

April 2019

Spartina Survey and Control Project 2018/19

Summary Report

CONTENTS

Contents	2
Introduction	3
1.1 Spartina in Canterbury	3
1.2 Spartina Project Funding Application	4
1.3 Project Aims and Deliverables	4
1.4 Project Management Group	5
Project Methodology	6
2.1 Project Management	6
2.2 Community Consultation and Notification	6
2.3 Control and Search Methodology	7
2.4 Monitoring	10
Project Results	11
3.1 Consultation and Notification	11
3.2 Search and Control Results	13
3.3 Results of the Dog Search	13
3.4 Environmental Monitoring Results	14
3.5 Data Recording and Management	144
3.6 Financial Expenditure	144
Future Management Programme	166
4.1 Long Term Management Goal for Spartina	166
4.2 Spartina management in Canterbury beyond 2018-19	Error! Bookmark not defined. 6
Summary	188
References:	19
Appendix 1: Maps	20
Appendix 2: Environmental Protection Authority Permission for the use of substances	277
Appendix 3: Project Milestones and Financial Expenditure	322
Appendix 4: Contractor Reports	35

1

INTRODUCTION

This report is a summary of the work undertaken in 2018/19 for the Spartina Survey and Control Project started in 2017. The project was funded with a grant received from the Department of Conservation in 2017/18 and coordinated by Environment Canterbury in partnership with Christchurch City Council and the Department of Conservation.

1.1 Spartina in Canterbury

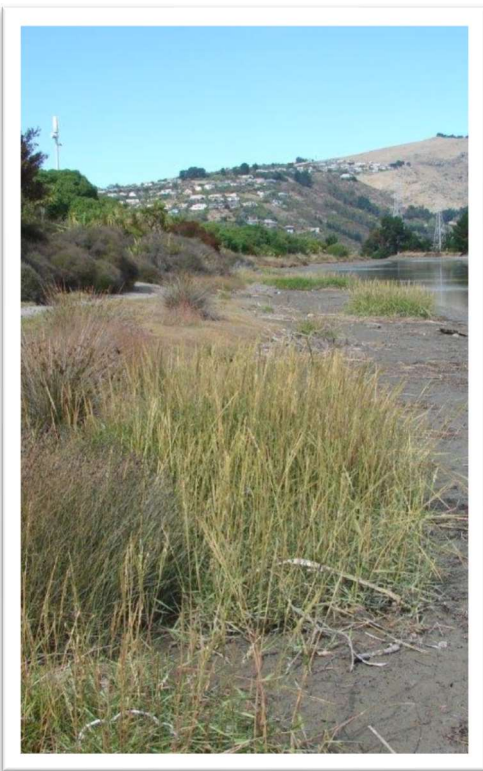


Fig 1: *Spartina* on the banks of the Heathcote River, Christchurch, December 2017

Spartina (*Spartina anglica*, *S. alterniflora*) is an introduced maritime grass which colonises bare intertidal zones, forming dense swards and trapping sediment (Fig 1). If left to spread, spartina can reduce large estuaries and shallow harbours to thin drains surrounded by rough pasture, resulting in an immense loss of biodiversity. *Spartina* is widespread in the South Island of New Zealand, but at very low densities in almost all the areas where control operations are being carried out (Brown and Raal, 2013).

Spartina is known to occur at low levels in the greater Christchurch area in three distinct locations: Lyttelton Harbour, the Avon Heathcote Estuary and Brooklands Lagoon. There are no other known infestations in the Canterbury region.

Monitoring and control of spartina populations has been ongoing for many years, with a different regulatory agency responsible for spartina control in each location, as specified in Table 1.1. This fragmented

approach to spartina control led to a lack of clarity as to the exact extent of spartina infestations in Christchurch.

Location	Agency Responsible
Lyttleton Harbour	Department of Conservation
Avon Heathcote Estuary	Christchurch City Council
Brooklands Lagoon	Environment Canterbury

Table 1.1 Agencies responsible for spartina control in Christchurch

1.2 Spartina Project Funding

In 2017, the Department of Conservation made funding grants available to support regional councils in community-based weed control initiatives that target outcomes for the Dirty Dozen weed species. Environment Canterbury applied for, and was granted, \$50,000 to undertake a multi-agency partnership project to survey and control spartina sites in the 2017/18 year. \$6,000 remained from this grant and was carried over to 2018/19 to help fund the final project milestone.

The final milestone (5) of this project required the project management group to get a future management programme underway. The project group decided that the budget allocated to this milestone (\$6000) would be best used to support Christchurch City Council in a monitoring and control programme of sites at the Avon Heathcote Estuary in 2018-19, to ensure progress made at these sites was not lost.

Environment Canterbury had a \$5000 budget for spartina, which was used to provide coordination between the agencies for follow up search and control work. The Department of Conservation had 16 labour hours allocated for the monitoring and control of spartina around Lyttleton Harbour, and to assist Christchurch City Council with search in McCormacks Bay. The Christchurch City Council provided 12 hours of labour for search down the Heathcote river and some additional time with coordinating follow up control.

1.3 Project Aims and Deliverables

The aims for this project during 2018/19 were as follows:

1. Undertake follow up control at all sites visited during the 2017/18 season.

2. Search between known infestations and in areas surrounding previously identified infestations.
3. Develop an accurate costing for an ongoing search and control programme to accompany the future management plan agreed upon by the contributing agencies.

The deliverables for this project during 2018/19 were as follows:

1. All identified spartina plants are controlled.
2. Up to date information on the number and location of spartina plants made available to all agencies.
3. Search and control costing for future management considerations provided to contributing agencies.

1.4 Project Management Group:

The project management group was comprised of representatives from each agency who have been involved in spartina control work in the past. Representatives on the project management group were as follows:

Environment Canterbury:	Laurence Smith (Project Manager)
	Rich Langley (Project Coordinator)
	Greg Stanley
Department of Conservation:	Ian Hankin
	Tom Hitchon
	Keith Briden
Christchurch City Council:	Kristina MacDonald
	Pieter Borchers

2

PROJECT METHODOLOGY

2.1 Project Management

This project was managed and coordinated in 2018/19 by Environment Canterbury with advice and guidance provided by the project management group via an initial meeting and ongoing email correspondence. All administration for the project was undertaken by the Project Coordinator at Environment Canterbury.

Final project milestone 5 was developed by the project management group and agreed on by the Department of Conservation prior to project commencement. A copy of the project milestones is available in Appendix 3.

