STUMPING IN WALNUT

Jo Clark and **Matt Brocklehurst** report on work carried out in The National Forest to improve the form of walnut species suffering from frost damage.

Stumping, or stumping back, is a common forestry practice, carried out either at planting time or a few years after establishment. Stumping can be particularly beneficial on trees that re-sprout from dormant buds such as oak and walnut. It entails cutting the tree back to the base, leaving about 5-10cm of stem. Although stumping confers no overall growth advantage (Evans, 1984), it can be extremely beneficial in improving trees with poor form. The poor form can often be caused by repeated frosting of the terminal shoot, which results in trees with multiple leaders. Other purposes of stumping are to improve the shoot to root ratio, to promote straight, vigorous growth, and to reduce post planting stress and therefore increase survival rates (Pope and Mayhead, 1994).

Walnut is a species of interest to foresters in Great Britain as it grows fast, producing an end product in sixty to seventy years that in today's market is worth about three times the amount of oak. However, it has a reputation of being tricky to grow, and to produce high quality stems. Although walnut flushes late in the UK, it is still prone to damage from late spring frosts, and can also suffer from winter cold too, with the current year's growth not hardening sufficiently before the colder temperatures arrive.

The walnut silviculture trial in The National Forest

In 2002 a research trial was established at Lount Wood, close to Ashby-de-la-Zouch in The National Forest. The National Forest Company, working with the Forestry Commission and the Earth Trust, is interested in walnut as it is likely to be an alternative commercial forestry species in the Forest area in the future, as a consequence of predicted increases in temperature resulting from climate change.

The research trial was initially established to investigate the silviculture of growing walnut for timber in Britain. Two species of walnut were used, common (*Juglans regia*) and black (*Juglans nigra*) as well as two hybrids: NG23 and MJ209, both *nigra* x *regia* crosses. The walnuts were planted at 5 x 5m spacing, with a combination of various tree and shrub nurses employed to help improve the growing conditions and microclimate of the walnuts. Tree nurses included larch, cherry, alder and birch, and shrub nurses were hazel, elder and autumn olive. Two blocks were planted with four replicates in each (one for each walnut type) with

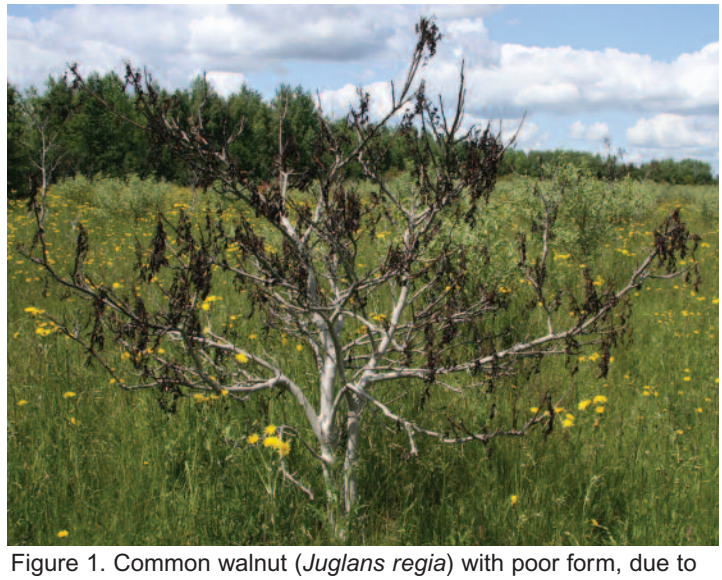

Figure 1. Common walnut (*Juglans regia*) with poor form, due to repeated frost damage as evident here. Corrective pruning is not possible on trees such as this.

Table 1. Numbers of walnut trees stumped, out of a possible 255 trees per species, summer 2007 (Block 1) and winter 2007 (Block 2), and survival in October 2008 and 2009.

	Number stumped	Survival (%) Oct 2008	Survival (%) Oct 2009
Block 1 (summer stumping)			
regia	30	96.7	90.0
nigra	70	92.9	78.6
NG23	26	88.5	76.9
MJ209	38	94.7	92.1
Total number	*164*	*150*	*137*
Block 2 (winter stumping)			
regia	23	100.0	91.3
nigra	81	93.8	75.3
NG23	66	98.5	93.9
MJ209	55	89.1	81.8
Total number	*225*	*206*	*190*

all tree and shrub nurse combinations to investigate which species benefited the walnuts the most.

