



Final Report

Project Title:	Green thistle beetle monitoring to spread the bio-control attack on Californian thistles
Project Number:	L11-172
Date of Report:	24 July 2013

Note: The Final Report is due to your Project Adviser within two months after the project completion date.

If any material supplied in, or attached to, this report contains confidential information, or is otherwise unsuitable for wider dissemination, please clearly mark accordingly and highlight directly with your Project Adviser (including the reason for wishing to treat the material in this manner).

This information from Sections 2 – 5 and Section 11 will be published on the Ministry for Primary Industries (MPI) website unless you advise us otherwise.

1. Milestone Summary Table

Milestone Number	Milestone [As per SFF contract schedule]	Completion Date		Percent Complete
		Original	Actual	
1	Make contact with Landcare Research and Southland and Otago bio-contractors to share information on existing survey results and sites; produce a survey plan and protocols. Contact known Southland/ Otago farmers on identified new or existing sites.	Dec/11	Dec/11	100%
2	Visit and survey beetle sites identified in the survey plan. Co-ordinate surveying of sites with similar data collection templates by all Southland/ Otago bio-contractors. Gather wider data on beetle's spread by asking farmers to report sightings – to be encouraged through a press release and via CalTAG and CADB contacts.	Mar/12	Mar/12	100%
3	Complete SFF and co-funding Beef+Lamb New Zealand reporting requirements.	Jun/12	Jun/12	100%

4	Return to earliest and most promising sites in following season; continue record of site management and beetle establishment according to the survey plan.	Jan/13	Jan/13	100%
5	Analyse all survey data and statistics and produce recommendations as to the most supportive conditions for green thistle beetles in Southland/ Otago Notify media and regional farmers of results. Collect names of Southland and Otago farmers who would be keen to have green beetles released on their property.	Apr/13	Apr/13	100%
6	Identify the best 5 established Southland/ Otago sites as shown by the survey results. In conjunction with Southland/ Otago bio-contractors, establish a plan to arrange collections and for the spreading of beetles via a farmer field collection day or as appropriate.	June/13	June/13	100% of what was possible.
7	Final Report	June/13	August/13	100%

Summary of Key Performance Indicators

(NB: This section only applies to projects from 2010 onwards. Outline progress against the KPIs listed in your original project plan, by using direct measures (e.g. percentages, cumulative totals, etc). If a KPI can only be measured in the longer-term, then please note when and how this could be recorded.)

KPI Description	Overall Progress
Make contact with at least 80% of the farmers/ land managers responsible for the original release sites.	Achieved. We made contact with 100% of the release site farmers in summer of 2011-12 and also 30/31 of the South Otago releases, 9/15 of the Southland and others – overall 85% in summer 2012-13.
Develop an establishment record for at least 75% of sites.	Achieved. Establishment record created for 94% of Otago and Southland sites. All but the three Crown-owned DOC sites are being monitored and have records.
Identify the best 5 or more sites as suitable for 'farming' the beetles and spreading them in due course to other properties.	All sites have been analysed and categorised. The 5 best sites have been identified, but a much more detailed view of the progress of the green thistle beetle over all sites has been achieved. Some beetles have been 'farmed' and spread further but this has not ended up being the main achievement of this project.

2. Project Objectives

(Why did you do this project? What were your key objectives at the start of the project? Outline if any of these objectives changed during the course of the project.)

Our key objectives were:

- To survey the extent of the establishment of the green thistle beetle (*Cassida rubiginosa*) since its first releases in New Zealand in 2007.
- To monitor the beetles' progress at the release sites over the two recent summers 2011-12 & 2012-13 and to see where they have established best.
- To consider, if there are large beetle populations developing at some sites, the harvesting and re-establishment on other farms 'to spread the attack' on thistles.

The objectives changed slightly when it became clear that there were not many sites with large numbers of beetles to enable widespread harvesting and re-establishment amongst other farmers. Some of this did take place, just not as much as we might have hoped for.

