Control of Stinging Nettle on Craigleith

Image John Hunt, Craigleith July 2024

Report Prepared for the Scottish Seabird Centre

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SRUC

Summary

Clearance of invasive tree mallow from most of the island of Craigleith has allowed puffin numbers to increase and the natural coastal vegetation to return to the island, with common stinging nettle part of that plant community. Given the highly fertile soils on Craigleith due to abundant seabird droppings, common nettle stands on the island have thrived, are following an upward trend and now cover approximately 7% of the island. Although common nettle provides food and habitat for some butterflies, its spread occurs in some areas where puffin burrows are found and where digging of new burrows could occur. Dense nettle patches can limit access to burrows and are known to sting and temporarily paralyse young puffins and eiders, making them susceptible to predation by gulls. This study trialled three treatments to control growth of common nettle on Craigleith. Nettle growth was significantly reduced in the same year and the following year in areas that had been treated with Grazon Pro (a herbicide that targets broadleaf species, while leaving grasses unaffected). Cutting nettles close to the ground reduced nettle growth the following year but led to strong regrowth towards the end of the same year treatment was applied. Pulling nettles up from the ground was ineffectual in controlling nettle growth in the same and the following year treatment was applied. Germination of both nettle and tree mallow seedlings were evident in areas where the soil had been disturbed by puffin and rabbit activity.

Both cutting and removal of flowering nettle plants and spraying with a targeted herbicide such as Grazon Pro could be used to control the spread of common nettle on Craigleith. Cutting and removing flowering plants could be carried out at the same time as visits by volunteer SOS Puffin parties to the island to control tree mallow. However, to fully control nettle growth in any one year, visits may be required during the nesting season, which would likely result in a small increased disturbance to breeding birds on the island. Herbicide application would require fewer visits to the island but must be carried out by trained personnel following strict guidance and is generally viewed as a less environmentally friendly option. Decisions on any treatments should be agreed on by all stakeholders after consultation.

SRUC

Introduction

On Craigleith island in the Firth of Forth, tree mallow (*Lavatera arborea*) had become a significant problem by 2006. The invasive plant covered over 80% of the island, blocking entrances to puffin (*Fratercula arctica*) burrows, with a resultant decline in the number of breeding puffins using the island (Van der Wal, 2006). A successful campaign of cutting and removing tree mallow from Craigleith (Scottish Seabird Centre's SOS Puffin initiative) has reduced the coverage of this invasive plant to less than 10% of the island (Anderson, 2024). A concurrent increase in the number of apparently occupied puffin burrows has occurred as tree mallow coverage has declined, indicating a successful outcome for the Scottish Seabird Centre's SOS Puffin initiative (Hunt and Goodship, 2024).

As well as an increase in the numbers of breeding puffins on Craitleith, one of the other aims of SOS Puffin was to restore the native coastal vegetation to the island (Craigleith Management Group, 2023). In general, this has been achieved, with the island now dominated by the perennial grasses Yorkshire fog (*Holcus lanatus*) and red fescue (*Festuca rubra*), perennial herbs such as sea campion (*Silene unifolia*), hemp nettle (*Galeopsis tetrahit*), docks (*Rumex* spp.), sea mayweed (*Tripleurospermum maritimum*), members of the goosefoot family such as fat hen (*Chenopodium album* agg.) and annual herbs such as chickweed (*Stellaria media*; Craigleith Management Group, 2023). Perennial common stinging nettles (*Urtica dioica*; and to a lesser extent small nettle (*Urtica urens*)) are part of the mix that form the coastal plant community on Craigleith (Craigleith Management Group, 2023; Anderson, 2024).In response to the fertile soil of the island (due to the accumulated droppings of many thousands of seabirds), common nettle has flourished, with large patches now established, which are a recurring annual feature. Extensive stands are prevalent (Fig. 1), and percentage cover of common and small nettle on the island reached a high of 34% in 2015 (Anderson, 2024). Cover dropped to a low of 1% in 2016 and has been on a generally increasing trend since then (c.f. 2.2% in 2017, 2,7% in 2018, 7.8% in 2019, 5.1% in 2020, 5% in 2021 and 6.2% in 2024 (Anderson, 2024).