2.2 Community Consultation and Notification

A community consultation and publicity programme were developed early in 2017 to make local groups aware of the purpose and scope of the project. Brochures and posters were created and distributed to local libraries and groups, and a short video clip was created for use on participating agencies social media accounts.

No further consultation or publicity was considered necessary for the 2018/19 control season as community groups were already provided the appropriate information prior to the commencement of the project in 2017. In addition, all concerns raised during that initial consultation were documented as being fully satisfied.

As per the EPA permission requirements, the following groups were notified at least 5 days prior to herbicide application at both Brooklands Lagoon and the Avon Heathcote Estuary:

- Te Ngāi Tūāhuriri Rūnanga
- Fish and Game North Canterbury
- South Island Eel Association

- Department of Conservation

These groups were again notified prior to the second round of follow-up control undertaken this season in March/April. Example copies of the notification letters are available in Appendix 2.

Schools and education providers within 250m of any of the spray sites were notified of the dates and areas for spraying.

Signage was erected prior to spraying at all sites within 100m of a public access area and remained in place for 10 days following application. The signs were also a requirement of the EPA permission for using haloxyfop and advised that a herbicide had been applied to water and to avoid swimming, gathering food or drinking from the water.

A public notification was issued in The Press ahead of the second round of spraying, and information was published on Environment Canterbury's website to advise of the spray operation.

2.3 Control and Search Methodology

Search Methodology

Ground Search

Department of Conservation staff searched the Lyttleton Harbour foreshore focussing on prone areas and in areas previously known to have had spartina. They then visited McCormacks Bay and once again searched through the estuary area paying attention to inter-tidal areas and making note of any findings of live plants or regrowth. These were passed on to the project management group.

The Christchurch City Council staff searched the inter-tidal area of the Heathcote River bank where a significant number of patches were controlled during the 2017/18 season. Sightings were marked using GPS and the coordinates were passed on to the project coordinator.

While visiting and undertaking ground control at previously identified spartina sites, the contractors (Keystone Ecology) undertook search in the immediate surrounds and between these sites.

Dog Search

John Taylor was contracted to undertake search with a sniffer dog in the Avon Heathcote Estuary and Brooklands Lagoon. Due to the smaller monetary value of the contract to search, no tender process was required.

John regularly undertakes search operations for spartina for the Department of Conservation (Southland) and has been integral to the success of their spartina control programme. The dog is trained to avoid nesting birds and was therefore considered an appropriate tool for search in the areas identified for this project.

The search was undertaken over two days with the intention of answering four key questions.

1. Is using a dog an effective search method for locating spartina in the specified environment?
2. Will the dog find live plants around areas that have already been sprayed this season? If so, how confident can we be that one round of control in a season is enough to realistically identify and control all plants?
3. Would the dog find any mature plants that were potentially missed during the initial survey in 2017?
4. Is using a dog for search cost effective?

John was asked to undertake search following the methods he would usually use when working with DoC Southland. He searched through all the areas where control had already taken place and in between these sites, paying attention to areas that he believed were vulnerable to the establishment of spartina. The dog covered considerably more ground than John tracking through areas and marking on plants where appropriate.

John was asked to provide electronic copies of survey tracks and GPS coordinates of all plants found. These results were then mapped onto Environment Canterbury's mapping system and can be viewed in Appendix 1.

Control Methodology

Keystone Ecology were contracted to undertake control work at all sites. This involved an initial round of control followed by a second round after the dog search. Due to the smaller monetary value of the contract, no tender process was required.

Control at Brooklands Lagoon and the Avon Heathcote Estuary followed Department of Conservation guidelines on best practice chemical application for control of spartina (Brown and Raal, 2013), which is as follows:

- Apply the herbicide mixture Gallant Ultra at a rate of 29 mL/10 L (0.29% volume/volume) (equivalent to 15 g/L Haloxyfop ester active ingredient) plus Kwickin (canola-based oil penetrant) at 200 mL/10 L (2.0% volume/volume) and ammonium sulphate at 100 g/10 L (1% wt/volume) from a knapsack to the entire spartina plant until it is saturated.

- Plants should be sprayed with clean water to remove salt and mud residues before the herbicide is applied.
- Apply herbicide at least 2 hours before spartina is reached by an incoming tide.
- The seed heads should be removed and bagged to prevent weed spread.

The herbicide haloxyfop is classified as highly toxic to aquatic organisms, and as such permission is needed from the Environmental Protection Authority (EPA) to use haloxyfop in or over water. Environment Canterbury and the Department of Conservation hold permission from the EPA for this work. A copy of Environment Canterbury's permission is available in Appendix 2. The permission stipulates conditions that must be adhered to for consultation, notification and environmental monitoring.

Summary

The search and control programme for the 2018/19 season included work undertaken at the following times:

November	Visual search conducted by Department of Conservation staff around Lyttleton Harbour and MrCormacks Bay. Finds were reported to the project management group.
January-February	Visual search by Christchurch City Council staff on the banks of the Heathcote River. Finds were reported to the project coordinator.
February 5 th – 18 th	First round of spartina control covering the Avon/Heathcote Estuary and Brooklands Lagoon. The control operation involved visiting previously identified sites from the 2017/18 season and the sites identified during search in Nov and Jan. In addition to this, limited search was undertaken by the contractors between these previously identified sites.
March 4 th & 5 th	Search using sniffer dog. Covered large parts of the Avon/Heathcote Estuary and Brooklands Lagoon. Search involved visiting previously controlled areas and new sites with potentially suitable habitat.
March 21 st – April 5 th	Second round of spartina control visiting sites identified during dog search around Avon/Heathcote Estuary.

2.4 Monitoring

Environment Canterbury is subject to a joint monitoring framework for the use of selected herbicides by the EPA. This monitoring framework stipulated that sediment samples were to be taken to monitor herbicide residues in Lyttleton Harbour only. There were no spartina plants controlled at this site in 2018/19, therefore there was no requirement for sediment monitoring.

Visual monitoring of areas where haloxyfop was applied was undertaken to check for any potential by-kill or incidents arising.

3

PROJECT RESULTS

3.1 Consultation and Notification

No response was received from any of the notified parties.

3.2 Search and Control Results:

The spartina patches identified and controlled are noted in table 3.1. For the purpose of this project, a patch is defined as being up to several square metres in size and may consist of several individual plants. More specific details regarding the patches controlled can be viewed in the reports provided by the contractor in Appendix 4. Maps showing search tracks and the locations of patches controlled are available in Appendix 1.

