Further notes on *Agonis flexuosa* foliage death at Yalgorup National Park: Survival rates of affected trees. October 2006

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Time of appearance of symptoms

Symptoms of foliage death were first noticed on the Old Coast Road in Yalgorup National Park on the morning of Monday 25th June 2006 (Wills 2006). Symptoms first observed 25th June (passing at 110 kmh^{-1}): Pale green and dry appearance to *Agonis flexuosa* foliage, aromatic smell of dead foliage. Tuarts appeared unaffected. Symptoms not confined to road verges. Symptoms were photographed 2nd July and the extent of affected trees along Old Coast Rd noted. By this time the dead foliage was starting to turn light brown. Some time would have needed to elapse between foliage death and foliage dehydration, however the characteristic odour and dry greenness of the foliage indicated that the foliage death was very recent. Death of the foliage appeared to have been induced by frost conditions on 17 June 2006. Frosts and near-frost conditions were extensive on the coastal plain on that date. Frost is not unprecedented in the Yalgorup National Park but it has been presumed that Tuart is more sensitive to frost than *A. flexuosa* (Shea 1999).

Subsequent development of symptoms

On 28 August 2006 Mike Stukely numerous affected regrowth *A. flexuosa* trees fully defoliated around Ellis Rd (just over 1km S of Preston Bch Rd), within 100m west of Old Coast Rd; others part-defoliated had some remaining green/sick leaves. No new epicormic shoots seen at that time on any trees. Defoliated parts of crowns appeared to be dead, buds not viable (crumbly), wood very dry internally on twigs and branches and becoming brittle.

The area was re-inspected by Allan Wills on 9th October 2006 to check for extent of foliage loss and mortality of *Agonis flexuosa*. By this time most dead leaves had fallen from affected trees and those that were still alive retained some green foliage and/or had epicormic shoots. At 3 sites the amount of foliage lost and mortality of 10 *A. flexuosa* plants were assessed. Other species possibly affected and the extent of areas affected were also noted.

Defoliation in Yalgorup NP appeared to be confined to a depression area extending from just north of Preston Beach Road and 1 km westwards along Preston Beach Road from Old Coast Road, south to Ludlow Road and extending west about 0.75 km along Ludlow Road from Old Coast Road. There were indications of some defoliation to *A. flexuosa* in places up to 100 m east of Old Coast Road between Johnston Road and Bagieau Road. On the low-lying areas of shrubland, the main species affected was an *Acacia sp*. The principal area of *A. flexuosa* affected was a narrow strip parallel to and immediately west of Old Coast Road between Preston Beach Road and

Ludlow Road. Though not extensive in area within the National Park, the defoliation is highly visible due to its frontage to Old Coast Road.

Amount of defoliation of *A. flexuosa* varied between sites. In the worst affected site assessed all trees suffered 100% defoliation. While in the least affected site assessed (Fig.1, Table 1) defoliation ranged between 20% and 100%, with a modal defoliation of 70%. Other areas not assessed showed lesser defoliation. Plant mortality was 10% at two sites (Tables 1 and 3) and 0% at the other site (Fig.2, Table 2). Dead trees were those 100% defoliated and with no epicormic shoots. Live defoliated trees had epicormic shoots (Figs 3 and 4).

Outlook for affected *A. flexuosa*

Root:shoot biomass ratios were probably altered by the defoliation event and this may leave the plants vulnerable to both root and above-ground pathogens. Mortality rates of *A. flexuosa* should be monitored periodically at the 3 sites assessed. Further inspections of these sites will be conducted in December 2006 and March 2007.

Recommendations

Allan Wills to re-inspect sites in December and March.

Dead *A. flexuosa* material is contributing dry standing fuel and therefore represents a change in potential fire behaviour in the affected area. Relevant district staff should be made aware of this.

References

Shea 1999 CALM Media statement. Accessed 18/10/2006
http://www.calm.wa.gov.au/news/news.cgi?item=938761916

Wills 2006 Note on *Agonis flexuosa* foliage death at Yalgorup National Park June 2006. Department of Environment and Conservation. Unpublished report.

Fig. 1. Site 1. 32^{o} 54.977’ S 115^{o} 42.500’ E. North side of Preston Beach Rd about 1.3 km west of Old Coast Rd.

Table 1. Site 1. Defoliation and mortality of *A. flexuosa*.

Tree	Estimated % of foliage lost	Mortality	Diameter class of largest stem
1	80		11-20 multi stemmed
2	70		11-20 multi stemmed
3	70		11-20 multi stemmed
4	20		11-20 multi stemmed
5	20		11-20 multi stemmed
6	90		11-20 multi stemmed
7	60		11-20 multi stemmed
8	100	alive	1-10 single stem
9	100	dead	1-10 single stem
10	70		1-10 single stem

Fig. 2. Site 2. 32^{o} 56.949’ S 115^{o} 43.363’ E. About 1 km north of Ludlow Rd and 50m west of Old Coast Rd.
Wildfire regrowth has been subjected to defoliation. Dieback and death of small tuarts in foreground associated with borer girdles.

Table 2. Site 2. Defoliation and mortality of *A. flexuosa*. Wildfire regrowth.

Tree	Estimated % of foliage lost	Mortality	Diameter class of largest stem
1	80		1-10 multi stemmed
2	100	alive	1-10 multi stemmed
3	100	alive	11-20 multi stemmed
4	90		1-10 multi stemmed
5	100	alive	1-10 multi stemmed
6	90		1-10 multi stemmed
7	30		1-10 multi stemmed
8	90		1-10 multi stemmed
9	100	alive	1-10 multi stemmed
10	100	alive	1-10 multi stemmed

Other observations: Some dead *Jacksonia sp*. also.

Table 3. Site 3 Defoliation and mortality of *A. flexuosa*.
32^{o} 55.967’ S 115^{o} 43.174’ E. About 1km South of Ellis Rd 50m West of Old Coast Road. Wildfire regrowth.

Tree	Estimated % of foliage lost	Mortality	Diameter class of largest stem
1	100	dead	1-10 multi stemmed
2	100	alive	1-10 multi stemmed
3	100	alive	1-10 multi stemmed
4	100	alive	1-10 multi stemmed
5	100	alive	1-10 multi stemmed
6	100	alive	1-10 multi stemmed
7	100	alive	1-10 multi stemmed
8	100	alive	1-10 multi stemmed
9	100	alive	1-10 multi stemmed
10	100	alive	1-10 multi stemmed

Other observations: Senescent and dead *Acacia saligna.* Some dead *Jacksonia sp*. also. Jarrah Leafminer present on jarrah.

Figure 3. Epicormic shoots on *A. flexuosa* that is completely defoliated but still alive at present.

Fig. 4. Epicormic shoots about 3m high on completely defoliated regrowth stems. Dead material above shots will potenially alter fire behaviour.