Alternative treatments for giant hogweed

BSS-funded student project Robert Engstrom¹, Charlotte Neary², Jay Mackinnon¹ & Rob Briers¹

¹School of Applied Sciences, Edinburgh Napier University (j.mackinnon@napier.ac.uk); ²The Water of Leith Conservation Trust (admin@waterofleith.org.uk)



WATER

of LEITH

Conservation Trust

INTRODUCTION

Giant hogweed (GH) is strongly competitive and can reduce species richness and diversity of other plants (Pysek and Pysek, 1995). As the plant is a monocarpic forb, invaded riverbanks turn bare overwinter which can lead to soil erosion into the watercourse (CABI, 2017).

Glyphosate is an effective and cheap translocated herbicide (Nielsen et al., 2005) but can have adverse effects on non-target organisms (Rodrigues et al, 2017; van Bruggen et al, 2018). The European Commission were recently petitioned to ban it due to concern over impacts on human and ecosystem health (European Citizens Initiative, 2017). The City of Edinburgh Council uses an estimated 4700 litres of glyphosate-based herbicide (GBH) Heracleum



AIMS

- To investigate the efficacy and practicality of manual control methods and a reduced GBH concentration for sustainable giant hogweed management along a watercourse.
- To investigate the immediate and long term impacts of the different management methods on associated riparian plant communities.
- To map range and abundance of giant hogweed in order to pinpoint sources

annually and are looking into alternatives to significantly limit their dependency (Edinburgh Council, 2016). mantegazzianum Severing the tap root 10cm below ground and uprooting kills GH (Nielsen et al., 2005).

of seed input and areas running a high risk of invasion, to aid prevention of further spread and prioritisation of target areas for control.

METHODS









Around 1000 plants surveyed along a 3mile river stretch in April 2017 and 2018. Locations with 6 plants or more within 4x4m quadrats used as test sites; 28 quadrats treated in 2017 and 47 in 2018.



Sites revisited ~23d later and regrowth recorded in Jun/Jul





number of plants

quadrat percentage cover

Heatmap of giant hogweed range and density along the Water of Leith in 2017 (top) and 2018 (bottom). Warmer colour indicates higher density.

Treatment	Avg. time per quadrat (min)	Time relative to standard
root-cutting	12 ± 11	8
reduced GBH	2 ± 1	1
standard GBH	1.5 ± 1.5	1

Workload adjustments did not alter time taken relative to standard.

All treatments were more effective at reducing number and cover of GH plants in the second year but this did not influence the relative effectiveness of the three treatments.

□ We found no significant difference between treatments either in the first year, second year or both years combined.



Distribution and central tendency of regrowth for the different variables and treatments. '% regrowth' calculated as number (or cover or height) of plants after treatment as a percentage of before. Differences investigated using ANOVA. Outliers above graphs accompanied by their specific regrowth percentages.

CONCLUSIONS

- Although standard GBH (control) seemed to reduce plant regrowth most in terms of abundance, it was not significantly better than a reduced concentration of GBH or root cutting.
- Root cutting is more labour intensive but comparable control of GH can be achieved, at least in the short term.

<u>FUTURE WORK:</u> https://tinyurl.com/GH-sustainable-mgmt

- Analyse presence and cover of other plant species before and after treatments to explore impacts on other vegetation
- Continued treatment and monitoring of permanently-marked quadrats in successive years and perhaps expand study to other catchments.
- Test effectiveness of above-ground cutting and stem injection in comparison to existing treatments.
- Conduct a survey of catchment managers and conservation workers to explore acceptability of alternative treatments.
- Consider an integrated management approach, applying different treatments depending on growth and weather conditions, including preventative measures such as early treatment.

REFERENCES

- CABI (2017) 'Heracleum mantegazzianum (giant hogweed) invasive species datasheet'. http://www.cabi.org/isc/datasheet/26911 EC (2018) 'Renewal of approval: glyphosate'. https://ec.europa.eu/food/plant/pesticides/glyphosate_en
- Edinburgh Council (2016) Alternatives to the use of glyphosate-based herbicide to control weeds on streets and green spaces. Transport and Environment Committee.
- European Citizens Initiative (2017) 'Ban glyphosate and protect people and the environment from toxic pesticides'. Commission registration number: ECI(2017)000002. 25/01/2017.
- Nielsen, C., Ravn, H.P., Nentwig, W. & Wade M. (eds.) (2005) 'The Giant Hogweed Best Practice Manual. Guidelines for the management and control of an invasive weed in Europe'. Forest & Landscape Denmark: Hoersholm.
- Pysek, P. & Pysek, A. (1995) 'Invasion by Heracleum mantegazzianum in different habitats in the Czech Republic'. Journal of Vegetation Science 6: 711-718.
- Rodrigues, L.D., de Oliveira, R., Abe, F.R., Brito, L.B., Moura, D.S., Valadares, M.C., Grisolia, C.K., de Oliveira, D.P. & de Oliveira G.A.R. (2017) 'Ecotoxicological assessment of glyphosate-based herbicides: effects on different organisms'. Environmental Toxicology and Chemistry. 36(7): 1755-1763.
- van Bruggen, A.H.C., He, M.M., Shin, K., Mai, V., Jeong, K.C., Finckh, M.R. & Morris, J.G. (2018) 'Environmental and health effects of the herbicide glyphosate'. Science of the Total Environment 616: 255-268.

THANK-YOU

Botanical Society of Scotland for Student Project Grant. ENU students Tom Twigg, Euan Fraser, Bailey Brown, Anna Grozelier, Yamina Monteiro Zwahlen, Elektra Athinaiou, Shyloh Solomon; WOL volunteers Ian Combe, Andrew Dickson and many more for assistance in the field. Violette Fivet for her patience and administrative support.