Location	Notes
Lyttleton Harbour	No spartina found.
Brooklands Lagoon	Two plants located and sprayed during first round of control in Feb. No new plants found during dog search.
Avon Heathcote Estuary	All sites controlled during 2017/18 were revisited this year in Feb. Some patches either showed regrowth, or new growth around the edges. No figure was provided by the contractor regarding exactly how many of these patches required follow up control. Following the first round of control. The sniffer dog identified 27 additional patches requiring control or further monitoring. All patches identified during dog search were visited and controlled in a second round of control in Mar/Apr.

Table 3.1: Search and control 2018/19.

Near the conclusion of the control programme Keystone Ecology were asked to undertake additional search through a salt marsh area located south of the Heathcote river bank and adjacent to 250/280 Tunnel Road. Search in this area uncovered a significant spartina find with five large, established patches being identified in a small channel. These plants were not identified during the initial survey in 2017/18. A map showing the location of these plants can be viewed in Appendix 1. Seed heads were removed from these plants at the time.

Due to the presence of water in the channel where these patches are growing, the spartina will be controlled next summer, during a period of low tide variance to allow maximum drainage. It may still be necessary to drain some residual water at the site before the application of herbicide can take place.

Summary

There were no new spartina finds in Lyttleton indicating that control prior to the 2018/19 season was successful.

At Brooklands Lagoon there was one new patch identified. The second site here consisted of a few plants that were previously treated showing signs of regrowth.

There were several new patches identified around the Avon/Heathcote estuary, in particular where growing within juncus or in areas previously covered with debris. Several previously treated patches were either showing regrowth or further growth around the perimeter of dead plants (Fig 2). A couple of patches were found to be seeding and the seed heads were removed prior to spraying.



Figure 2: Fresh spartina growth around previously controlled plants Feb 2019.

3.3 Results of the Dog Search:

The key questions asked in relation to the viability of using a dog to search for spartina were answered as follows.

1. Is using a dog an effective search method at the specified sites?

Yes, the dog was efficient in covering the area required and working in the encountered terrain. There were no reported incidences involving bird disturbance.

2. Will the dog find live plants around areas that have already been sprayed this season? And therefore, how confident can we be that one round of control in a season is enough to realistically identify and control all plants?

The dog was able to identify some plants that were missed during the initial control. It also indicated on some plants that had already been sprayed but were slow to die off. In some cases where these were very green they were sprayed again. The dog certainly proved that there is value in undertaking more than one round of control in a season. This would be more in line with how the Department of Conservation operate when controlling spartina in Southland.

3. Could the dog find any plants that were potentially missed during the initial survey in 2017?

Two relatively mature patches were found that were some distance from those identified in the original survey in 2017. One of these certainly appeared to be at a maturity to indicate it was likely missed during the initial survey. It was the northern-most patch (upstream) controlled in the Avon River during follow up. This indicated that additional dog search in new areas not previously covered in the survey would be worthwhile.

4. Is using a dog for search cost effective?

The dog did not cover the same area as the contracted search during the initial delimiting survey, but certainly covered a significant amount of ground quickly and found a significant number of plants. Based on speed and accuracy, the dog proved to be a cost-effective option compared with staff undertaking visual search.

3.4 Environmental Monitoring Results

Regional Councils operate on a joint monitoring framework for EPA permissions nationally, with one council taking responsibility for monitoring the environmental effects of a particular herbicide each year. Under this framework, Environment Canterbury was not required to undertake any sediment monitoring at the sites where haloxyfop was applied, however site visits and response to community queries was prioritised throughout the project.

Two queries from the community were received regarding the potential effects of the control work being undertaken. Both queries were addressed appropriately by Environment Canterbury staff.

Results from monitoring of sediment samples can be viewed in the project report for 2017/18.

3.5 Data Recording and Management:

Upon completion of the search and control work, all search tracks and waypoints are to be provided to Christchurch City Council and the Department of Conservation for recording in their own internal systems. In addition, all coordinates of spartina plants are to be loaded into Nature Watch to provide public access to the project data, and the Environment Canterbury administered Surveillance Database, to which the Department of Conservation and Christchurch City Council both have access.

3.6 Financial Expenditure

A record of financial expenditure for the whole project dating back to 2017 is available in Appendix 3.

The key objective for the project this year was to meet milestone 5, and in doing so develop an accurate, indicative costing for an ongoing search and control programme to accompany the future management plan agreed on by the contributing agencies. A break down of expenses for the 2018/19 search and control programme can be viewed in table 3.2.

Spartina Project 2018/19 Expenses Breakdown

Activity	Date	Supplier/ Contractor	Deliverables	Expenditure
Project Coordination	Oct 2018 – April 2019	Environment Canterbury	<ul style="list-style-type: none"> • Undertake notification of affected parties • Organise compliance with EPA permissions • Erect & remove required signage • Organise contracts for search and control • Respond to public queries • Write publicity material • Reporting 	\$4,550.00
Spartina Search – Lyttleton & McCormack's Bay	Nov/Dec 2018	Department of Conservation	<ul style="list-style-type: none"> • Locate live spartina plants • Provide location information to project management group 	\$1,300.00
Spartina Search – Heathcote River	Dec 2018- Feb 2019	Christchurch City Council	<ul style="list-style-type: none"> • Locate live spartina plants • Provide location information to the project management group 	\$1,200.00
Spartina Search – Sniffer dog	Mar 2019	John Taylor	<ul style="list-style-type: none"> • Locate live spartina plants • Provide location information to the project coordinator 	\$1,629.64
Spartina Control – Initial control	Feb 2019	Keystone Ecology Ltd	<ul style="list-style-type: none"> • Locate and spray live spartina plants following specified guidelines • Provide a report to the project coordinator 	\$3,573.50
Spartina Control – follow up control	Mar/Apr 2019	Keystone Ecology Ltd	<ul style="list-style-type: none"> • Locate and spray live spartina plants following specified guidelines • Provide a report to the project coordinator 	\$3,333.70
			TOTAL EXPENDITURE	\$15,586.84

Table 3.2 Break down of expenses relating to the spartina search and control operation for 2018/19

4

FUTURE MANAGEMENT PROGRAMME

4.1 Long Term Management Goal for Spartina

All representatives of the project management group agree that the long-term management goal for spartina in Canterbury should be eradication.