Figure 1 One of the extensive dense stands of common nettle (Urtica dioica) on Craigleith (image (c) Helen Anderson 2024)

It is thought that puffins avoid nesting in dense stands of nettle, while other ground nesting species such as eiders (*Somateria mollissima*) will nest at the edge or within sparse areas of nettle but generally avoid dense patches (Coulson, 2010). The stinging action of nettles can temporarily paralyse young birds (as observed on the Isle of May and noted in Hunt J, 2024), thereby increasing their chances of being predated on by gulls. A study in 2018 on Craigleith found that some greater black-backed gulls (*Larus marinus*) used the edges of stands of taller vegetation (such as nettles) to hide in and predate puffins by ambushing them (Nugent, 2019) and puffins are known to avoid areas where herring gulls (*Larus argentatus*) are present (Rice, 1985). Hence, although common nettle certainly is part of the coastal vegetation community of the island, control of some dense stands could aid expansion of areas in which puffins could burrow. It may also assist in reducing predation on young birds (pufflings and eider chicks) via fewer occasions of temporary paralysis, thereby helping the puffin population on Craigleith to continue to increase.

Some ad-hoc control methods for common nettle were employed in 2015, 2016 and 2021 but regrowth of nettles, tree mallow and other vegetation was not scientifically monitored (Hunt J, 2024). This study has trialled the use of three different treatments (two manual and one chemical) to control the growth of stinging nettle on Craigleith using a fully standardized scientific methodology. The aim was to determine which treatment provided sufficient control of the growth of common stinging, whilst also limiting the growth of tree mallow and maintaining a coverage of natural coastal vegetation. Treatments applied were a herbicide (Grazon Pro) that targets broadleaf species with little/no effect on graminoids (Corteva, 2025)). There was agreement to trial non-chemical methods, so cutting nettles at the base of the plant (as close to the ground as possible) and pulling nettles up from the ground (with as much roots attached as possible) were also trialled.

Methods

The Site

Craigleith is a small (7.4 ha) island 1000 m north of North Berwick. Along with Fidra and the Lamb, it forms part of the Forth Islands SSSI and is also an SPA (Craigleith Management Group, 2023). It is home to breeding populations of many seabirds, including cormorants (*Phalacrocaorax carbo*), herring (*Larus argentatus*) and greater black-backed (*Larus marinus*) gulls and puffins (Craigleith Management Group, 2023). Tree mallow has been controlled on the island since 2007, with the slopes now dominated by grass swards of red fescue (*Festuca rubra*) and Yorkshire fog (*Holcus lanatus*) (Anderson, 2024). Common nettle (*Urtica dioica*), docken (*Rumex* spp.) and Yorkshire fog occupy large areas of the glen (Anderson, 2024).

Sampling Protocol

On 8th July 2024, plots within common nettle stands were marked out on the island to trial different methods for controlling growth of common nettle. Three treatments were trialled: spraying via knapsack application of a herbicide (Grazon Pro), cutting the plants close to the ground and pulling the plants up from the ground (with as much roots as possible). Three blocks were established, within which were three 2 x 2 m plots and one control plot (where no treatment was applied). Plots were marked out using bamboo canes, with GPS coordinates taken and used along with photographs to aid plot relocation. The herbicide used was Grazon Pro, recommended by SRUC agricultural colleagues due to its ability to target broad-leaved species (such as common nettle), while having no effect on grass species (REF). Herbicide preparation and application was carried out by David Ross (Craigleith Management Group member) during favourable weather conditions, thereby limiting wind drift of the chemical to adjacent vegetation. The cutting and pulling treatments were carried out by three SRUC students.

