ARORANGI COMPANY

Invasive Species Project

TIAEA PROGRESS REPORT

CAPACITY BUILDING

1. Trained on identifying Cuscuta

Gerald McCormack shows tiaea on site in Kiikii.

Team Tiaea, at a planning session.

- **Expert Presentation** – we had a briefing from Gerald McCormack as the resident expert of the invasive species – dodder, cuscuta tempris & tiaea in Kiikii where the only citing of the species on the island of Rarotonga was located. Initial findings of the first citing was around 12-15 years. From this, we initiated our research into the ins/outs of this invasive plant.
- **Research Internet/Site** – from our research, our findings below in a poster format.
- Community approach –research into the invasive plant lead us to say that Mangaia was infested by the plant. The first site of infestation in Rarotonga was thought to be by accident (or not knowing what the differences between two very similar plant - tainoka vs tiaea) that was brought over by hawaiian travellers that was visiting Mangaia and thought that the plant was of traditional value in their homeland. Only to find out once in Rarotonga, that it was a different plant but of similar plant family, according to the landowner where the first citing of the plant in the Rarotonga.
- **Field Identification** – after physical studying and viewing of the plant, identification program was put in place where the community where informed of the plant through media publication and they would make contact with the 'team tiaea" and the team come out and identify the plants on location. A good response from the community where of vine plant families eg balloon vines, mile-a-minute. The process of community response, the team has identified positively, two other areas on Rarotonga namely, kauare, titikaveka & rauroa road, arorangi of infestation.
- **Personal Interview** – talking to people of the street, older generation and within the agricultural sector, very little is known about the tiaea plant and its impact on the environment. Most if not all, have seen the plant in one way or another but as just another part of the fauna & flora in their own community surroundings.

First citing of Tiaea infestation on Rarotonga in Kiikii.

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Phone:
+682 54092
or 75302

Email:
arorangibb@gmail.com

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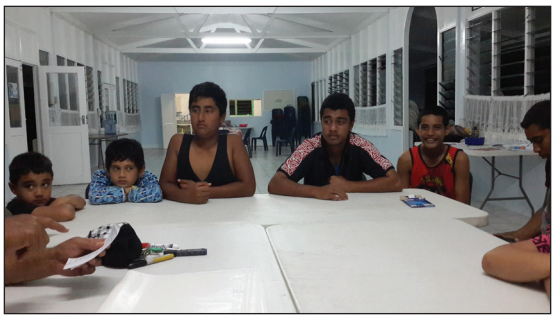
2. Presentation Cuscuta to NES/Community

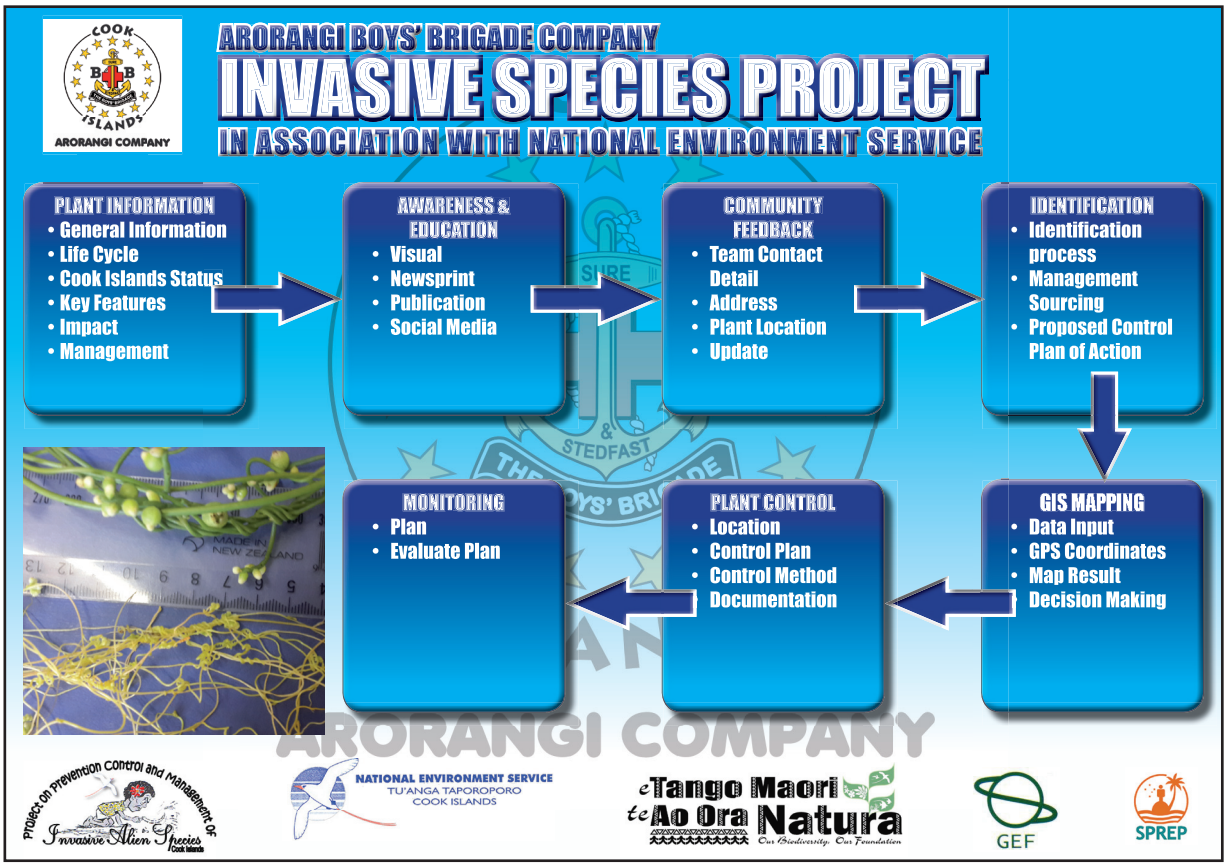
To bring about knowledge and physical of the invasive plant – tiaea, team tiaea put together a "Tiaea EXPO", and was launched at the Calvary Hall, Arorangi. Members of the community and associated partners in the project was invited to the launch. From the outcome of our research, the team presented a comprehensive plant details/information, live plant and Q&A at the launch to kick start our media education and awareness phase of the project.