Eradication of spartina from the South Island is thought to be possible if certain criteria are met (Brown and Raal, 2013). These criteria have been factored into the development of the suggested future management programme in Canterbury and include the following points:

- All agencies are committed to aiming for eradication
- One agency is responsible for coordinating the programme
- Management in each agency support the eradication objective
- The programme is adequately resourced
- The programme is managed by dedicated staff who understand the difference between control and eradication
- Best practice control methodology is used at all operational sites
- The programme is monitored and data is collated and analysed centrally

4.2 Spartina management in Canterbury beyond 2018-19

The management of spartina, including coordination and control beyond 2018-19 is yet to be decided, however it is recommended that the agencies continue to work together, with one agency taking overall responsibility for coordinating the spartina programme.

The project management group recommends an annual monitoring and control programme at existing known sites, with a more thorough survey of known/prone areas to be undertaken at 5 yearly intervals. Incorporating new surveying methods should be considered in the future long-term management programme. This could include the use of dogs for scent detection to identify

very small or hidden plants, boosting eradication efforts. A worthwhile consideration would be trialling a joint search and control methodology whereby a dog searches and indicates on patches of spartina and these are controlled at the time. This would help improve accuracy and reduce the potential for plants being missed. It is also important to note that this year a second round of control was initiated due to additional finds during dog search. This highlights the need to consider more than one round of control each season.

Each agency will continue to have responsibility for resourcing spartina monitoring and control in their respective areas. Annual monitoring of sites should take place in November/December. Control work should be undertaken at the same time (or as close as possible), to avoid seeds maturing and shedding. Methodology for control work will be decided by each agency based on the number and size of infestations. While spraying with haloxyfop is the preferred approach for an eradication programme, there may be instances where this is not suitable. Any contractor engaged in spartina monitoring or control should have a good level of plant ID skills and experience in controlling aquatic weeds.

Under rules 5.20 & 5.22 of the Canterbury Land and Water Regional Plan, application of a herbicide to water is a Permitted Activity provided the spray operation complies with the requirements of the Hazardous Substances and New Organisms Act 1996, including compliance with EPA approvals and controls. Environment Canterbury and Christchurch City Council are currently working to develop a process whereby the City Council can operate under Environment Canterbury's EPA permission to enable the use of haloxyfop by their own contractors. The Department of Conservation also hold a permission from the EPA for the use of haloxyfop to control spartina.

The new Canterbury Regional Pest Management Plan (2018-2038) lists spartina as a pest species. This enables Biosecurity Officers who are warranted under the Biosecurity Act 1993 to access private land to search for and control spartina. This is an important step towards eradication, enabling search and control in areas where we may previously have been denied access.

In future, data relating to annual monitoring and control will be collated and stored in a location that is accessible to all agencies. In the short term this information will be stored in the Environment Canterbury Surveillance Database. There is ongoing work at present to develop new technologies for pest surveillance and control, including a new Biosecurity database for Environment Canterbury, which may provide improved options for data sharing in the future. The promotion of publicly accessible applications for reporting pest sightings, such as Nature Watch, should also be a component of the future data sharing programme to enable the continued involvement of local communities in the eradication effort.

5

SUMMARY

This project was undertaken to determine the extent of spartina infestations in Canterbury and establish an ongoing control methodology. In 2017/18, a survey of areas known to be infested with spartina turned up 78 patches across three separate locations, covering an area of 159m². All the identified plants were controlled following best practice methods.

In 2018/19 these sites were revisited and a lower incidence of spartina was recorded. Follow up control and some additional search was undertaken as a means of achieving the final milestone for the project and getting the eradication programme underway. A breakdown of costs associated with the programme was provided and can be used for budgeting moving forward.

As well as providing the agencies involved with up to date information on the extent of spartina in Canterbury, this project has allowed us to develop a partnership framework which can be continued in future years through effective coordination and control efforts. This project has been successful in lowering the incidence of spartina as we continue to work towards a long-term management goal of eradicating spartina from Canterbury.

REFERENCES:

Brown, K. and Raal, P. (2013) Is eradication of spartina from the South Island feasible? Department of Conservation.

APPENDIX 1: MAPS

1. Spartina plants found during search undertaken by Christchurch City Council staff in January 2019: Heathcote River



2. Map from 2017/18 showing spartina patches that were revisited during the first round of control in February 2019: Brooklands Lagoon



3. Map from 2017/18 showing spartina patches that were revisited during first round of control in February 2019: Avon Heathcote Estuary



4. Search tracks and waypoints from scent detection dog 3 weeks after initial control: Avon Heathcote Estuary



5. Spartina sites revisited during second round of control in March/April 2019: Avon Heathcote Estuary



6. Location of the channel containing several large spartina plants, found during search of the salt marsh area located behind the Heathcote River bank



APPENDIX 2: ENVIRONMENTAL PROTECTION AUTHORITY PERMISSION FOR THE USE OF SUBSTANCES



Permission for the use of substances

Pursuant to section 95A of the Hazardous Substances and New Organisms Act 1996.

Name of applicant: Environment Canterbury

Postal address: PO Box 3454, Christchurch 8140

Permission register number: STRG-06-06-2018-015

Purpose of application: Use of a number of herbicides for the control of emergent aquatic weeds within the Canterbury Region

Application area: Affected areas in the Canterbury Region

Start date: 15 February 2018


Finish date: 01 April 2023

Approval

I, Stephen Cobb, acting under powers delegated by the Environmental Protection Authority (the Authority), grant permission for the Environment Canterbury ("the permission holder") to use the following substances ("the permitted substances")¹ by application into or onto water in the Canterbury Region.

1. Emulsifiable concentrate containing 100 g/L haloxyfop-R as the methyl ester.
2. Ignite.
3. MSF 600.
4. Unimaz 250SL.
5. Crest 520.
6. Scorp EC.
7. Garlon 360.
8. Water dispersible granule containing 600 g/kg metsulfuron-methyl (Substance A).
9. Water dispersible granule containing 600 g/kg metsulfuron-methyl (Substance B).
10. Water dispersible granule containing 200 g/kg metsulfuron-methyl (Substance A).
11. Water dispersible granule containing 200 g/kg metsulfuron-methyl (Substance B).
12. Soluble concentrate containing 250 g/L imazapyr as the isopropylamine salt.

This permission is valid for five years, and is subject to the conditions set out in Schedule 1 attached hereto. This approval expires at the end of 01 April 2023.