Some nurse species were more successful than others in promoting good growth and form in walnut (see Clark et al., 2008). However, as protection was minimal during early establishment, many trees suffered from repeated frost damage.

In July 2007 all walnuts were pruned to improve form. However, for many individuals, the form was so poor that corrective pruning was not possible (Figure 1). It was therefore decided to investigate the effect of stumping to improve the form. In walnut silviculture the most important benefit of stumping is in its promotion of rapid height increment through the early frost sensitive phase of growth. In this case stumping was carried out as a corrective measure due to poor form.

Method

The silviculture trial at Lount lends itself very well to further experimentation on silvicultural practices as it comprises two blocks of four replicates. Thus, two treatments could be applied – a summer and a winter stumping. Those trees that it was deemed impossible to improve by pruning were stumped in July 2007 in block 1 and in November 2007 in block 2 (Table 1).

Stumping was carried out at approximately 10cm above ground level using loppers where stem diameter was small enough, or a pruning saw on larger trees. The cut was performed at a slight angle to assist in water run off. The trees in block 1 were assessed for regrowth in November 2007. All trees were assessed in October 2008 for survival, the number and vigour of shoots, and for the number of competing leaders. Shoots were scored as dominant (taller than 50cm, and thus competing with each other) or minor (less than 50cm) and the height of the tallest shoot recorded to the nearest centimetre. Figure 2 shows a stump just breaking bud.

Many of the competing shoots were removed by Forestry Commission staff in July 2009, in most cases leaving a single leader. The trees were assessed again in October 2009 and height to the nearest centimetre recorded.

A simple one-way analysis of variance was carried out looking at the effect of treatment (summer versus winter stumping) on height growth and survival.

Figure 2. A stumped walnut, with many new shoots emerging.

Results

Survival

The time of stumping had no significant effect on survival of the walnut trees. Nearly all trees in block 1 had sent out several shoots by the time of assessment five months later, in November. Out of the 164 trees stumped, all but 36 had sent out at least one strong shoot, and only 9 trees had sent out no shoots at all. A full assessment of all trees was carried out in October 2008. Survival in block 1 was 91% with 14 trees dead. Seven of these had simply died, with seven others dying from a specific cause (either mowing, swamping by vegetation or girdled by voles). In block 2 survival was also 91% with 19 dead trees, with 16 not re-sprouting, and three being mown. Mortality increased during the 2009 growing season with an additional 29 trees dying (Table 1). In the majority of cases, this was due to weak regrowth following stumping, which was then unable to compete with vegetation (mainly rank grass) around the base of the walnuts.

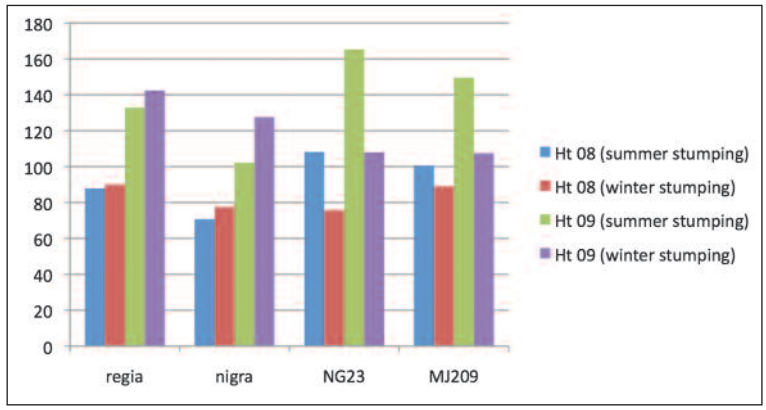

Figure 3. Mean height (cm) of walnut regrowth by species, comparing summer (July 2007) and winter (November 2007) stumping, recorded in October 2008 and 2009.

Growth

The time of stumping had no significant effect on height growth, regardless of walnut species.

Figure 4. Common walnut regrowth, October 2008, showing three competing leaders and several minor shoots.