Team Tiaea, at a planning session during the preparation of the Tiaea Expo.

Staff Sergeant A.Mana with in team during the launch in the information booth.

Lance Corporal JW.Gosselin behind the live plant booth controlling the viewing of the plant.



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+682 54092
or 75302

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arorangibb@gmail.com

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EDUCATION & AWARENESS

1. Develop educational & awareness program
   - Tiaea Expo (Launching)
   - Print Material (Posters)
   - News Article & Advertisement (CINews)
   - Pictorial & Posting (Facebook)
   - News Article (CITV)
2. Publication of article in local media & community
   - Tiaea Expo (Launched at the Calvary Hall, Arorangi)
   - Print Material (Posters)
   - Media Material (CINews)
   - Social Media Material (Facebook)
   - Visual Material (CITV)

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Dodder running rampant along a fenceline – it can grow up to 13 cm a day. 14073004

Dodder campaign to be launched Monday

AROARANGI Boys Brigade Company (ABBC) is launching a campaign on Monday that it hopes will rid Rarotonga of the invasive plant Dodder – or at least control it.

The only problem is, no-one knows just how much of a problem it is – and that's the focus of the campaign initially – to find out whether it will be possible to eradicate it.

ABBC are working in association with the National Environment Service (NES) to control and manage the spread of the Dodder/Tiaea on Rarotonga.

A recently introduced plant, it has naturalised on lowlands. It has become one of the most widespread and destructive weeds in gardens, taro patches and in waste and unused areas on Mangaia where it has become a serious weed problem. It was discovered in Mangaia in 1988 by W. A. Whistler and in Rarotonga in 2013 by Gerald McCormack.

Based on feedback from the community, very little is currently known about where the plant is found.

Due to the magnitude of the project, the ABBC is seeking the assistance of the community to report any sighting of the invasive plant. This will give ABBC an idea how widespread it is on Rarotonga and enable ABBC to put in place a control and management plan.

Using the locations provided by the public, ABBC will put in place processes of documenting, mapping, controlling and managing the invasive plant.

Dodder, Cuscuta species, is a parasitic weed that sucks the life out of other plants. It forms yellowish mats made up of slender stems that cover its victims.

When it first comes in contact with its host victim, it coils around it in a clockwise direction. It then uses its sucking fangs called 'haustoria' to penetrate the stems or leaves of the plant victim to drink its water and nutrients. Dodder can grow up 13cm per day, depending on the species, and will continually produce new 'haustoria' to rob the host plant of nutrients.