The emphasis of the project became much more to collect a complete and very detailed record (surveys and photos) of the initial release sites that can be used well into the future. We achieved a 100% record of the Otago sites and also most of the Southland ones with the support of Environment Southland bio-control contractors as planned. We were also able to put more emphasis on the next steps to make use of our understandings as a basis for further work on Californian thistles

3. Approach

(What did you do – how did you go about it?)

We established that there were 31 releases of the green thistle beetle (*Cassida rubiginosa*) onto 'nursery' sites in Otago (mostly South Otago, 3 on the Otago peninsula, 2 near Oamaru, and one in the Mt Aspiring area); also 14 original releases in Southland, and one in the Horizons Regional Council area. These releases were all made under SFF project 05-010 between November 2007 and January 2011.

All these 46 releases were co-ordinated by the Californian thistle group, an associate group under the Clutha Agricultural Development Board, which has been active in bio-control programmes for Cali thistles since 1999.

At this time Landcare Research also raised further beetles that were distributed largely to Regional Councils in other parts of the country, e.g. Wellington, Bay of Plenty, Manawatu, Rangitikei. The number of these is not known and they were not part of this project's monitoring programme.

The project team was able to go back and check on 30 of the 31 Otago sites, and with the support of Environment Southland's biocontrol contractors 9 of the 14 Southland sites. This was not a scientific study but a practical and consistent survey so that sites could be compared.

- We checked for evidence of establishment – mostly by looking for the distinctive feeding 'windows' (not holes) that identify the beetles' presence.
- We also looked for beetle eggs/ larvae/ and adults.
- We searched outwards, generally involving firstly a close inspection of thistle plants in a 20m radius from the release site. We then had the general aim to look 50m and then 100m away from the release point. This idea had to be adapted, in light of the number and location of thistle plants within the wider area. An inspection of every plant was not feasible, so we thought it most sensible to look where we thought the beetles may have extended their range to. This may have been towards the next most promising patch of thistles, or downwind of the initial site, or towards the fence-lines in now well-grazed pasture or for some other site-specific

reason. We believe that this enabled us to come to a reasonable conclusion as to how well the beetles had established at each location.

- As well as looking primarily at the Californian thistles, we did inspect Scotch and Nodding (rarely seen) thistles also.
- We estimated the health of the current thistle population and made a very general comparison with the same population at release time. We took photos at all visits to enhance those comparisons.
- We noted the basic site management approach from the farmer/ land manager concerned, especially with respect to the level of grazing in and around the site and any spray use nearby.
- We established a comprehensive file record of the sites and all this information.
- As well as some limited harvesting of the beetles for farm-to-farm transfers (from one Southland site to five new sites over the two seasons), we believe we have more importantly kept up the information gathering since the 2007-11 releases so that further informed work is possible to maintain an 'attack' on Californian thistles.

4. What were the main findings from this project?

Perhaps our most important 'finding' is the confirmation that the green thistle beetles (*Cassida rubiginosa*) have established at almost all of the 31 original release sites in Otago from CalTAG's SFF release programme. The establishment appears to be much stronger on some sites than others.

At 30 of the 31 Otago sites the project team observed at least some signs of beetles or their feeding windows on at least one of the two summers surveyed.

Support from farmers throughout has been tremendous. Almost all are sticking to the initial informal agreement to avoid heavy grazing and spraying around the release sites. The beetles have to survive and adapt to current farming procedures in order to be widely successful and so we asked no more than this. Two of the initial sites have been destroyed by re-development but even here, the beetles may have safely moved on. Finding these would have involved a larger scale search than the finances of the project allowed.

Much of the following commentary is derived from the "Release Site Progress Table, Monitoring 2011-13" enclosed with this report.

Of the 25 Otago sites with thistles to inspect in both summers, at 9 of these there has been no sightings of any stage of beetles, and only minor evidence of windows. And yet on only one site were thistles the 'same' as at release and two others with 'minor reduction' of thistles. So even at these 9 sites with minimal evidence of beetle activity, 67% of them show 'significant reduction' or 'extensive reduction' of the thistles since releases of the beetle.

