

Excessive Heat Damage to PNW Christmas Trees-*a two weeks later overview*

As most of you know there was a significant heat event in the Pacific Northwest in late June 2021. Over the course of 3 to 4 days, temperatures reached records highs, some as high as 118 F recorded in Salem Oregon.

Damage has been extensive in many crops and Christmas trees were not spared. Chal has talked to many growers over the last two weeks since this unprecedented heat event.

Here are some of the key observations being seen in the fields.

- Most severe damage seen in lower elevation fields in PNW
- South side of trees show more heat damage
- Species ranked by most damage
 1. Fraser fir
 2. Grand fir-showing a range of damage, leaders/needles
 3. Noble fir-wide range of damage, leaders, needles- current season and last years growth
 4. Nordmann & Turkish fir- damage seen on leaders and upper whorls mainly, late bud-breaking trees showed more damage
 5. Douglas-fir-little to no damage so far

So what actually happened within the trees during this extreme heat event?

Here is tree physiologist and Professor Bert Cregg, of MSU, explanation.

“The extreme high temps and low RH’s result in very high vapor pressure deficits. Under typical summer midday conditions in the PNW (90 F, 35% RH) vapor pressure deficit is around 3 kPa. At 118 F the RH would be about 15% resulting in VPD’s around 9 kPa. That’s a whole lotta sucking force trying to pull water out of those needles. With limited soil moisture, the stomata close, which saves water but eliminates transpirational cooling, so now tissue temperatures begin to increase to the point there is direct damage especially to the succulent new shoots, which likely hadn’t hardened off yet. I suspect if you had the same temps at the end of July you would still see the needle browning (needle desiccation due to high VPD + limited soil moisture) but less of the direct heat injury to shoots.”

Dr. Bert Cregg-MSU

Some examples of damage seen on trees in the mid-Willamette valley at low elevation.



Noble fir

- Types of damage (harvest size)
- S. side of tree- red needles on current season age-class needles
- S. side of tree- last year's needles red and damaged (current season needles OK)



Interior needles damaged-NWREC seed orchard

- Top whorls with dead needles all the way around the tree
- Wilted-dead current season growth
- Wilted tops



Turkish fir leader damage-NWREC seed orchard



Turkish fir-More leader damage



Turkish fir-leader and south side damage



Douglas-fir- minimal damage NWREC seed orchard