The overall mean height of regrowth in 2008 (regardless of species or treatment) was 90cm and 131cm in 2009. All but five of the 33 trees that re-sprouted in 2008, and died in 2009, were below 50cm in height. Where the regrowth was vigorous, and the shoot well clear of the competing vegetation, survival was excellent. Four trees recorded as dead in 2008 sprouted in 2009: these were two NG23s from block 2 (winter stumping) and two *nigras* from block 1.

Figure 3 shows mean height of walnuts in 2008, and in 2009, once they had been singled. In some cases height growth was exceptional, especially within the hybrid NG23. The tallest tree overall was a *J. nigra* at 355cm after the second growing season. The tallest *regia* was 214cm, the tallest NG23, 350cm and the tallest MJ209 278cm.

Regrowth tended to fall clearly into two categories – strong shoots that were competing equally, and minor shoots (Figure 4). Several trees had one dominant leader and several small shoots. The number of competing leaders produced was slightly greater with a winter stumping for all walnuts, except NG23. Winter stumping also caused a greater number of shoots to be produced overall, than did a summer treatment (Figure 5).

Discussion

Overall, the stumping has yielded outstanding results. Only those individuals that exhibited very poor form were stumped. At time of

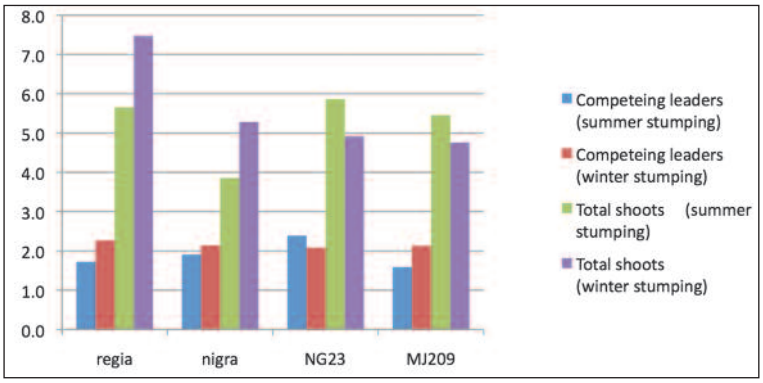

Figure 5. Comparison of mean number of competing leaders and total number of shoots between summer and winter stumping by species, assessed October 2008

planting shelter would have been virtually non-existent. Six years later, when the walnuts were stumped, the surrounding nurse species were well established and providing shelter, and, in the case of the Italian alder and the autumn olive, also providing nitrogen to the walnuts.

After two growing seasons post stumping, 62 trees (16%) had died out of 389 trees stumped. From this the cause of mortality could be broken down to that caused by the stumping treatment (35 trees) and that caused by other factors (27 trees). When these other factors are ignored, overall walnut suvival was 91%. Where the walnut had died without other causes, the walnut had been particularly small, and in both summer and winter treatments mortality of the black walnut (*Juglans nigra*) was highest, as these were the smallest trees, with the poorest form. After singling, most trees had a single strong shoot (Figure 6), with good apical dominance. Given the significant improvement in the form of the walnuts, this can be viewed as a successful treatment.

Interestingly, no significant difference was observed between treatments in terms of height growth or survival. Summer stumping produced fewer shoots overall and fewer leaders that were competing. This meant that singling was easier within the summer treatment. However, it was observed that there was much dieback in the first year of the summer treatment, with shoots being produced in the same season as stumping, but not hardening off sufficiently before winter. When assessing trees the following spring, is was noted that all summer shoots had died over the winter and therefore all shoots were produced as new the following spring. This would account for the fewer shoots with the summer treatment, as the stump had to re-sprout twice. This would also account for winter stumping tending to produce a leader greater in height than with the summer treatment, as the stump had only produced shoots once. So, although addtional singling is required with a winter treatment, the resulting growth is stonger and dieback much reduced. It should however be pointed out that the two subsequent winters after stumping in this case were relatively mild. Should the winter post stumping

Figure 6. Black walnut, three years after stumping.

be particulalry cold, results might have been different.

Another point to note is that walnuts were stumped at around 10cm. It may be possible to stump the walnut lower (at 5cm) in future, and thus fewer shoots should be produced.

Further information on The National Forest walnut research trials can be found at www.nationalforest.org/document/research/

References

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