Plots were visited on 28th August 2024 (51 days after treatments were applied) to determine the short-term response of the vegetation to the treatments. Plots were revisited on 25th June 2025 (352 days post treatment) and 11th August 2025 (399 days post treatment) to determine the longer-term response of the vegetation to the treatments. When resurveying the plots the following variables were measured: percentage cover of stinging nettle, percentage cover of bare ground and number of tree mallow seedlings. Mean results are quoted with standard error of the mean given as ±. Statistical methods and results are detailed in the Appendix.

Results

Over a short time (51 days), the only treatment that was effective in reducing the cover of nettle was the herbicide application, where mean nettle coverage was reduced to 3% (±1%), compared with a mean nettle coverage of 99% (±1%) in the control plots (Fig.2). Both cutting (93% ± 2%) and pulling (99% ± 1%) treatments did not significantly reduce mean nettle cover in the short-term (Fig. 2). Over longer time periods (352 and 399 days), in both herbicide and cutting treatment plots nettle coverage was reduced by approximately a third compared to control plots (Fig. 2). However, nettle coverage in the pulling treatment plots (87% ± 3% at 352 days and 78% ± 7% at 399 days) remained similar to that in control plots after 352 (82% ± 3%) and 399 days (75% ± 8%; Fig. 2). Thus, the herbicide treatment was effective in reducing nettle cover within the same year that it was applied and over the next growing season. Cutting nettles led to quick regrowth in the same year, but reduced coverage in the following growing season, while pulling nettles up had no discernible effect on regrowth in the same and the following season.

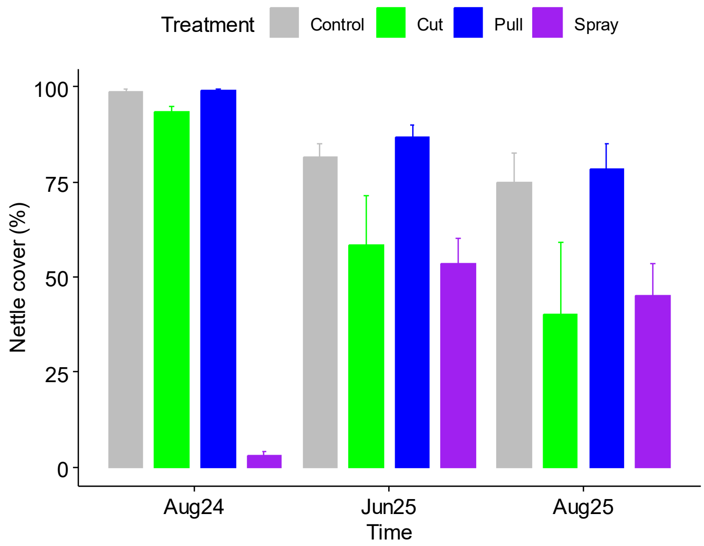

Figure 2 Percentage cover of common stinging nettle on Craigleith after different treatment methods to control growth had been applied. Treatment methods were cutting plants as close to the ground as possible, pulling plants up with as much of the root as possible and spraying the plants with the herbicide Grazon Pro, which targets broad-leaved species (such as common nettle) while having no effect on grass species. Treatments were applied on 8th July 2024 and plots were surveyed on 28th August 2024 (51 days after treatments were applied), 25th June 2025 (352 days post treatment) and 11th August 2025 (399 days post treatment). Grey bars indicate control plots, green bars are plots where nettles were cut, blue bars are plots where nettles were pulled up and purple bars are plots where nettles were sprayed with a herbicide. Results are shown ± standard error of the mean.

51 days after treatments were applied, the mean number of tree mallow seedlings growing in herbicide treated plots (46 ± 15) and cut plots (26 ± 7) was similar to that found in control plots (34 ± 33; Fig. 3). No tree mallow seedlings were found in the pulled treatment plots (Fig. 3).

Tree mallow seedling numbers were significantly lower the following year in all plots, but generally followed the same pattern as observed in June 2025, i.e., similar numbers of tree mallow seedlings were found in herbicide (approximately 8-10), cut (approximately 5-6) and control plots (approximately 8), with no seedlings found in the pull treatment plots (Fig. 3). It therefore appears that tree mallow seeds generally germinated rapidly after nettle control treatments were applied and continued to germinate the following year, albeit in reduced numbers.

