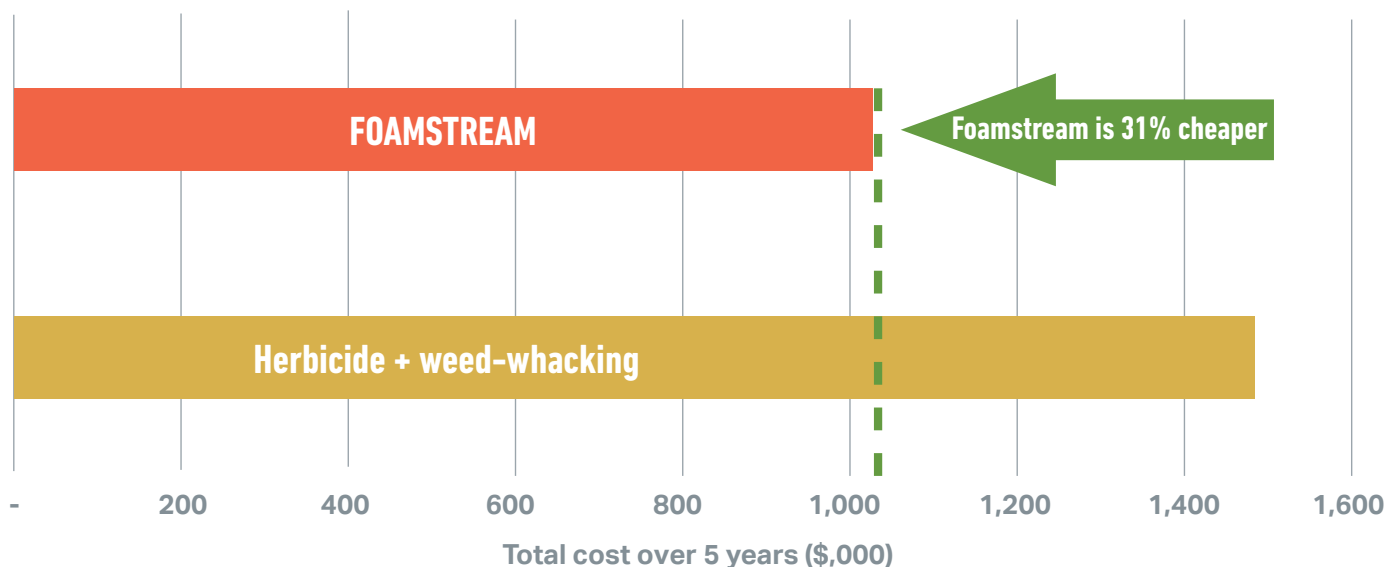




FOAMSTREAM VS TRADITIONAL VEGETATION CONTROL METHODS

The increasing debate around the use of herbicide and its safety has given rise to the relevance and need for alternative technologies such as Foamstream. Change, in a sector which traditionally has had low levels of innovation for decades, has been met with concerns around efficacy, versatility, ease of use, and cost.

Foamstream Vs Traditional Weed Control, \$,000



This whitepaper addresses the issues surrounding the market for alternative technologies and aims to evaluate the misconceptions that have been associated with the alternative sector. It will provide a balanced review of the strengths, benefits and costs of Foamstream, and other traditional methods; specifically, herbicide and weed-whacking. It will outline through use of data how Foamstream's cost effectiveness and efficacy versus other traditional alternatives is unparalleled.

The two data sets that are referenced in this document are provided by accurate sources and both provide actual costs incurred over a year-long period associated with treating similar areas of vegetation – 100 hectares comprised of play areas, fence lines, obstacles, housing estates, verges and roundabouts. One data set, provided by Rigby Taylor, is based on treatment of a UK city council using a combined approach of herbicide and manual weed practices including weed-whacking to control weed growth within Doncaster, the reference city. The second data set is provided by a London Borough, currently using five Foamstream M1200 machines to treat the 100 hectare area.

N.B. Both data sets outline the actual costs, include any additional methods used, costs of consumables associated with using Foamstream and outline the actual number of treatment cycles performed within the year.

