

Effectiveness of Sheep Grazing of the Invasive Giant Hogweed at Kirkside Farm, Macduff, Aberdeenshire

2020 Progress Report - A Robinson and R Van der Wal, University of Aberdeen

1. Introduction

This trial project is a practical experiment to investigate if and how land managers could best use sheep to control substantial Giant hogweed (*Heracleum mantegazzianum*) infestations – in this case in a woodland site – with a view to preparing practical advice for land managers. Where Giant hogweed has taken over in an area it can be difficult, time consuming and expensive to tackle the problem and requires the use of herbicides. This study has been assessing the opportunity of using sheep to control Giant hogweed in a trial site at Kirkside Farm near Macduff at the bottom of the River Deveron catchment.

This trial is part of the Scottish Invasive Species Initiative (SISI) and where the Deveron Rivers Trust, Aberdeen University and Kirkside Farm have been working together to assess:

- The impact of sheep grazing on the volume of Giant hogweed throughout the site, and
- The impact of the sheep grazing on the rest of the vegetation

By monitoring and recording our work we intend to write a good practice guide for land managers who may wish to control invasive plant problems through sheep grazing.

2. The site at Kirkside Farm, Macduff

The site in Macduff is part of Kirkside Farm on the right bank of the Deveron near Macduff distillery. It is a strip of mature woodland with an access road between it and the River Deveron (Grid reference: NJ688626). The site is well known for having large amounts of Giant hogweed, is popular with dog walkers and opposite the local golf course.

Due to the scale of Giant hogweed infestation and the difficult terrain of the site previous chemical control actions were ineffective, time consuming and expensive. Therefore, we wanted to find a more effective approach to Giant hogweed control here. After successes in using sheep to control Giant hogweed elsewhere in the Deveron catchment at Auldtown Farm, the landowners at Kirkside were keen to try using sheep on the site as the extent of Giant hogweed was increasing and there was concern about public health implications given its recreational popularity.

The site allows an assessment of the effectiveness of sheep grazing in a radically different setting (mature woodland) compared to a previous study site at Auldtown.

3. Sheep and grazing regime

In 2019 the sheep were initially reluctant to tackle the Giant hogweed and so were contained in an area by the farmhouse to allow them to familiarize themselves with the site and available grazing and before being released onto the wider site. In 2020 the same sheep were utilised and did not need this familiarization period so were released straight onto the whole site.

Due to overgrazing observed and reported in 2019 the plan was to reduce grazing pressure in 2020 by halving the number of sheep utilised and removing them from the site earlier in the year. The grazing periods for 2019 and 2020 are summarised in Table 1. This confirms that in 2020 the overall number of sheep days was just under half that of 2019, however variable numbers of sheep were on site throughout the grazing period, as well as a period of three weeks when sheep were off the site for shearing.

Table 1: The number of sheep and duration they spent within the trial site

Year	Start	End	Sheep put on	Sheep taken off	Sheep days
2019	12/04	01/11	26	25	5075 (Estimated based on 25 sheep)
2020	06/04	26/04	24	12	^a 480
2020	26/04	24/06	12	12	^b 708
2020	12/07	06/09	23	23	^b 1288
2020					Total 2476

^a 2020 - Twenty-four sheep were initially added by the farmer due to his concern about the amount of Giant hogweed emerging. However, on advice sheep numbers were reduced from 24 to 12 due to concerns in 2019 about overgrazing.

^b 2020 dates split as sheep were off the site for shearing from the 24th June until the 12th July.

In 2019, through speaking with the farmer and members of public who use the site it was reported that the sheep developed something of a daily routine whereby in the morning they would spend their time at the northern end of the site and then in the evening spend more time by the road and farm. The sheep seem to have adopted a slightly different routine in 2020, spending less time in the paddock and northern end of the site and much more time in the upper middle section.

4. Monitoring

a) Giant hogweed

The density and spatial distribution of Giant hogweed plants was monitored to assess whether and the extent to which sheep grazing was affecting number of Giant hogweed plants.

Monitoring plots were stratified along the top of the site at approximate 15m intervals. Forty-two plots were established in total as shown in Figure 1 (blue circles). Each 1m² plot was permanently marked using metal stakes and their position recorded using GPS, to allow repeat surveys to be undertaken at each location and the accurate recording of change.