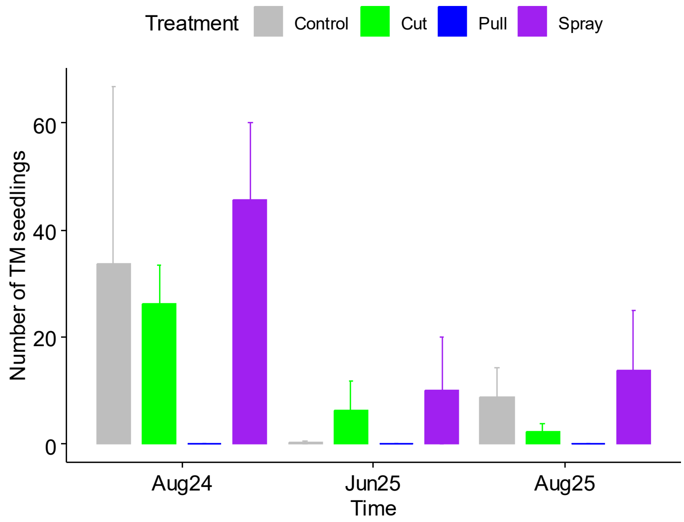

Figure 3 Mean number of tree mallow seedlings in plots on Craigleith where different treatment methods to control growth of common stinging nettle had been applied. Treatment methods were cutting plants as close to the ground as possible, pulling plants up with as much of the root as possible and spraying the plants with the herbicide Grazon Pro, which targets broad-leaved species (such as common nettle) while having no effect on grass species. Treatments were applied on 8th July 2024 and plots were surveyed on 28th August 2024 (51 days after treatments were applied), 25th June 2025 (352 days post treatment) and 11th August 2025 (399 days post treatment). Grey bars indicate control plots, green bars are plots where nettles were cut, blue bars are plots where nettles were pulled up and purple bars are plots where nettles were sprayed with a herbicide. Results are shown ± standard error of the mean.

In the short term (51 days after treatment), no bare ground was found in the control, cutting and pulling plots, but 3% (± 1%) of the ground in the herbicide sprayed plots was bare (Fig. 4). In June the following year, the amount of bare ground in the cutting, herbicide and control plots had increased to approximately 3 – 5% but remained at 0 in the pulled treatment plots (Fig. 4). By August 2025 bare ground had appeared in the pulled plots and was similar to that found in the control and cut treatment plots (approximately 3 – 5%), but the amount of bare ground in the herbicide plots was significantly higher at 12% ± 2% (Fig. 4). Thus, bare ground was more apparent in the herbicide treated plots in both the short and longer term, whereas in the other treatment and control plots it only became evident in the following year.