Stephen Cobb
Acting General Manager
Hazardous Substances and New Organisms

15/2/18
Date

¹ including these same substances where they bear different tradenames

Schedule 1 – Permission conditions

Permission Register Number: STRG-06-06-2018-015

In addition to the requirements specified under the Hazardous Substances and New Organisms (HSNO) Act 1996 and its regulations, including the decision of the Authority dated 10 December 2012 on Application APP201365 (Approval codes HSR000373, HSR002431, HSR000063, HSR100098, HSR100054, HSR008025, HSR007690, HSR000232, HSR000242, HSR000238, HSR000245 and HSR000521), the following conditions shall apply to the use of the permitted substances onto and into water:

1. Subject to the conditions listed in this permission, the permitted substances can be used over/in any waterbody in Canterbury Region, when and where required, to treat the following aquatic pest plant species:
 - a. *Alternanthera philoxeroides* (Alligator weed), *Schoeneoplectus californicus* (Californian bulrush), *Nymphoides peltata* (fringed water lily, yellow floating heart), *Zizania latifolia* (Manchurian rice grass), *Nymphoides geminate* (marshwort), *Erythrane guttata* (monkey musk), *Phragmites australis* (Common reed, Cane grass), *P. karka* (Common reed), *Lythrum salicaria* (Purple loosestrife), *Paspalum vaginatum* (Saltwater paspalum), *Sagittaria montevidensis* (Giant arrowhead), *S. platyphylla* (Arrowhead), *S. sagittifolia* (Arrowhead), *Salvinia molesta* (Water fern), *Gyemnocoronis spianthoides* (Senegal tea), *Spartina anglica* (Spartina hybrid, Cordgrass), *S. alterniflora* (Salt Grass, Cordgrass), *Eichornia crassipes* (Water hyacinth), *Hydrocleys nymphoides* (Water poppy) and *Iris pseudacorus* (Yellow flage iris).
and/or justification
 - b. Any aquatic pest plant species listed in any Regional Pest Management Plan in New Zealand prepared by a regional council or unitary authority, Annual Control Works programme administered by LINZ, Weeds Checklist prepared by the Department of Conservation, or any aquatic plant that is determined by the CTO to be an Unwanted Organism under the Biosecurity Act 1993.
2. Notwithstanding condition 1, the permission holder may use the substance on any pest plant where there are reasonable grounds (based on potential impacts including the ability to establish and displace other plants, and potential geographic distribution), that the target plant is a pest plant, or is an emerging risk plant and that the substance has efficacy against the target plant. The permission holder must document their reasons and rationale for why the target plant is a pest plant or an emerging risk plant, and why the substance will be effective against this plant. This information shall be provided to the EPA prior to application of the substance and made available by request of a HSNO enforcement officer as required.
3. The permission holder may only use the substance on a pest plant providing a risk assessment around every/each application of the substance has been addressed by the permission holder in the form of a Resource Consent or by compliance with a Permitted rule. The risk assessment shall be provided to the EPA prior to application and will be made available on request of a HSNO enforcement officer.
4. The application of herbicide must be undertaken in accordance with the Safety Procedures and Contingency Plan as established in the associated regional pest management plan, resource consent or permitted rule under which the application was made.

5. The permission holder must ensure that a copy of this permission is provided to all persons undertaking the application of the herbicide authorised by this permission, prior to commencing works.
6. The permission holder must ensure that a copy of this permission is held on-site for the duration of the activity and be made available to any HSNO enforcement agency/officer on request.
7. Where practicable, application of the herbicide within 250 meters of any schools shall be carried out in the school holidays.
8. Any incidents, including accidental by-kills, must be reported (including the time, date and location monitoring was undertaken) to the EPA within 72 hours of the discovery of the incident. A copy of the report of any incident must also be forwarded to local iwi/rūnagna representatives.
9. The permission holder must, at least five working days prior to each application of a permitted substance onto or into water, give written notification to the following parties:
 - a. Every person taking water for domestic supply within one kilometre downstream of the proposed discharge;
 - b. Every holder of a resource consent for the taking of water for water supply purposes within one kilometre downstream of the proposed discharge;
 - c. Every owner/operator of any aquatic farm within 100 m of the proposed discharge;
 - d. The relevant local iwi runanga representatives;
 - e. Department of Conservation (Canterbury Conservancy);
 - f. Fish and Game (Canterbury region); and
 - g. The South Island Eel Industry Association.
10. The written notification required by condition 9 must include:
 - a. the name and location of the water body(s) that the substance will be applied to;
 - b. the date and approximate duration of each application;
 - c. the identity or name of the substance that is being applied;
 - d. the relevant restrictions on the use of water that will apply; and
 - e. the name and contact details of the permission holder.
11. The permission holder must, within one year of the granting of this permission, provide a monitoring plan to the Authority. The monitoring plan must include details of the methods the permission holder will use to ensure that it meets the monitoring requirements of the reporting controls specified in paragraphs 6.20 and 6.21 of decision for application APP201365.

29 January 2019



Fish and Game North Canterbury
PO Box 50
Woodend
CHRISTCHURCH 7641

Customer Services
P. 03 353 9007 or 0800 324 636

200 Tuam Street

PO Box 345
Christchurch 8140

E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

To Whom It May Concern

Re: Notification of follow-up application of haloxyfop-P methyl to treat Spartina

Following on from my letter dated 26th November 2018, I am writing to notify you of our intention to undertake a follow-up application of Gallant herbicide (active ingredient haloxyfop-P methyl) at various sites around the Avon Heathcote Estuary to control the pest plant Spartina. Spray operations will be carried out between January 4th to January 18th. Herbicide will only be applied at low tide between the hours of 8am and 5pm and will be weather dependant. A map is enclosed with this letter showing the areas to be controlled.

Signage will be erected on the day of the application before the operation starts. These signs will be located at public access areas within 100m of the application area and will state:

- Do not swim
- Do not gather food from the waterway (including fish)
- Do not take water for consumption

It is important that you adhere to these restrictions while signage remains in place. We will contact you to inform you if there are any changes to the spray operation.

Please contact me on 027 839 3878 or rich.langley@ecan.govt.nz if you require any further information.

Yours Sincerely

Rich Langley

A handwritten signature in blue ink, appearing to read 'Rich Langley', is positioned below the printed name.