At each plot:

- Photos of the plot and surrounding area were taken to enable relocation and monitoring change in Giant hogweed and vegetation cover.
- Vegetation height was recorded at 3 points within the plot as well as recording the main vegetation types to allow detection of change in the vegetation composition.
- The number of Giant hogweed plants/seedlings were recorded in the 1m² plot.
- In addition, to investigate further the density and spatial distribution of Giant hogweed plants, additional counts were made in adjacent 1 m² quadrats (to the right and below, creating 4 x 1 m²).

The plots were surveyed on 24th June and 16th September 2020. Ideally the plots would have been surveyed earlier in the spring when the sheep went on the site but due to COVID-19 restrictions this was not possible.

b) Habitat / vegetation monitoring

Habitat recording undertaken is based on the methodology used as part of the Repeat Woodland Bird Survey (RWBS) (Amar *et al.*, 2006).

Habitat recording was undertaken at seven points as shown in Figure 1 (orange circles), spaced approximately 150m apart. Four (4) points were distributed along the south of the site with two (2) along the lower half above the track and one (1) in the paddock area at the entrance of the site.



Figure 1: Hogweed monitoring plots (blue markers) and vegetation monitoring plots (orange markers) at the Macduff trial site.

Each habitat survey point is the centre of a 25m radius area within which habitat recording took place. Some measurements were recorded from the centre of the 25m plot, whilst others were recorded in four 5m radius sub-plots centred 12.5m north, east, south and west of the centre of the plot. The centre point and the four 5m radius sub-plots were marked with a metal stake to allow easy relocation.

Presence of sheep paths, streams and the dominant tree and herb species were recorded, as well as browsing pressure at the plot level. The recording took place on 3rd July and 18th September 2020.

Subplot level information

At each of the four subplots the following were recorded:

Horizontal Visibility (assessed to gauge openness of the site).	A 2.4m pole marked with alternate black and white 10cm sections was placed in the centre of the plot and viewed from the centre of each subplot. The number of black bands that were at least 50% visible through the vegetation (maximum 12) was recorded. This method is described in detail in Wilson et al. (2005).
Canopy cover	% canopy cover overall over the plot
% vegetation cover in ht classes (0.5-2m, 2-4m, 4-10m)	Total cover by veg of the 5m subplot as if viewed from above, considering only the vegetation in each height band in turn
Field layer cover	% cover of each of the following - bracken, herb, grass, moss, leaf litter/wood, rock, bare ground, salmonberry, wood rush, hogweed, dead hogweed stems, nettle, other. Note % herb excludes nettle
Presence of shrub species	Shrubs under 5m high only
% shrub species grazed - Elder, Salmonberry, Ash, Sycamore	For woody stems <2m high: no browsing, light browsing, moderate browsing, heavy browsing
Level of Hogweed grazing	light browsing, moderate browsing, heavy browsing

5. Results

a) Giant hogweed

Giant hogweed was extensive especially across the top of the site prior to the sheep being added in 2019. After 6.5 months of grazing in 2019 most of the large Giant hogweed plants were all grazed and gone with only small seedlings remaining, shown in Figure 2. The number of plots with Giant hogweed was 41 in June 2019. In June 2020 there were 37 plots with Giant hogweed. The number of plots with Giant hogweed was also lower in September 2020 (22) compared to 34 in October 2019 (Table 2).

Areas that showed heavy sheep usage and poaching of the ground in autumn 2019, featured numerous small Giant hogweed seedlings in 2020, shown in Figure 3. However, overall, there were a third less Giant hogweed seedling/plants across the whole site in June 2020 (907) compared to June 2019 (1,371). Likewise, in September 2020 there were a third less (340) compared to October 2019 (501) (Table 2). In June and October 2020 95% of the Giant Hogweed plants were < 10cm with the remainder between 10 cm – 30 cm. Giant hogweed plants that opportunistically grow out of reach of the sheep (Figure 4) could eventually be a seed source on the site.

