Flying, Burning Leaves: Testing the Conventional Wisdom Peter Scott, August 2008

As residents of the wildland – urban interface, we live in fear of the wind-driven fire that roars out of the forest and into our neighborhood. It has happened before and it will happen again. A key factor in the spread of the fire, and the ignition of our houses, is a phenomenon called "spotting."

Spotting occurs when embers and burning debris are blown ahead of the firefront , to ignite whatever flammable material they land in. Spotting can occur hundreds of yards ahead of the fire, allowing the fire to jump freeways or firebreaks. The airborne embers can be bits of brush and trees, building material, whatever the wind can pick up and drive forward, buoyed by the rising hot air.

In our community's effort to defend against wildland – urban interface fires, we have implemented a strategy called "vegetation management,“ which generally means reducing the amount of potential fuel – trees, brush, grass, debris - both in the wildland and around our houses. In theory, reducing the fuel load will reduce the heat of the fire, the length of the burning and, with wind, minimize the risk from spotting.

Until recently, specific tree species were singled out as being more fire-prone than others: for example, eucalyptus was consistently blamed for starting and aggravating fires in the hills. With the benefit of further investigation and experience, we have learned the eucalypt's fiery reputation was a myth, a convenient scapegoat for the fire the fire departments failure to anticipate or manage; the true wildland culprit – and it is true for all tree species – was the brush and debris that was allowed to build up in the understory, around the base of the trees.

As it became clear that no scientific or historical evidence supported their view, some "eucaphobes" responded with a new claim: they said eucs were to blame for spreading the fire by spotting. They speculated that eucalyptus leaves had a unique ability to get and remain airborne, twirling in the wind, because of their slender, curved shape. Fiery eucalyptus leaves, sailing ahead of the conflagration, carrying enough heat to ignite something – one could almost believe that. Since there was no documented proof of this phenomenon, I decided to conduct an experiment.

I gathered half a dozen eucalyptus, oak, tanoak, bay and redwood leaves, both green and dry, singles and multiples. With a 24" diameter five-blade radial fan providing the "wind," I let each sample fly, and measured its distance. I repeated the procedure, starting the leaves from a horizontal surface rather than from my hand, to see if there was any tendency for the leaves to take off. What immediately became clear was that the higher the proportion of surface to density, the more likely the leaf would fly. Therefore, broad, dry, lightweight leaves tended to fly further (oak the winner) while the redwoods performed miserably because of the needles' lack of surface. Most interesting was the eucalyptus leaves' behavior: because of their narrow, slightly boomerang shape, they tended to flit any which way, sometimes even doubling back. On average, they performed almost as badly as the redwood needles.

Then, one by one, I burned the leaves, observing how quickly they ignited, the nature of their burning, and what was left afterward. Dry redwood and oak leaves ignited easily and burned completely with a sudden flare, green samples were relatively slow to ignite but once the heat was up, they also burst into flame. The green eucalyptus leaves were similarly slow to start, and once they ignited they burned more slowly, spitting tiny flames off the leaf's edges and creating quite a plume of smoke. Dry eucalyptus leaves burned similarly, only quicker, but what was left, either green or dry, was the frailest, disintegrating tissue of ash – not capable of flying anywhere, much less sustaining any spark. Bay leaves were the most dramatic: igniting quickly and burning aggressively - smoking, spitting and flaring - but then for some reason they tended to self-extinguish. After all the fireworks, bays sometimes left a half-burned leaf. Their ash residue was similar to the eucs'.

My test was not a rigorous scientific experiment, but my point is: no one else has produced any sort of evidence in support of the claim that eucalyptus leaves, because of their flying ability or because of their ember sustainability, are able to spread a fire by spotting.

This leaves open the question of the eucalyptus bark. Generally, eucs are mostly naked of bark, but some retain thin (max 1/8") peeling strips of dense woody material. The question is: do these narrow strips somehow disengage from the trunk and, burning, take flight? Based on the surface v. density proportion mentioned above, I doubt it. As for the loose strips of bark on the ground or caught in crotches of the trunk, in terms of fire hazard, they are no different from the limbs and debris shed by other species. If eucalyptus created more debris, or more hazardous debris, than other trees, experts in vegetation management would recommend more frequent clearing under and around them. Yet authoritarian studies of forest maintenance recommend clearing and thinning under mixed hardwood forests every two to five years, exactly the same interval recommended for eucalyptus forests.

Conclusion: There is no doubt that spotting occurs, spreading the wind-driven fire, but the material that carries an ember must have sufficient thickness to sustain ignition-capable heat during its flight. Driven by wind and rising heated air, all sorts of material are picked up and projected forward – brush, limbs, shingles, plastic buckets (a fire-fighter pilot reported a burning sheet of plywood at his altitude). But flying leaves, especially eucalyptus leaves, are not the cause of spotting.