Combining the visits in both summers we found eggs, larvae, and/ or adult beetles at only 18% of the sites. Also combining the visits to active farms, only 7% had 'extensive' windows evidence, 21% had 'significant' windows evidence. 46% had 'minor' evidence and 26% had no evidence. These figures would indicate a less successful establishment of the insect. Yet there is little consistency in the data (and perhaps in the beetles' activity?). At more than one site there was no observed evidence in the 2011-12 summer and yet the beetles or their windows appeared in 2012-13. The reverse was also true.

Sites where eggs, larvae or adults were found in both summers numbered only two and these were not the sites with the most impressive numbers of all the beetles in either year. The best site in 2011-12 was in the Catlins and the best site in 2012-13 was the original first release site near Lawrence (5 summers on).

The most significant 'finding' beyond establishment is that almost all sites show a reduction in the number of thistles at or around the release sites. At 3 (10%) of the 29 active sites there appeared to be no more thistles growing at all around the release area. At 5 more sites (17%) we have judged the there to be an 'extensive reduction.' At another 14 sites (48%) there has been a 'significant reduction'

and at 6 sites (21%) there has been a 'minor reduction.' That is at 75% of the sites, the reduction in thistles was deemed 'significant' or better!

Something is going on here. We cannot assume or even suggest that our few beetles at each site have caused this effect. But there is certainly data here that needs further investigation. Amongst our set of inconsistent data, the most consistent fact is that there are fewer thistles now than there were at the releases of the beetle. Californian thistles are still New Zealand's worst pastoral weed and any sort of success from the green thistle beetle, be it in combination with other factors or not, needs to be scientifically considered and promoted.

As to the ideal conditions for looking after the beetles, I'm not sure we can be at all certain about these. Clearly the populations of beetles have not done well when their release sites have been heavily grazed and yet this has not wiped them out in all cases, at least not yet. Spraying also appears to have had an effect on a couple of sites, once where there was spray drift from a neighbour.

Something that we were unaware of earlier may be important for any future nursery release sites was the apparent significance of nearby shelter trees. The science had told us that the beetles shelter and over-winter in the leaf litter of the thistles and surrounding grasses. We noticed a correlation between the sites that had strong establishment evidence and the fact that there were shelter trees nearby in most (but not all) of these cases. We suspect these trees are being used as shelter and not only during the winter hibernation phase.

Another of our important findings relates to the range of the beetles and the distances they may be covering. We had understood that once released into a healthy patch of thistles, there would be no need for them to travel very far to build their population and expand as a group like ripples on a pond. The reality in the field appears to be quite different.

There are only a couple of populations that we have observed growing strongly in one confined locality near the release site. At most sites the evidence is that they are on the move and that this can happen quickly after release. We found windows evidence at 200m and at 500m from a March 2010 release site just three seasons later in January 2013. At 5 of the 29 active release sites we have observed windows at distances beyond 200m, and we have only usually looked that far away on access roads, so this is a limited sample.

This ability to travel is probably a mixed blessing. It could signify wide dispersal or it could mean that many of them act as adventurers who end up isolated from potential mates.

Further "findings" are in the "Report on Observations" – M. Deverson, 14 August 2013, attached with this report.

5. What difference has this project made to your group / community of interest / industry?

This project has made it possible for the CalTAG group and the Clutha Ag. Board to continue work to weaken the hold of Californian thistles over many farmers in New Zealand. We have been able to come up with observations and data that should encourage all farmers in New Zealand (sheep & beef especially). We will have re-invigorated our 'nursery site' farmers and the overall results will have encouraged them to 'stick with the programme.'

Scientists who look at weeds to support pastoral farmers should also be encouraged by these observations and data collected. There are a good number of indications through our results as to the further science that is required to make this a huge success story for farming.

We will continue to make the most of this story across our stakeholders, especially our farmer members and the media. There is a 'sustainable management' success story in the making here that we will try to distribute as widely as possible. It is good to have a positive farming story to offer the general public.