Table 2: Number of plots with Giant hogweed seedling/plants and total number across all plots

Monitoring visit	Number of plots with Giant hogweed seedling/plants	Total number of Giant hogweed seedling/plants recorded in the plots across the whole site
11/06/2019	41	1371
01/10/2019	34	501
24/06/2020	37	907
16/09/2020	22	340



Figure 2: Dramatic changes in Giant hogweed cover occurred after 6 months of grazing by sheep in 2019 as shown in Plot 24. In 2020 there were lots of Giant hogweed seedlings and a distinct sheep path.

Figure 3: In areas where there was heavy sheep usage and poaching of the ground observed in autumn 2019 by 2020 there were lots of small Giant hogweed seedlings such as in plot 26.



Figure 4: Giant hogweed growing 4m up a tree out of reach from sheep.

b) Vegetation change

The average vegetation height did not change between the two visits in 2019 (7cm). In 2020 the average vegetation height was higher (22cm in June and 14cm in September). This reflects the changes in vegetation composition with an increase in nettles alongside a reduction in herbs due to overgrazing.

As in 2019, there was a continuation of heavy grazing of Hedge woundwort and other herbs (Figure 5). Nettles increased in cover as was evident by autumn 2019 (Figure 6 and see plot 9 photos in Appendix 1 and 2). To a lesser extent and in more open areas there was an increase in the amount of thistles (see plots 29 and 32 photos in Appendix 1 and 2) and in a few plots in the east of the site Giant Hogweed and bare ground has been replaced by an increase in Bracken (see plots 5 and 6 photos in Appendix 1 and 2).

This increased dominance of highly defended plant species such as nettles and thistles which are less palatable to sheep occurs where grazing levels are too high.

Figure 5: Heavy grazing of herb species in particular Hedge woundwort as seen in plot 34



Figure 6: Plot 16 showing Giant hogweed has been replaced with stinging nettle.



In many plots ash seedlings and saplings were regenerating well in June 2020 but by September were heavily grazed (see plot 23 photos in Appendix 1). Salmonberry was heavily grazed with the majority of lower branches within reach of sheep being grazed and there was evidence of the shrub layer dying off (see plot 21 photos in Appendix 1). This may or may not be entirely attributed to overgrazing.

In 2019 there was an increase in the amount of bare ground in the 1m² plot from 47% to 59%. The amount of bare ground was lower in 2020 with an average of 41% in June 2020 and 42% in September 2020.

In some areas of the site there were encouraging signs of re-vegetation as shown in Figure 7. Likewise, in the south-west of the site in some areas the ground flora was re-vegetating.

Figure 7: Encouraging signs of re-vegetation in plot 4 plot where there has been a change from Giant Hogweed and bare ground to a mixed grass sward



c) Vegetation plots

Horizontal visibility was lower at both visits in 2020 than in 2019. This can partly be explained by the increases in nettles and other taller grazing tolerant plants.

In 2019 the amount of bare ground increased from an average of 24% to 38%. Vegetation plots 1, 2 and 3 all had extensive sheep paths through them. In contrast grazing pressure was limited just above the access track as shown in the photos of vegetation plot 5 (Appendix 3). In 2020 the percentage bare ground was lower (22% and 21% for the June and September visits respectively). There were again very distinct sheep paths in the upper half of the site with sheep spending more time around vegetation plot 2 in the middle of the site. However, there appeared to be an increase in sheep usage in the lower half of the site nearer the track as indicated by new sheep paths, dung and grazing just above vegetation plots 5 and 6.

In June 2019, 19 out of the 28 sub-plots had Giant hogweed, with 9 plots having 10% or more hogweed cover. By October 2019 only 9 of the sub-plots had Giant hogweed (maximum cover of 10%). In June 2020, 15 out of the 28 sub-plots had Giant hogweed and of these, half were less than 5% cover. As in October 2019 in October 2020, only 9 of the sub-plots had Giant hogweed, and all apart from 1 were less than 5% cover.