Dodder produces hard-coated seed that can remain dormant in the soil for more than 20 years. Numerous broadleaf weeds also serve as hosts to dodder. Although dodder is capable of limited photosynthesis, it obtains nearly all of its energy from the host plant. A dodder seedling can survive several days without a host, but if it doesn't come into contact with one within five to 10 days, the seedling will die. Dodder stems that have attached to a host plant have been known to survive for several days after being detached from the host plant.

As dodder plants grow, they continually reattach to the host. When other suitable hosts are nearby, dodder shoots spread from host plant to host plant, often forming a dense mat of intertwined stems. Shaded areas greatly reduce twining and attachment.

Dodder can cause severe damage to lucerne, vegetables, many broadleaf crops, seed crops and ornamental plants. The worst damage occurs when it attaches itself to young seedlings. It may only reduce the energy of mature plants and make them more prone to disease, but it will kill young plants or seedlings.

Once there is a dodder infestation, it needs to be quickly removed before it produces seed. The best way to control dodder is to use multiple approaches. This means getting rid of current dodder plants, prevention of seed production, and destruction of new seedlings. Planting non-host plants is an effective means of managing dodder infestations. Keeping the garden weed-free is also a good idea, because many weeds serve as hosts for dodder.

Crop rotation is very effective as the crops can be moved and replaced with non-host plants. If using weeding crews be sure they clean and check all equipment to prevent spreading the seed.

The project launch is at a Plant Expo to be held at Calvary Hall, Arorangi, at 6pm on Monday.

Meantime, if you sight a plant you believe to be Dodder, then call project coordinator Mahai Daniel on 54092.