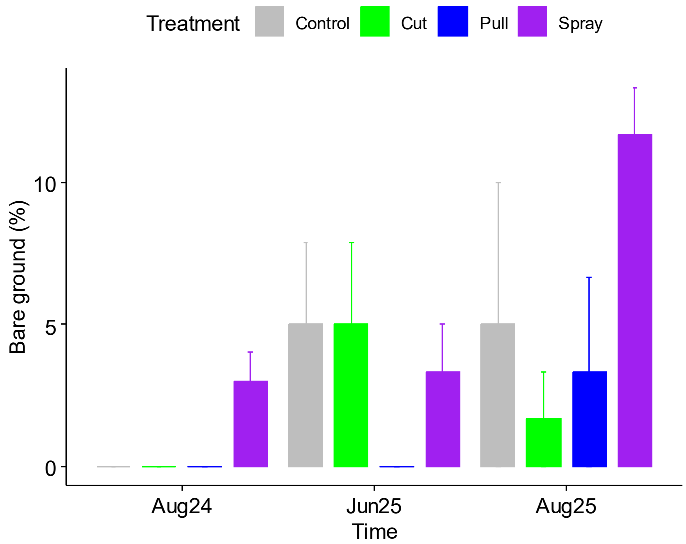

Figure 4 Percentage cover of bare ground in plots on Craigleith where different treatment methods to control growth of stinging common nettle had been applied. Treatment methods were cutting plants as close to the ground as possible, pulling plants up with as much of the root as possible and spraying the plants with the herbicide Grazon Pro, which targets broad-leaved species (such as common nettle) while having no effect on grass species. Treatments were applied on 8th July 2024 and plots were surveyed on 28th August 2024 (51 days after treatments were applied), 25th June 2025 (352 days post treatment) and 11th August 2025 (399 days post treatment). Grey bars indicate control plots, green bars are plots where nettles were cut, blue bars are plots where nettles were pulled up and purple bars are plots where nettles were sprayed with a herbicide. Results are shown ± standard error of the mean.

Discussion

The SOS Puffin initiative, led by the Scottish Seabird Centre, has successfully reduced the extent of mature invasive tree mallow on Craigleith, decreasing its coverage from over 80% to less than 10% within a ten-year period (Anderson, 2024). Given the highly fertile soil on the island (from seabird droppings) and nettle's ability to grow in a range of environments, it is unsurprising that common nettle (which responds well to high soil fertility (Taylor, 2009)) is part of the plant community on Craigleith. While smaller areas of nettle are an important food source for some butterflies (Bryant, Thomas and Bale, 1997) and are to be encouraged, larger stands could hinder expansion of puffin burrows and aid in predation on the young of some bird species. Therefore, it is important to understand how effective different treatment methods are for limiting growth and spread of common nettle on a seabird breeding island that is recovering from domination by an invasive plant species.

Over short timescales, the strong regrowth of nettles plants that had been pulled up and where they had been cut can likely be attributed to their extensive network of rhizomes (underground carbohydrate storage organs) and stolons (horizontal rooting stems). Rhizomes will aid strong regrowth by providing nutrients to the plant, allowing a fast growth response to any damage to the plant and stolons allow the plant to spread across the ground quickly (Martz and Kankaanpää, 2025). Indeed, parts of nettle plants situated outside the manual treatment plots (and hence not subjected to control) were likely able to spread and quickly fill the gap left by nettle plants that had been removed from inside the treatment plots. However, for some of the time between the manual treatments and the resurvey 52 days later, nettle regrowth in these plots would have been low, but that information was not captured (due to no visits to the island to reduce disturbance to breeding birds). The herbicide treatment worked particularly well over the short term as the chemical will have been rapidly absorbed into the plant leaves and stems and transported to the rhizomes. The active ingredient in the herbicide would have killed off the above-ground plant parts as well as a large part of the roots, rhizomes and stolons.

In the year following treatment applications, nettle growth was controlled to an equal extent by both the manual treatment of cutting and by the herbicide treatment. It is hypothesised that both methods reduced the vigour of plants in the longer term sufficiently by curtailing carbohydrate storage in rhizomes over the winter. In fact, applications of some herbicides to perennials are recommended in late summer/early autumn so that storage organs are killed off (C Bowers (Corteva), 2024 pers. comm., 14 November). For the cutting treatment, it is thought that the rapid growth observed in the short-term depleted the rhizomes sufficiently to reduce plant vigour over the longer term. Nettle growth in the plots where plants had been pulled up remained high in the longer term. This may be due to the disturbance of the soil that occurred during treatment, which aided the spread of this shallow-rooted species (Taylor, 2009). Since disturbance of the ground around puffin burrows promotes germination of tree mallow seedlings (Anderson 2025) and nettle seedlings were found in numerous disturbed areas of soil across the island in August 2025 (Fig. 5), it is highly likely that disturbance also enhances nettle seed germination. The fact that rabbit activity in 2025 was very high, with numerous scrapes, droppings and animals observed (pers. obs.), along with numerous nettle and tree mallow seedlings present in the loose, friable soil (Fig. 5) supports this theory. The bare ground present in all but the pulling treatment plots will also have helped promote nettle and tree mallow seedling germination and growth due to the lack of competition by other plants.