There has been a reduction in herb cover in most plots. But the plot nearest the farmhouse (vegetation plot 4), which had been sprayed with herbicide in spring 2019, showed an increase in both grass and herb cover and in 2020 there was a mixed sward of grasses and mixed herbs. At vegetation plot 1, herb cover was on average 36% in June 2019 yet by June 2020 this had dropped to 25% (Figure 8). There was an increase in grazing tolerant species observed in many plots. At vegetation plot 1 for example, the percentage cover of nettles was on average 18% in June 2019 this had increased to 35% by September 2020 (Figure 8). In the paddock area and more open areas of the site thistles which are also grazing tolerant were appearing too. The spread of nettles normally occurs on bare ground or “gappy” swards created through overgrazing or poaching and where nitrogen enrichment of the soil occurs, in this case because of sheep dung.

Figure 8: Vegetation plot 1 - Hedge woundwort heavily grazed and reduction in cover and increase in the amount of nettles.



In some plots there has been very little change as in vegetation plot two. In quite a few plots by June 2020, following three weeks of 24 sheep on site initially (in April), thereafter reduced to 12 sheep on site for two months (from end of April until end of June), there was some regeneration of vegetation picked up during the monitoring in June. From end of June until middle of July, the sheep were off site for three weeks where vegetation could regenerate further, followed by 23 sheep being added until September - resulting in a lot of the regeneration of vegetation observed during June monitoring having been grazed by September monitoring. (Figure 9).

This indicates that around 12 sheep, based on vegetation regeneration observed in June, is likely to be the right number for the site, compared to the observed overgrazing in September following 23 sheep having been on site.

Figure 9: Vegetation plot 3. Lots of Ash seedling and grass re-generation in evidence in June 2020 but by September 2020 the Ash seedlings were heavily grazed and cover had reduced from 80 to 50%.



Salmonberry bushes were mostly lightly grazed in June 2019 but by October were showing moderate to heavy levels of grazing. This trend continued in 2020 when by autumn two-thirds were categorized as being heavily grazed (Figure 10).

The high grazing pressure in 2019 was evidenced by the fact that even stinging nettles and bracken had also been grazed. There was still signs of grazing of these plants in 2020 but to a lesser extent (Figure 11).



Figure 10: Heavy grazing of Salmonberry

Figure 11: Even bracken and stinging nettles have been grazed showing very high grazing pressure.



6. Summary and Recommendations

In 2019 the introduction of 25 sheep over a period of seven months at Kirkside Farm resulted in a massive reduction in Giant hogweed but also in the site becoming heavily overgrazed to the detriment of other parts of the plant community. Consequently, there were extensive areas of bare ground, grazing of shrubs and saplings and quite large changes in ground flora apparent. It was recommended that a smaller number of sheep were introduced in 2020 – between 10 - 15 sheep – and that grazing should take place from April to August at the most.

The number of sheep deployed in 2020 varied across the summer months but, overall, the total number of sheep days in 2020 was reduced to 2476 days – 49% of the grazing pressure recorded in 2019. The plant community monitoring undertaken in 2020 still, however, confirmed overgrazing at the site – though at levels less severe than that found in 2019. Therefore, we recommend that grazing is further reduced in 2021.

We propose that similar numbers of sheep (12) are put on the site in 2021 from the beginning of May until end August (there can be some flexibility on actual dates) to deliver approximate total of 1500 sheep days in 2021 (based on 12 sheep on site from beginning of May until end of August this would be 1476 days), compared to 2476 total sheep days in 2020. This would represent a reduction in grazing days of 40% from 2020 based upon 1476 grazing days in 2021 compared to 2476 in 2020 and an overall reduction of 71% in grazing days when compared to the 5075 grazing days recorded in 2019.

In 2021 we will continue to monitor plant communities to assess grazing pressure across the year. We will also review whether the sheep need, or could be left on site for longer, depending on any time sheep may be off the site for shearing, or if the farmer's (Gordon) observations show that they favour/ignore certain areas of the site. We predict that apart from isolated or inaccessible Giant hogweed plants the sheep will have dealt with the majority of plants on the site by the proposed removal time at the end of August.

Although it may appear that Giant hogweed grows up quickly in the spring we know, from video footage and field observation, that sheep will tackle large Giant hogweed plants by rubbing and knocking them over before grazing and so we do not need to start grazing in early Spring – the animals will happily tackle larger plants later in the season.

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References

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