depend on the level of underlying vascular tissue damage. In a blowtorch fire, trees with foliage scorch that are furthest away from the heat source will have a greater regrowth potential and better response to pruning. Responses to post-fire pruning treatments in slow-cooker affected orchards will be variable, depending on the degree of conductive tissue damage in the trunk of each tree.

Developing and maintaining fire-resilient orchards

Lessons learned from the 2019-20 bushfires have helped identify orchard management practices for bushfire preparedness that complement survival plans.

The report sets out the NSW Rural Fire Service's recommended four-step process to develop a home bushfire survival plan, complemented by the additional considerations needed for a horticultural enterprise.

It includes a great reference graphic setting out orchard bushfire preparation action, along with a comprehensive table of damage prevention/mitigation strategies for both trees and infrastructure.

More information

As previously stated, this information is provided as an introduction to the comprehensive manual *Bushfires in orchards: a guide to preparedness, response and recovery* (© New South Wales Department of Primary Industries and Regional Development).

For the full detail on bushfire management of your grove, download the report [here](#).

You can also find out more about the project *Developing management strategies to enhance the recovery of horticulture from bushfires (AS19002)* on the Hort Innovation website [here](#).



Other resources

The AOA has a number of bushfire-relevant resources available on the industry website www.australianolives.com.au, in particular the following articles published in *Australian & New Zealand Olivegrower & Processor*.

March 2020 edition

[Olives and bushfire](#), pages 14-17: User-friendly information, including practical peer experience, providing a heads-up on what to do and how to do it should you experience a bushfire in your grove

[Recovery of olive groves after fire](#), pages 18-19: Practical management information on post-fire care of olive groves

September 2020 edition

[Bushfire recovery, six months on](#) - pages 18-20: Observations and advice on grove bushfire recovery and general grove management practices

[Recovery of Australia's soils following bushfire](#) - pages 21-22: CSIRO report on impact of fire on soils and options for recovery and mitigation

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