Figure 5 Newly disturbed soil on Craigleith with common nettle and tree mallow seedling germination (image (c) Helen Anderson August 2025)

Ecosystems that have already been disturbed, for instance by an invasive species, tend to be less resilient ((Gaertner, Homes and Richardson, 2012). This is particularly true in island settings and can be seen on Craigleith in the growth and spread of the highly adaptable species common nettle after tree mallow clearance. Given the highly fertile soils on the island and since Craigleith has relatively poor plant species richness ((Craigleith Management Group, 2023), this is to be expected. Recovery of the natural coastal vegetation to the island post tree mallow removal has been a natural process. However, restoring the balance of this natural coastal vegetation, although also mostly left to natural processes, may need targeted assistance. Balancing the growth and spread of common nettle to aid puffin burrow expansion and puffling survival, while maintaining sufficient nettle stands to allow benefits to other wildlife can be achieved on Craigleith. This study has shown that common nettle growth can be controlled by either herbicides or cutting, with reduced growth evident in the same year as treatment as well as the year following treatment. Furthermore, avoiding disturbance of the soil during treatments would help limit growth of nettles and tree mallow from the seedbank.

Conclusion

Limiting the growth and spread of common nettle on Craigleith could aid an increase in numbers of successfully breeding puffins (and eiders) on the island. Two effective treatments are recommended from this study. Manually cutting nettle plants as close to the ground as possible and removing cut flowering stems from the island would be immediately beneficial, as well as reducing the vigour of plants the following year. However, this would have to be a regular activity, particularly if vigorous regrowth in the same year is to be avoided. This would increase the potential of disturbance to breeding birds as cutting would be required during the nesting season. Spraying nettle patches with a herbicide such as Grazon Pro would reduce nettle growth in both the current and following year, with significantly less disturbance to breeding birds on the island. Cutting nettle patches could be a volunteer activity, combined with existing visits to control tree mallow. Herbicide application is a significantly less environmentally friendly approach and requires trained, authorised personnel and application under strict conditions. Careful thought and discussion between stakeholders will be required to agree on which treatments should be adopted and when.

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Appendix

Statistical Analysis

To determine the effects of the different treatments at different time periods on the coverage of nettles on Craigleith we used a linear mixed model (lmm) with treatment and time as the fixed effects and plot as the random effect. To determine if the cover of bare ground had changed in the treatment plots during the trial, a lmm using the same fixed and random effects was used. Finally, to determine if the number of tree mallow seedlings changed in the treatment plots during the trial, a generalized linear mixed model with a negative binomial distribution was used; fixed and random factors were the same as the other models. Tukey post-hoc tests were applied to determine significant differences between treatments at each time period. Mean results are quoted with standard error of the mean given as ±. Statistical analysis was carried out in RStudio (2024).

Statistical Results

Table 1 Analysis of Deviance Table from linear mixed model with nettle cover as the response variable, treatment and time as the fixed effects and plot as the random effect.

Variable	**Chi squared**	**Degrees of Freedom**	**p-value**
Treatment	87	3	<0.001
Time	7	2	0.04
Treatment*Time	47	6	<0.01

Table 2 Analysis of Deviance Table from generalized linear mixed model with a negative binomial distribution. Tree mallow seedling numbers as the response variable, treatment and time as the fixed effects and plot as the random effect.

Variable	**Chi squared**	**Degrees of Freedom**	**p-value**
Treatment	13	3	0.004
Time	10	2	0.006
Treatment*Time	5	6	0.5

Table 3 Analysis of Deviance Table from linear mixed model with bare ground cover as the response variable, treatment and time as the fixed effects and plot as the random effect.

Variable	**Chi squared**	**Degrees of Freedom**	**p-value**
Treatment	8	3	0.05
Time	8	2	0.02
Treatment*Time	8	6	0.2