Regional Project Coordinator Biosecurity

APPENDIX 3: PROJECT MILESTONES AND FINANCIAL EXPENDITURE

Milestone name	Activity	Deliverable	DOC funding contribution	Due date
1 Partnership development and community engagement	1. Form partnership between local agencies (ECan, CCC, DOC) 2. Develop and distribute education resources for local groups and landowners 3. Engage with local community groups, iwi and landowners	Meeting minutes from meeting participants Partnership agreement about responsibilities Copies of promotional/educational resources produced.	\$2,000	30 th September 2017
2 Survey commissioned	1. Engage contractor 2. Survey of estuarine and coastal margins from Oct 17 to Feb 18 to determine extent of current infestation, led by contractor in conjunction with council/DOC staff and community group volunteers	Up to date database and maps produced all current infestations	\$30,000	31 st January 2018
3 Control strategy developed	1. Control strategy developed and roles agreed on by partnership and community.	Written control strategy produced	\$2,000	28 th February 2018
4 Control strategy implemented	1. Control strategy implemented by contractor in conjunction with partner agencies and community	Contractor carrying out control at all sites.	\$10,000	31 st May 2018
5 Surveillance programme developed and implemented	1. Surveillance programme designed, and agency roles agreed, to confirm effective control at known sites and ongoing monitoring of high-risk sites. 2. Surveillance programme implemented	Written surveillance programme produced and implemented.	\$6,000	30 th June 2019

Table A3.1 *Spartina* project milestones

Spartina Summary of Expenditure

	Summary of expenditure	Supplier/Contractor	Expenditure (Cash)	Expenditure (In kind)
Milestone 1 Project setup 2017	Design + print of communications material	Environment Canterbury	\$969.12	
	Coordinator time (\$70/h)	Environment Canterbury	\$1,050.00	\$1,400.00
	Milestone Budget		\$2,000.00	
	Milestone Expenditure		\$2,019.12	\$1,400.00
	Difference +/-		-\$19.12	
Milestone 2 Survey 2017/18	Survey: Brooklands Lagoon	Tussocklands	\$6,811.28	
	Survey: Lyttelton Harbour	Tussocklands	\$4,177.52	
	Survey: Ashley River	Tussocklands	\$4,984.11	
	Survey: Avon Heathcote Estuary	Graeme Ure	\$9,410.00	
	Coordinator time (\$70/h)	Environment Canterbury	\$700.00	\$2,100.00
	Milestone Budget		\$30,000.00	
Milestone Expenditure		\$26,082.91	\$2,100.00	
Difference +/-		\$3,917.09		
Milestone 3 Develop Control Strategy 2017/18	Coordinator time (\$70/h)	Environment Canterbury	\$2,100.00	\$700.00
	Milestone Budget		\$2,000.00	
	Milestone Expenditure		\$2,100.00	\$700.00
	Difference +/-		-\$100.00	
Milestone 4 Control work 2017/18	Control of spartina at all sites	Keystone Ecology	\$10,752.00	
	Signage - EPA requirements	AdGraphix	\$1,459.40	
	Soil Sampling - EPA requirements	Hill Laboratories	\$1,146.00	
	Equipment for signage	Bashers ITM	\$228.96	
	Coordinator time (\$70/h)	Environment Canterbury		\$2,800.00
	Milestone Budget		\$10,000.00	
Milestone Expenditure		\$13,586.36	\$2,800.00	
Difference +/-		-\$3,586.36		
Milestone 5 Future control programme 2018/19	Control of spartina: Avon Heathcote Est. & Brooklands	Keystone Ecology	\$3,573.50	
	Dog Search: Avon Heathcote & Brooklands	John Taylor	\$1,629.64	
	Control of spartina (followup): Avon Heathcote Estuary	Keystone Ecology	\$3,333.700	
	Coordinator time (\$70/h)	Environment Canterbury		\$4,550.00
	Search: Lyttelton Harbour & McCormacks Bay (\$130/h)	Department of Conservation		\$1,300.00
	Search: Heathcote River (\$100/h)	Christchurch City Council		\$1,200.00
	Milestone Budget		\$6,000.00	
	Milestone Expenditure		\$8,536.84	\$2,800.00
Difference +/-		-\$2,536.84		
PROJECT TOTALS	TOTAL BUDGET		\$50,000.00	
	TOTAL EXPENDITURE		\$52,325.23	\$9,800.00
	Difference +/-		-\$2,325.23	

Table A3.2 Cash and in-kind expenditure for the Spartina Survey and Control Project 2017 - 2019

APPENDIX 4: CONTRACTOR REPORTS



KEYSTONE ECOLOGY

CONTRACTOR'S REPORT

**Spartina Control
Avon-Heathcote Estuary and Brooklands Lagoon**

February 2019

Niall Mogan. BSc, Hons
Ecologist & Ornithological Consultant
021 0540849 - niall.mogan@gmail.com - Birdsofchristchurch.co.nz

REPORT FOR ENVIRONMENT CANTERBURY REGIONAL COUNCIL BY KEYSTONE ECOLOGY LTD.

Written by Vicki Meyer (Ecology Field Worker).

Reviewed by Niall Mogan (General Manager).

Site: *Avon-Heathcote Estuary (various) and Brooklands Lagoon*

Job description: *Identify and control target species located in known areas of the Avon-Heathcote and Brooklands Lagoon, using herbicide application.*

Target species: *Spartina anglica, S. alterniflora*



Spartina Control, February 2019

Keystone Ecology completed Spartina control at various sites in the Avon-Heathcote Estuary and Brooklands Lagoon.

Sites were originally identified in a thorough survey completed in November 2017 to January 2018. Keystone Ecology carried out initial control in April 2018.

A total of seven distinct areas were searched and Spartina plants present were treated with the herbicide Gallant Ultra.

Work was completed over the period of the 5th to the 18th of February 2019

METHOD

Warning signs were erected prior to control by Rich Langley of Environment Canterbury. These were placed at visible locations and/or public entry points within 100m of the spray sites. These signs showed a date range for avoiding swimming, taking water or gathering food.

Maps provided indicated areas where plants were known to be located and had had initial control done in 2018. All of these locations were re-visited in 2019.

These areas were grid searched, with personnel being 3 to 10 metres apart depending on visibility, debris on vegetation and site characteristics.

Plants were first de-seeded by cutting and bagging seed heads. Any debris on the plants such as drift wood or sea lettuce was removed to ensure full chemical contact.

All plants were first sprayed with a knapsack containing clean (no chemical) water to remove any salt residue.

They were then sprayed with herbicide, ensuring coverage over the entire plant to saturation point.

Chemical used was Gallant Ultra at a rate of 29ml/10L, with Kwicken (canola-based oil penetrant) at 200ml/10L and ammonium sulfate at 100g/10L. A water based dye was added at a rate of 20m/10L to indicate sprayed plants.

All spraying was done as close to low tide as possible to allow for the maximum time before the plants are covered by in coming tides. All spraying was completed with a minimum of 2 hours before high tide.



Figure 1: Spartina prior to removing debris and spraying

RESULTS

See appendix 1 for maps of control sites

Ferrymead

Several plants (>20) were found within a large patch of reeds. The *Spartina* was of various sizes, from approximately 10cm to 50cm. Many had seed heads which were removed prior to spraying.