Traditional Methods

Foamstream

N.B. These costings have been converted from UK measurements to US measurements using the following criteria:

1 GBP = 1.31 USD 1 L = 0.26 gal 1 m² = 10.76 sq.ft.

Weed-whacking		
Application labour cost per hour	\$/hr	13.10
Weed-whacking machine cost per sq.ft. (hire/servicing)	\$/sq.ft.	0.001
Labour output of sq.ft. per hour	sq.ft./hr	3552.08
Total number of hours to weed-whack one hectare		30.30
Cost per hectare	\$/ha.	396.97
Cost per sq.ft.	\$/sq.ft.	0.004
Total number of hectares cut	ha.	100
Operation cost per 100 hectares	\$	39,696.97
Frequency of weed-whacking applications/annum		6
Total annual weed-whacking cost	\$	238,181.82

CDA Herbicide Cost		
Cost of CDA herbicide [inc. lance hire] per gal.	\$/gal.	38.83
Treatment application rate	gal./ha.	3.96
Treatment cost per ha.	\$/ha.	153.85
Treatment cost per sq.ft.	\$/sq.ft.	0.001
Number of hectares treated		100
Frequency of herbicide per annum		2
Total CDA chemical cost per annum	\$	30,771.90

Labour		
Application labour cost per hour	\$	13.1
Labour application work rate per hour	sq.ft./hr	10764
Total number of hours to treat one hectare		10
Total number of treated hectares		100
Frequency of applications per annum		2
Labour application cost per annum	\$	26,200

Cost summary		
Weed-whacking Cost	\$	238,181.79
Combined CDA Herbicide & Labour Cost	\$	56,971.90
Total Cost per 100 hectares/annum	\$	295,153.48

Foamstream OPEX		
Diesel consumption per hour	gal./hr	2.11
Cost of Diesel	\$/gal.	1.57
Foamstream consumption per hour	gal./hr	0.63
Cost of Foamstream	\$/gal.	1.62
Cost of labour	\$/hr	13.1
Labour output per hour	sq.ft./hr	8072.92
Total cost of treatment per hour	\$/hr	40.45
Total cost of treatment per sq.ft.	\$/sq.ft.	0.005

Treatment area single treatment		
Treatment cost per sq.ft.	\$/sq.ft.	0.005
Treatment cost per hectare	\$/ha.	539.37
Cost per 100 hectares	\$	53,937.07
Treatment cycles		3
Cost of treatment per season	\$	161,811.20

Capital cost requirement (Finance)		
Cost of Foamstream M1200	\$	40,610
Hectares covered per unit per season		20
Units needed for 100 hectares		5
Financed cost per season per machine	\$	8,122
Total CAPEX per season	\$	40,610

Capital cost - full purchase		
Cost of Foamstream M1200	\$	40,610
Hectares covered per unit per season		20
Units needed for 100 hectares	\$	5
Year 1 capital requirement	\$	203,050

Summary - Finance		
OPEX per season for 100 ha	\$	161,811.20
CAPEX financed	\$	40,610
Total cost to treat 100 hectares	\$	202,421.20

Year	1 (\$)	2 (\$)	3 (\$)	4 (\$)	5 (\$)	Total (\$)
Herbicide + Weed-whacking	295,153	295,153	295,153	295,153	295,153	1,475,767
Foamstream	202,421	202,421	202,421	202,421	202,421	1,012,106
Foamstream with full purchase	364,861	161,811	161,811	161,811	161,811	1,012,106

To ensure this was a fair comparison, it was important to ensure these data sets compared like-for-like in the following ways:

- The total treatment area was the same – the area covered per year is 100 hectares
- Both data sets were based on real data and actual performance, not projected outcomes, and included all methods used to control weeds for the year
- Both data sets were gathered from the UK to ensure similar climate and weed types

The data does however exclude the following missing variables:

- Additional costs incurred with pesticide spraying licensing
- Additional costs incurred on protective sprayer clothing for use with herbicides – often replaced daily.
- Cheap, fast-moving parts that require replacement on machinery (applicable to weed-whacking and Foamstream machines)