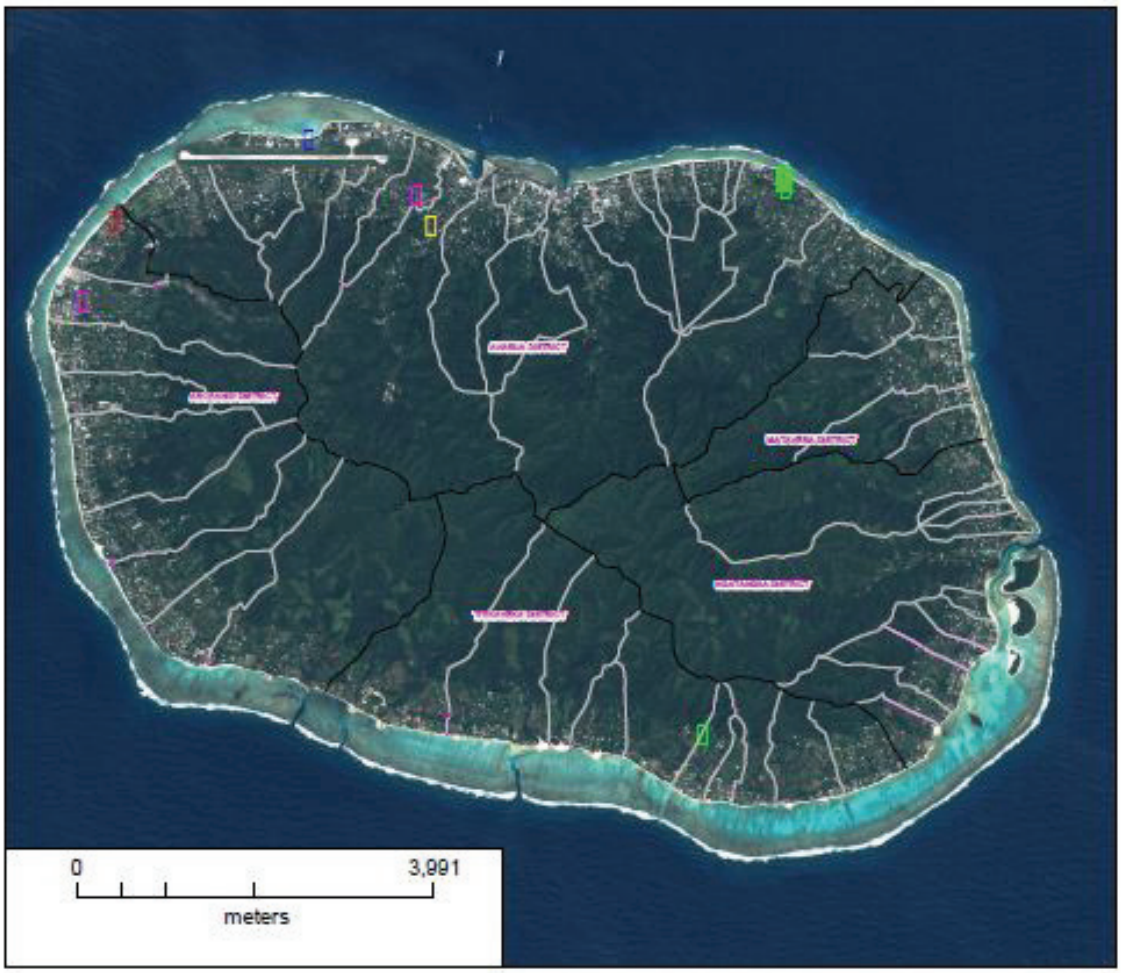
■ *Mark Ebrey*

Arorangi Boys Brigade Company members planning their Dodder campaign. 14073002

IDENTIFICATION & MAPPING

1. Locate & Identify sites
   - Created a Data Form (attached)
2. GIS Mapping
   - Working progress - Olaf Rasmussen

Rarotonga: 2007



Dodder/ Tiaea Locations on Rarotonga

- Balon Vine
- Dodder/ Tiaea
- Love Vine/ Tainoka
- Mile- a- minute/ Pokutekute teatea
- Other Plant

The Image above shows the locations of Dodder/ Tiaea species and others on Rarotonga.

The Inlet below is a closer view of the location of Dodder/ Tiaea invasive species within the Kiikii, Tupapa area.

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arorangibb@gmail.com

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CONTROL CUSCUTA

1. Method of control
   - Host Plant Control – ideal for areas of agricultural activity
   - Chemical Spraying – best for mass control areas with minimal agricultural and home garden areas. Dependent on the type of chemical, it could be used around agricultural sites. Case in point, kauare site, infestation in a maniota (cassava) plantation has been controlled by chemical (escort) spraying
   - Burning – could be used after spraying on high (off the ground) host plants but with absolutely control on transferring of plants/debris from one area to the other.
   - Manual Weeding – very risky method, due to the handling of the plant. Could be controlled.
2. Implementation of control plan
   - Site dependent
   - Monitoring