Where *Spartina* was growing within *Juncus*, they were pushed out of the way to minimize non-target contact. This was difficult where several plants were intertwined with thick *Juncus* and some non-target contact was unavoidable.

The majority of plants at this site were located in this reed area, however some individual plants were found within 10 to 15 meters growing closer to the rock wall under other shrubs.

Heathcote

The area below the Rutherford Street bridge was searched (true right), from the footbridge at the end of Connal Street to the footbridge at the end of Bamford Street.

One small plant was found near the steps south of Rutherford Street bridge, and 3 plants near an old control patch.

No plants were found at the site initially identified at the end of Barton Street



Figure 2: New *Spartina* plant found near dead *Spartina* patches (from 2018 control)

The true left bank of the Heathcote was searched from under the Tunnel Road bridge to where the bank begins to curve behind Storage King on Ferry Road. The majority of plants found on this side of the estuary were smaller individual plants.

However, one patch where plants were controlled the previous year had several large plants growing alongside dead Spartina. This may indicate that these plants did not receive full herbicide coverage during initial control.



Figure 3: Large Spartina plants alongside remnants of previously controlled plants

One large patch (approximately 3x2m) was found on the true right of the Heathcote, on the edge of a large juncus patch behind the main tree line. These plants ranged in size with many seed heads present. Singular plants were also growing within the juncus adjacent to the main Spartina patch. These were sprayed carefully to ensure minimal non-target damage.

All other plants found on the true right of this site were located at marked spots on maps, and were predominately smaller plants emerging at the edges of previously controlled larger patches.



Figure 4: Spartina patch behind the south bank (true right) of the Heathcote site

McCormacks Bay

The majority of the plants located at McCormacks Bay were found running along the bottom of the rock wall below Main Road. Most of these plants were small (5-10cm), with one patch of seeding plants located near the culvert that exits to the estuary.

The perimeter of McCormacks bay was searched, and also as much of the interior as possible. A full coverage search of the interior was not possible due the soft sinking mud.

The perimeter of the three main islands was searched with two patches of Spartina controlled at the edge of the most western island.

Some small plants were also found growing on the edge of a large dead patch controlled the previous year.



Figure 5: McCormacks Bay

Southshore

No plants were found between Tern Street and Plover Street.

One small clump was found opposite the end of Penguin Street. Two small patches found opposite 64A were covered in a lot of debris such as sea lettuce and various branches washed over by the tides.

Many plants/clumps of plants were found within a large juncus patch opposite 74C. There were of various sizes, including those with seed heads. Many of the plants were found within the juncus, as well as on the edges. Spartina was scattered over an area of approximately 8x10m within the juncus.

There was a large amount of debris covering juncus and built up on open areas at this site which meant it was difficult to see plants without pulling all debris away.

Lower Avon

Three clumps of Spartina were found south of Bridge Street.

North of Bridge Street 2 individual plants were found in the area between the dirt track and the estuary.

Several individual plants were located within thick rushes opposite 53 Kibblewhite Street. One large clump was also found buried under a pile of branches opposite 29 Kibblewhite Street.

Upper Avon

One clump of large healthy plants was controlled on the true left of the Avon opposite Admirals Way.

A small patch of plants that had previously been controlled on the true right opposite Parenga Way were showing signs of green growth at the base. These plants were resprayed.

Brooklands Lagoon

All known sites indicated on maps provided for Brookland lagoon were searched for Spartina with only one small (<5cm) plant found 5 metres north of point B003.

B001 showed signs of slight green growth at the very base of a few plants within the large patch and these were retreated. The rest of this patch showed good control from the previous year.

At site B002 the Spartina location and surrounding area was covered with very thick algae and stick debris. This was cleared away but no live plants were found.

Incident:

Prior to beginning spraying at this site, a family walked past to collect shellfish. The warning sign and period of no shellfish gathering was explained to them, however they were unconcerned and continued past to gather shellfish.

The furthest site from where they were gathering was searched first, and due to there being minimal plants at these sites no spraying had taking place before they left site.

Table 1: Chemical use per site

Site	Gallant Ultra	Kwicken	Ammonium sulfate	Marker dye	Total volume applied
Ferrymead	5.8ml	40ml	20g	4ml	2L
Heathcote	11.6ml	80ml	40g	8ml	4L
McCormaks Bay	11.6ml	80ml	40g	8ml	4L
Southshore	11.6ml	80ml	40g	8ml	4L
Lower Avon	8.7	60ml	30g	6ml	3L
Upper Avon	1.45	30ml	5g	1ml	0.5L
Brooklands	1.45	30ml	5g	1ml	0.5L
	TOTAL VOLUME APPLIED OVER ALL SITES				18L

CONCLUSION

Overall the amount of Spartina plants found was lower than the previous year. Many sites showed no evidence of plants that had been previously identified in the 2017/2018 survey. In some places, remnants of larger dead plants and patches were evident.

In comparison to the previous year strong winds were not an issue and spraying was able to be completed on all days.

The biggest issue while doing this control was the large amount of sea lettuce, sticks and branches and other debris that often covered the sites, and made locating plants difficult. Although material was removed as best as possible, it is possible smaller plants may have remained obscured.

A twice a season control approach is likely to be helpful to go over these areas after the first control of the season to pick up any missed plants.

Interactions with the public while spraying were minimal but generally pleasant. On most occasions people were interested in what was being sprayed (what plant species) rather than having a negative view on the spraying taking place.



KEYSTONE ECOLOGY

CONTRACTOR'S REPORT

**Spartina Control; follow up
Avon-Heathcote Estuary**

March/April 2019

Niall Mughan. BSc, Hons
Ecologist & Ornithological Consultant
021 0540849 - niall.mughan@gmail.com - Birdsofchristchurch.co.nz

REPORT FOR ENVIRONMENT CANTERBURY REGIONAL COUNCIL BY KEYSTONE ECOLOGY LTD.

Written by Vicki Meyer (Ecology Field Worker).

Reviewed by Niall Muga (General Manager).

Site: *Avon-Heathcote Estuary (various) and Brooklands Lagoon*

Job description: *Re-visit previously controlled sites at the Avon-Heathcote estuary, and control Spartina using herbicide application. Locations specified based on plants indicated by Spartina detection dog.*

Target species: *Spartina anglica, S. alterniflora*



Spartina Control, March/April 2019

Keystone Ecology completed initial Spartina control for this season at various sites in the Avon-Heathcote Estuary in February 2019.