CONSIDERATIONS OF THE DATA

Weed-whacking

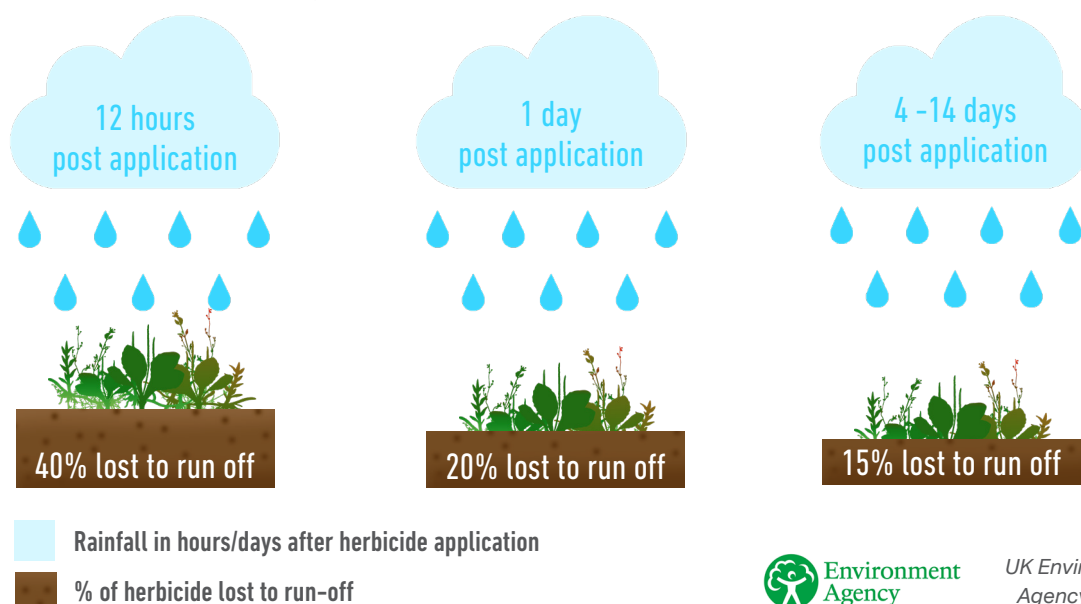
Based on the data presented it would be unrealistic to assume that in order to sufficiently control unwanted vegetation across 100 hectares, this could be achieved using six weed-whacking cycles alone. For the purpose of this paper, it is important to consider that the weed-whacking cycles are used in conjunction with the herbicide treatment – and that it is unlikely that the number of cycles used, if used solo, would be effective at controlling the vegetation. It is commonly known that when using weed-whackers as a sole form of weed control, sites need to be treated at least once a month due to the speed of regrowth caused as a result of disturbing the seed bed, spreading seeds and spores. This leads to total weed coverage increasing year on year, increasing time and cost to treat the same areas. Considering this, if using weed-whacking alone to treat 100 hectares, the cost per year would be circa \$459k Foamstream however sterilises un-germinated seeds. This reduces total future weed regrowth and decreases the level of work required year on year.