INVASIVE SPECIES PROJECT DATA SHEET

#	Date	Name	Phone	Address	Location	Date	Plant Identity	GPS Marker	Recommendation
1		Gerald McCormack	24894	Tupapa	Kiikii, Jon Jonassen resident		Identified positive Dodder/Tiaea, covering road side end of kapaie hedge and spread 25m radius in the area	Lat: 21°12'18.663"S Lon: 159°45'04.443"W Alt: 19.74m Radius: 25m	Propose action plan to Landowner and approval
2	10/8/2014	Tom J Marsters	20672	Kavera Arorangi	Resident	11/8/14	Other plant	To be entered	Nil
3	18/8/2014	Mona Unuia	25435/ 25074	Avatiu Valley	Resident	18/8/14	Other plant, unable to identify plant, plant dried up and covering the chestnut tree, allergic reaction to resident.	Lat: 21°12'36.22"S Lon: 159°47'21.336"W Alt: 30.82m Radius: 0	Assist in identifying the plant for health reasons (female owner allergic to the plant)
4	18/8/2014	Michelle	21233	Blackrock Arorangi	Blackrock Villas area	18/8/14	Other plant-balloon vine, covering chilly tree, palm tree hedge & surroundings	Lat: 21°12'34.137"S Lon: 159°49'24.199"W Alt: 24.58m Radius: 0	Resident to clean/weed balloon vine
5	18/8/2014	Rose Kareroa		Arorangi	Resident hedge at the Edgewater	18/8/14	Other plant – mile-a-minute on the hedge	Lat: 21°13'06.307"S Lon: 159°49'36.930"W Alt: 18.17m Radius: 0	Resident to clean/weed mile-a-minute
6	27/8/2014	Louisa Karika	21256 (wk)	Nikao	Hedge on Tutai Toru's resident main road Nikao between First window and D-Vent	27/8/14	Other plant – tainoka, covering hedge on the main road and inside land boundary hedge	Lat: 21°12'02.778"S Lon: 159°48'08.873"W Alt: 10.61m Radius: 0	Preserve the tainoka
7	1/9/2014	Maja (Agriculture)	25403	Nikao	Opposite the Mets Office, Tivaevae Shop				
8	3/9/2014	Albertos	51695	Atupa, Nikao	Resident	6/9/14	Other plant, mile-a-minute	Lat: 21°12'24.804"S Lon: 159°47'27.029"W Alt: 6.05m Radius: 0	Resident to clean/weed
9	6/9/2014	Mark Sherwin		Kiikii, Tupapa	Private Property, next to Diya Jonassen's section	6/9/14	Identified Tiaea around the boundary of section but not including sea side boundary. Main section cleaned. Coverage 10% Area: 36x21m = 756m2 20x4m = 80m2 Total area: 836m2	Lat: 21°12'17.584"S Lon: 159°45'04.519"W Alt: 19.51m Radius: 0	Hedge – cut, bag & burn. Sprayed "round up" under hedge
10		Diya Jonassen		Kiikii, Tupapa	Private Property, next to Jon Jonassen building site.	6/9/14	Identified Tiaea around and inside the section. Coverage 15% Area: 56x18m = 1008m2	Lat: 21°12'18.431"S Lon: 159°45'04.136"W Alt: 17.53m Radius: 0	Hedge – cut, bag & burn, sprayed "round up" under hedge. Sprayed low area only. Sprayed around tarapi bush boundary.
11		David Jonassen		Kiikii, Tupapa	Private Property, around boundary and limited inside section	6/9/14	Identified Tiaea around and inside the section. Coverage 10% Area: 39x16m = 624m2	Lat: 21°12'18.951"S Lon: 159°45'03.150"W Alt: 23.24m Radius: 0	Hedge – cut, bag & burn. Sprayed "round up" under hedge. Sprayed low area only
12		Tekeu Framhein		Kiikii, Tupapa	Private Property, around boundary and limited inside section	6/9/14	Identified Tiaea sea side boundary area Coverage 10% Area: 45x33m = 1485m2	Lat: 21°12'19.344"S Lon: 159°45'02.512"W Alt: 26.56m Radius: 0	Sprayed "round up" on low area only
13		Carl Framhein		Kiikii, Tupapa	Private Property, around boundary and limited inside section	6/9/14	Identified Tiaea on entry and west side of the boundary towards the back of the section Coverage 20% Area: 90x37m = 3330m2	Lat: 21°12'21.903"S Lon: 159°45'03.106"W Alt: 11.37m Radius: 0	Landowner had mowed (grasscutter) 50% of coverage area prior to action plan. Sprayed "round up" over cleaned area and balance of area infested.
14	6/9/2014	Brad Fraser	70200	Kauare, Titikaveka	Big Joe (Iro) Shop, backroad, left turn on backroad. Kauare	21/9/14	Identified Tiaea on vacant/maniota plantation plot next to Brad Fraser's resident in Kauare Titikaveka Area: approx. 40x40 = 1600m2 Coverage 40%	Lat: 21°15'54.436"S Lon: 159°45'35.367"W Alt: 34.29m Radius: 0	Cut, bag & burn. Sprayed "round up" under hedge. Sprayed low area only
15	20/9/2014	Nikki Griffin	77704	Tikioki, Titikaveka	Resident	21/9/14	Other plant – mile-a-minute,	NIL	Resident to clean/weed mile-a-minute
16	29/9/2014	Rua Teio	22459	Kavera, Arorangi	Next door neighbour, Miri Taana's place. Atupare road, Kavera.	29/9/14	Other plant – mile-a-minute on the hedge	NIL	Resident to clean/weed mile-a-minute
17	14/10/2014	Heath Heather	73539	Rauroa road, Inave, Arorangi	Back road entrance to Sam Samuel's plantation on the back road	8/11/14	Identified Tiaea on the kapaie hedge on the corner of Sam Samuel's plantation section on the back road. Area: approx. 10x2m = 20m2 Coverage 80%	NIL	Hedge – cut, bag & burn. Sprayed "round up" under hedge. Sprayed low area only