Sites were originally identified in a thorough survey completed in November 2017 to January 2018.

Following this initial control, a Spartina detection dog was employed to search and identify remaining plants.

Follow up control was completed by Keystone Ecology in March/April 2019, at these identified sites.

METHOD

Warning signs were erected prior to control. These were placed at visible locations and/or public entry points within 100m of the spray sites. Additional information was written on the signs for this round of work, which included the pest species name and active ingredient of the chemical used. Fact sheets which outlined the environmental impact of *Spartina* were attached to the warning signs to provide additional information.

Maps were provided by Environment Canterbury to show where live plants had been identified. These areas were targeted rather than re-searching all original sites as was done in the first round of control.

Prior to spraying all plants that had seed heads removed if present. Debris or algae/sea lettuce was removed and plants were sprayed with clean water to remove any salt or mud residue. Plants were then sprayed with herbicide, ensuring coverage over the entire plant to saturation point.

Chemical used was Gallant Ultra at a rate of 29ml/10L, with Kwicken (canola-based oil penetrant) at 200ml/10L and ammonium sulfate at 100g/10L. A water-based dye was added at a rate of 20m/10L.

Spraying was carried out as close to low tide as possible, with all spraying being completed with a minimum of 2 hours before high tide.

This allowed maximum chemical contact time before plants were re-submerged by incoming tides.

RESULTS

McCormacks Bay.

The majority of plants controlled at McCormacks Bay were situated below the rock wall along the Main Road causeway. Many of these were single small plants (<approx. 10cm) growing in rocky areas.

One plant was found growing on the edge of a large remnant dead patch out from the southern inlet near the playing fields.

Two small clumps were located and sprayed on the edge of the southern island in the bay. Within the large patches previously sprayed at this location some plants were showing small amounts of green growth at the base of the plants, with the majority browned off. Any plants with indications of growth were re-treated.

Heathcote ('Heathcote 1', Heathcote 2, saltmarsh search area)

The true left and true right of the outlined area were searched and all indicated plants located. This included a newly identified medium sized plant in the upper section of this area. Many of these plants were of a smaller size.

Several plants on the true right which had been indicted as requiring control were dead, which may indicate than some plants had not yet died off fully then the detector dog was searching after the initial control effort.

Five large seeding patches were found in a drain area at the edge of the saltmarsh search area, parallel to Tunnel Road. These ranged from approximately 2x1 to 1x1 metre squared.

These plants were located in an area of stagnant or very slow-moving water, with large amounts of algae indicating a lack of significant water movement. These plants were discovered at approximately 2.5 hours after low tide and were under a significant amount of water. A pipe at one end of the area appeared to have high levels of silt present which may account for the lack of water movement.

Due to the water presence these plants were unable to be controlled by spraying. Rich Langley of ECAN was contacted for advice and visited site.

Control of plant in this area will be decided after further consultation with ECAN. Removal via digger may be an option.

The remainder of this area was searched with 3 additional plants found and controlled.



Figure 1. New patch identified, saltmarsh area Heathcote

Ferrymead ('Heathcote 3')

Plants were located within the original search site within the reed bed. Locating plants within thick reeds proved challenging where singular leaved plants were swamped by other vegetation, particularly where reeds were pushed over by debris. In these circumstances' reeds were lifted and pushed aside in order to search.

A new patch was identified south of the original site and consisted of several medium to large plants growing in a stony area under a large macrocarpa. Large amounts of debris such as driftwood was covering the edge of this patch. This was lifted and checked underneath for plants.



Figure 2. A new patch located at Ferrymead (south)

Southshore

Five small plants were located in or near a large reed patch opposite 76 Rockinghorse Road.



Figure 3. Spartina growing against reeds

South New Brighton

One plant in this area was located and controlled. This was part of a larger clump of previously controlled Spartina.

Falcon Street

Three areas were located in close vicinity in jointed rush beds opposite 53B Kibblewhite Street. Similarly to other areas where Spartina has been found in reed beds, these plants were often camouflaged by thick, fallen reeds and required careful searching by lifting and separating the reeds to expose Spartina.

Admirals Way

One large clump of Spartina was located. This had been previously spayed and was in the process of dying off. This plant appeared to be taking longer than others observed to completely die. The clump was interspersed with browned off stems and others with varying shades of lighter green/yellow. This clump was resprayed to ensure complete control.



Figure 4. Admirals Way

Owles Terrace

A newly identified mature patch was located at this site. This patch was growing at the edge of the bank, emerging from a lower level gaban basket.

Table 1: Chemical use per site

Site	Gallant Ultra	Kwicken	Ammonium sulfate	Marker dye	Total volume applied
McCormacks Bay	7.25ml	50ml	25g	5ml	2.5L
Ferrymead	4.35ml	30ml	15g	3ml	1.5L
Heathcote	8.7ml	60ml	30g	6ml	3
Southshore	4.35ml	30ml	15g	3ml	1.5
South New Brighton	1.45ml	10ml	5g	1ml	0.5L
Falcon Street	2.9ml	20ml	10g	2ml	1L
Admirals Way	1.45	10ml	5g	1ml	0.5
Owles Terrace	2.9ml	20ml	10g	2ml	1L
	TOTAL VOLUME APPLIED OVER ALL SITES				11.5L

CONCLUSION

Having a Spartina detection dog as a resource is beneficial in detecting smaller or more obscured plants particularly for follow up control after initial work.

Performing search and control concurrently may be useful as plants can be controlled immediately after detection. All plants located could be marked with bamboo stakes with flagging tape or blaze paint on the tip. If a patch or group of plants is located in the search, having a record of '1 of 4/1 of 6/individual plant' etc. would be useful in order to ensure certainty that all plants in an area had been located.

Weather conditions were generally unproblematic, although on one day spraying had to cease when winds increased. Wind conditions and low tide times need to coincide which can mean when low tides are later in the day wind conditions can often be stronger.

While spraying at McCormacks bay, wind conditions were slightly elevated and would not have been suitable if large scale spraying was occurring. However, as the level of the plants being sprayed was below the road level and sheltered, coupled with using low drift nozzles and spot spraying, spraying was able to continue.

Some plants have appeared to die off at differing rates. Some plants that had been indicated as requiring control had died completely when located during follow up control. These may have shown signs of life when detected but had not yet fully died at that time.

Best practice currently outlines that herbicide should be applied at least two hours before Spartina is reached by an incoming tide. In order to ensure certainty of complete control it is recommended to increase this time to at least 3 hours, to allow additional contact time before being inundated by tides.