6. If you did the project again what would you do differently?

(i.e. what worked and what didn't?).

The project idea and design was very suitable for the purpose – and basically it all did go according to plan.

Perhaps it would have been good to check the thistles at exactly the same time (perhaps around mid December) at each site and in both seasons. This would have put huge pressure on the observers and some of our farmers.

A simple note for next time – take photos from exactly the same spot and same direction each time! We did 'okay' with this but it could have been better.

7. Is there anything the SFF could have done differently?

No, SFF was fully supportive. We have experienced people involved (scientists, project managers, farmers who all expect to be involved in projects periodically) and appreciate being trusted to get on with it.

It would be good to see SFF or other MPI staff at some events but we do understand the time & work load pressures on MPI staff.

We still believe that MPI SFF should reconsider the lack of a February application round and/ or the retention of some 'extension' monies for exceptional projects. We appreciate the opportunity to comment on our experience with the Fund through the recent survey.

We believe that this fund should be supporting lots of bursts of interest in a great variety of farming issues, involving farmers as much as possible, rather than giving even more money to the larger industry players to do huge-scale trial work.

8. Is there anything that you have learnt that would be useful for new project teams?

Nothing more than we have submitted in other project documents at this time.

9. Where to from here – what are the next steps?

Next steps are outlined in more detail in the "GTB Observations & analysis" – M. Deverson, 14 August 2013, attached with this report. Summary:

- strong evidence that the green thistle beetles have survived and established.
- indications that this bio-control agent could be very successful in the long term in New Zealand farmers' battle with Californian thistle.
- there are considerable questions to be studied soon if we are to make the most profitable use of this agent.
- it would be careless for us to abandon this agent to the chances of nature just yet, just at the point that a little more support might confirm its success
- the project group will continue its interest, but without supporting funds its activities will be very limited.

Science questions that need to be addressed to build this bio-control agent into one which will add significantly to production, sustainability and profitability:

- Where are the beetles where there is significant feeding signs but no beetles?

- What is happening to the thistles in the field when minor feeding appears to be associated with a thistle population collapse?
- Were there any particular conditions where the beetles appeared to do well?
- If they are moving well away from the release site, are they then successfully breeding.
- Is there any reason for their movement from or their stability in areas.
- Are spring releases significantly more successful than autumn ones?
- Are the beetles acting as a conduit to any rusts or pathogens helping to weaken emerging plants?

10. Financial summary

Provide a brief comment as to whether the project was completed on budget; whether there is any grant money left unspent. Please provide a financial statement to summarise the incomings/ outgoings over the life of the project – you can either attach a copy of your own financial statement or use the “final financial template” available at our website <http://www.mpi.govt.nz/sff/>

The project was completed on budget and on time. We acknowledge the considerable in-kind support from the bio-control team at Environment Southland, and the cash co-funding by Beef + Lamb New Zealand. The Final Financial document is attached.

11. List and attach any major outputs from the project.

- ❖ CalTAG Release Site Progress sheets – for Otago & Southland.
- ❖ The Thistle Beetle damage photos – before & after pics in a PDF document.
- ❖ “GTB Observations & analysis Aug13,” M. Deverson, August 2013 (not a project report, just a summary of observations).

The Clutha Ag. Board has a considerable amount of further information and photos from each site. This is all available for further scientific enquiry on request.

If appropriate, we would like to publish a copy of the above on our website: please provide an electronic copy for this purpose preferably in Word format.

Report Confirmation

Name [Project Manager]	Confirmation	Date
Malcolm Deverson	I hereby confirm the above information is true and correct: ✓	16 August 2013

Submission Notes:

1. **Final Reports should be sent electronically** to the MPI SFF Fund Administrator **and** your Project Adviser (in the same e-mail as the final Request for Payment form and invoice). Also attach electronic versions of any resources developed.
Please ensure you put your project number in the e-mail's subject line:
e.g., 09/999 Final report 2011.
2. **Hardcopies of any project resources** developed should be **posted** to the Fund Administrator **and** your Project Adviser.