Herbicide

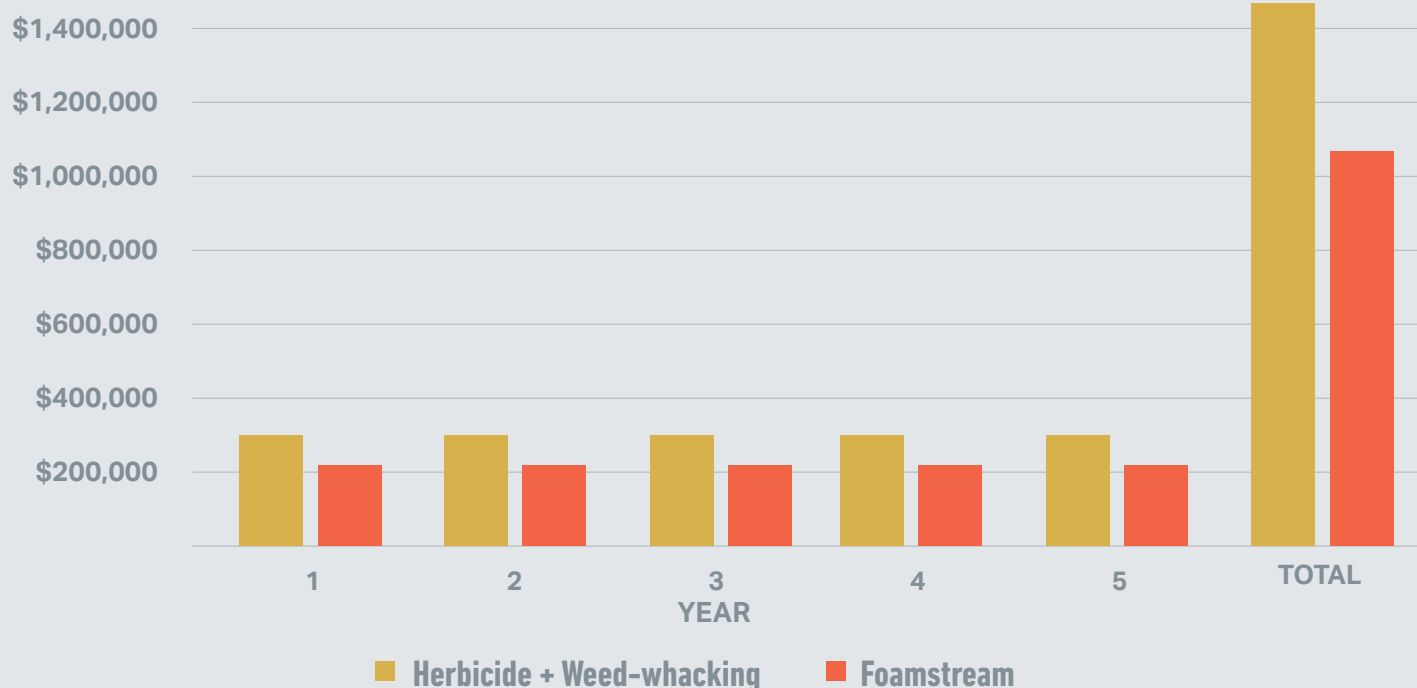
Based on the data presented, it is equally unlikely that the two required treatments using herbicide as shown in the data would fully control the unwanted vegetation in the area mentioned. For complete weed control of many of the surfaces in the identified areas, herbicide alone would not be a sufficient method due to limitations faced around treating around people and animals. The most common number of herbicide applications required each year is often three and not two. From our partner network it has been shown that in many instances, it can be four or five applications. With unpredictable weather patterns in the UK and high levels of precipitation, if rain falls immediately post herbicide application, the treatment will not take effect on the vegetation and the herbicide will be washed away. Considering these factors, the cost per year for using herbicide is more realistically between \$118k & \$157k.

HOW MUCH GLYPHOSATE IS LOST TO THE ENVIRONMENT WHEN IT RAINS?

As the infographic shows – the effect of the herbicide on the plant is reduced when rainfall takes place, meaning the application needs to be reapplied to ensure its effectivity.



Foamstream Vs Traditional Weed Control



The graph above clearly shows that when considering total annual spend as the most important variable, Foamstream is the most cost-effective solution in comparison to traditional methods.

If looking at costings in isolation, such as cost per square metre or the sole cost of using herbicide, it could lead to the assumption that Foamstream is costlier than traditional practices. Without the data presented it could be expected that when using existing labour and adding the minimal capital cost associated with weed-whacking equipment it would be the cheapest form of vegetation control however as shown from the data, it is evident that this is not the case. It is always important to consider the longer-term costs and include all variables to gain an objective view of the varying methods.

Aside from financials, there are other factors that need to be considered when evaluating methods of weed control which can impact the feasibility of using each method.

EFFICACY

Herbicide

- Provides good perennial weed control. It is effective, however is heavily reliant on weather conditions being suitable on and after application to ensure good efficacy. Increasingly there are cases of weeds becoming resistant to it as a herbicide.

Weed-whacking

- Ineffective as a long-term option. This is due to disturbing the seedbed and spreading seeds and spores – increasing total weed coverage and causing rapid weed regrowth over a wider area.

