

Soil microbes and bushfire

One of the other concerns raised by fire-affected growers was the effect on soil microbes. We again went to the experts and asked soil guru John Barton, of Charton & Bang, to explain what happens within the soil when there's a fire, and how growers can manage any negative effects.

Is it an issue?

We started by asking whether soil microbes are, in fact, affected by bushfire.

"Yes and no," Barton said.

"They don't get affected in the way you think they do, by the actual fire front. Soil is an incredibly good insulator and it can take 30 minutes to raise the temperature to 4-5 degrees above normal levels.

"So it has to be a very long, hot fire – for example, when a tree falls over and burns in

place – in order to have any real effect on the microbes from the actual fire.

"What's more problematic is bare ground with ash on it; that's really good at absorbing sunlight heat. That means you can then get significant heat in the top 10cm of the soil and that's where the highest population levels of microbes are, and the highest level of activity. They're generally down to 300mm, depending on the soil and the management: the highest will be in the litter that's on the

soil, if it's bare ground there could be almost nothing."

Heat tolerance

Barton said that most soil microbes can survive temperatures up to 50 degrees for a while.

"They won't like it but they'll survive," he said.

"Once it starts getting over 50 degrees for a period of time, some will be killed and



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Want to know more about soil and your grove?

Attendees at last year's AOA National Olive Industry Conference will remember John Barton's presentation on the importance of soil carbon, rated as one of the program highlights. If you missed out, or were left wanting more, there's a second chance to hear, speak with and ask questions of Barton at the AOA's "Healthy soils – healthy and productive groves" regional field days, being held across Australia from April to August. For more information, including dates and venues, go to the Events section of the OliveBiz website – www.olivebiz.com.au.

Quick reference TLC for fire-affected groves

- if available, provide trees with water ASAP
- break up any black ash layer covering the soil to prevent radiant heat absorption
- (preferably working in compost at the same time)
- stimulate plant re-growth with nitrogen (provides protein for leaf growth) and phosphorus (for cell membranes), plus other necessary nutrients
- plant a cover crop in season
- maintain ongoing good grove management

most will be shut down – and a few will be really active. They're the type that are active in composting. Anything over about five minutes will start to have an effect, and as the temperature goes up the period shortens.

"But most fires only last a few minutes. At a soil depth of 2-4 cm it would take 15 minutes to have any appreciable temperature rise, so even an intense fire front will only heat the top few centimetres.

"The real effect is when you've lost canopy and ground cover and the soil heats up. That can affect the top 100mm of soil and start causing problems for the microbes."

Post-fire action

Barton said that where trees are completely burned the soil will regenerate in the time it takes to replant, but growers can do a lot to manage surviving stressed and damaged trees.

"Other than getting water to them, the most important thing in the short term is getting rid of the black layer on the ground," he said.

"The ideal would be to cover it with a light layer of hay but that's expensive and difficult – and anyone who's had a fire come through isn't likely to have hay to spare. A practical alternative is a light cultivation to mix the black layer into the soil so it's not continuous. That's something you rarely want to do, especially since olives have very

shallow roots, but if you do it just on the surface you'll bring up the lighter coloured soil which will reflect more heat.

"And if you're going to tickle the ash layer in, it's also a good opportunity to apply some compost beforehand and work it into the ground at the same time. It's efficient and you'll have it arrive at a time where it's needed most to support the soil.

"Another alternative, depending on the time of year, is to immediately plant a cover crop – if you've got water available or some residual soil moisture. That will help the microbes a lot because they need living plants to be fully functional. A portion of the total soil population work on degrading stuff that's dead – roots and plant material – and there's going to be a lot of that in the short term, but a lot of the important soil microbes rely on sugars from living roots. If you don't have living plant cover for an extended time you're going to lose some of that population.

"They can come back relatively quickly but if you're looking to help them recover ASAP, having those plants to feed the soil will reduce their stress.

"But of course there's a downside of time involved here. If you've got something to cover it tomorrow, it's covered tomorrow but it'll take a few weeks after planting to have much crop cover."

What not to do - maybe

One method Barton would generally avoid

is using a mulch like raw woodchips.

"It may be easily sourced, because there are so many trees needing to be cut down, but there are two issues: one is the diseases which can be brought in through unprocessed organic matter; the other is that an excess of carbon can cause nitrogen drawdown – an excess of carbon microbes will lock up the nitrogen in the soil for the short term. That will go away in weeks to months but it's something growers need to be careful of.

"That said, it's all relative, and just covering the soil might be more important than worrying about those two risks."

The really good news

Barton said that even if you can't do anything immediately, soil microbes generally are incredibly resilient in the long term.

"It's easy for a population to go up and down hour by hour, day by day, but the vast majority are able to shut down and go into survival mode. And it's only the very top layer harmed by fire front: the microbes are still down underneath and at the end of summer most will come back or be reintroduced over time.

"They're also windborne, so if they find good conditions elsewhere they'll grow a population there – and really quickly. A single microbe, if it divides every 30 minutes, in seven days would fill the entire solar system. It's true."