Foamstream

- Fast, instantly visible results. As heat transfer goes from leaf to root, and the heat is held on the plant for an extended period of time by the insulating foam blanket, this ensures a highly effective plant kill. Variables such as size of weed, speed of treatment and time of year need to be considered.

"In our first season using the Weedingtech Foamstream M1200 we have experienced similar kill rates and cycle times as glyphosate and other non-selective herbicide treatments."

Ian Boyd | General Supervisor | City of Toronto

3-MONTH TRIAL COMPARING FOAMSTREAM, HERBICIDE AND DOING NOTHING

Below illustrates the effects of Foamstream vs herbicide vs doing nothing in a trial carried out by the French Chamber of Agriculture over a three month period – tracking kill rate and rate of regrowth.

FIGURE 1

FOAMSTREAM



CHEMICAL HERBICIDE



DOING NOTHING



As Figure 1 shows – Foamstream's results are instantly visible on the day of treatment unlike those of herbicide. By 30th April – herbicide and Foamstream have similar results – herbicide weeds are almost dead but Foamstream showing the weeds previously treated and killed are still not re-growing. By 15th May – it shows small signs of regrowth with areas still dead – this is when the next application would be suitable for treating with Foamstream and why the importance of understanding treatment cycles is critical when it comes to vegetation management. If looking to move away from herbicides, this diagram clearly illustrates that doing nothing is not a viable option for management of weed growth.

SAFETY

Herbicide

- In public spaces, such as those used in this comparison, people are highly exposed to herbicides and their residue. Irrespective of whether herbicides are deemed as safe or not, there is an increasing trend of residents concerned with herbicide exposure. This has led to a rise in the number of municipalities moving away from use of traditional herbicides, especially in public spaces, in response to their resident's concerns.

Weed-whacking

- A low safety risk outside of the risk posed to the operator and passers-by due to flying debris and stones during operation.

Foamstream

- Safe for unrestricted use around people, animals and waterways. It is approved for organic use and organic food production. Made from natural plant oils and sugars, it's biodegradable and does not bioaccumulate.

"We purchased a Foamstream M1200 in the spring of 2018. We used it through the season and found that the weed kill results we got were better than when using green, class 11 pesticides and its use doesn't require advanced sign posting like a pesticide. From field observations, the Foamstream treated weeds did not regrow as quickly as the pesticide treated ones and new seeds did not tend to germinate after application. This unit is easy to use and increased our efficiency in weed management."

Rob Gagen | Supervisor, Parks Operations | Community Services Department | City of Pickering

EASE OF USE

Herbicide

- Easy to spray but not easy to formulate due to the number of variables that have to be considered. On-going sprayer licence and training required. Protective clothing needed.

Weed-whacking

- Easy and simple to use, although vibration and white finger risk.

Foamstream

- Machines are easy to use, simple to start up and have touch screen navigation.

OTHER RESIDUAL BENEFITS OF FOAMSTREAM

- Foamstream is an all weather, all surface, all year-round solution – costs saved that are often attributed to down time when using traditional methods.
- Instantaneous results are achieved when using Foamstream. Results are visible in 24 hours compared with a four week time delay to see the effect of using herbicides.
- Multi-functionality of system as it can be used for weed control and outdoor cleaning, including power washing, gum removal and sanitisation. This allows the capital costs of Foamstream units to be split across different departments and allows users to gain the most from their machines. This isn't considered in the data.

- Foamstream is a great positive public engagement tool versus the use of herbicide, which is poorly received especially in residential areas.

"I was struck by the speed and efficiency of Foamstream. What is particularly pleasant is how clean the streets look and actually feel to be in. During treatment, the streets are cleaned as well as weeded.

My impression is that there is a freshening quality to Foamstream treatment.

We could say this is a holistic approach to community health".

Victoria Conran | Resident | Bonnington Square | London

In summary, it is clear there are benefits to all methods of weed control reviewed in this paper. However, when looking at the whole picture and deciding upon the total cost of ownership in conjunction with the year-round use, multi-purpose functionality and health and safety considerations, Foamstream is clearly the solution to choose to provide forward looking organisations with an alternative method of outdoor space management.