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CONTROL PLAN TABLE

INVASIVE SPECIES PROJECT CONTROL SHEET

#	Name	Location	Recommendation	Implementation Action
1	Tom J Marsters	Resident	Resident to clean/weed plant	Advised resident of identification process and been negative species. No further action from Team Tiaea
2	Mona Unuia	Resident	Resident to clean/weed plant	Advised resident of identification process and been negative species.
3	Michelle	Blackrock Villas area	Resident to clean/weed plant	Advised resident of identification process and been negative species.
4	Rose Kareroa	Resident hedge at the Edgewater	Resident to clean/weed plant	Advised resident of identification process and been negative species.
5	Louisa Karika	Hedge on Tutai Toru's resident main road Nikao between First window and D-Vent	Resident to clean/weed plant	Advised resident of identification process and been negative species.
6	Maja (Agriculture)	Opposite the Mets Office, Tivaevae Shop	NIL	NIL
7	Albertos	Resident	Resident to clean/weed plant	Advised resident of identification process and been negative species.
8	Mark Sherwin	Private Property, next to Diya Jonassen's section	Cutting, Bagging & Burning, Chemical spraying	Hedge – cut, bag & burn. Sprayed "round up" under hedge
9	Diya Jonassen	Private Property, next to Jon Jonassen building site.	Cutting, Bagging & Burning, Chemical spraying	Hedge – cut, bag & burn, sprayed "round up" under hedge. Sprayed low area only. Sprayed around tarapi bush boundary.
10	David Jonassen	Private Property, around boundary and limited inside section	Cutting, Bagging & Burning, Chemical spraying	Hedge – cut, bag & burn. Sprayed "round up" under hedge. Sprayed low area only
11	Tekeu Framhein	Private Property, around boundary and limited inside section	Cutting, Bagging & Burning, Chemical spraying	Sprayed "round up" on low area only
12	Carl Framhein	Private Property, around boundary and limited inside section	Landowner cleaned area. Chemical sraying	Landowner had mowed (grasscutter) 50% of coverage area prior to action plan. Sprayed "round up" over cleaned area and balance of area infested.
13	Brad Fraser	Big Joe (Iro) Shop, backroad, left turn on backroad. Kauare	Cutting, Bagging & Burning, Chemical spraying	Chemical spraying – Meturon at a rate of 10ml
14	Nikki Griffin	Resident	Resident to clean/weed plant	Advised resident of identification process and been negative species.
15	Rua Teio	Next door neighbour, Miri Taana's place. Atupare road, Kavera.	Resident to clean/weed plant	Advised resident of identification process and been negative species.
16	Heath Heather	Rauroa road, Back road entrance to Sam Samuel's plantation on the back road	Cutting, Bagging & Burning, Chemical spraying	Hedge – cut, bag & burn. Sprayed "round up" under hedge. Sprayed low area only

top left: burning tiaea after cutting and bagging.
top right: team tiaea using waste cooking oil to assist in the burning process
above: agriculture chemical consultant & Avatiu Mongoose Golden Oldies member, Anau Manarangi assisting in the chemical spraying

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+682 54092
or 75302
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MONITORING PLAN TABLE

INVASIVE SPECIES PROJECT MONITORING SHEET

Date	Name	Location	Coverage (approx.)	Regrowth	Recommendation
6/9/2014	Mark Sherwin	Private Property, next to Diya Jonassen's section	Initial Coverage 10% Area: 36x21m = 756m2 20x4m = 80m2 Total area: 836m2 5% total coverage	Driveway hedge – 5% regrowth & new growth.	Cut, Bag & Burning with chemical spraying at the base of the hedge.
	Diya Jonassen	Private Property, next to Jon Jonassen building site.	Initial Coverage 15% Area: 56x18m = 1008m2 10% total coverage	Front & middle of section with 10% regrowth & new growth	Chemical spraying Agriculture - Anau Manarangi
	David Jonassen	Private Property, around boundary and limited inside section	Initial Coverage 10% Area: 39x16m = 624m2 1% total coverage	2% Right side boundary towards sea side. Hedge complete control.	Chemical spraying Agriculture - Anau Manarangi
	Tekeu Framhein	Private Property, around boundary and limited inside section	Initial Coverage 10% Area: 45x33m = 1485m2 5% total coverage	3% sea side and under iron wood tree	Chemical spraying Agriculture - Anau Manarangi
	Carl Framhein	Private Property, around boundary and limited inside section	Initial Coverage 20% Area: 90x37m = 3330m2 5% total coverage	5% road side entry, right side driveway, next to house foundation.	Chemical spraying Agriculture - Anau Manarangi
6/9/2014	Brad Fraser	Big Joe (Iro) Shop, back road, left turn on back road. Kauare	Initial Coverage 40% Area: approx. 40x40 = 1600m2 20% total coverage	Some areas not reached by the chemical spraying. Growth still very much in the coverage area	Cut, Bag & Burning with chemical spraying.
14/10/2014	Heath Heather	Rauroa road, Back road entrance to Sam Samuel's plantation section.	Initial Coverage 80% Area: approx. 10x2m = 20m2 50% total coverage	5% road side entry.	Cut, Bag & Burning with chemical spraying at the base of the hedge.
21/10/14	Kiikii 5 Sites	• **Coverage** – there has been some decreased on the overall coverage of the 5 sites in kiikii, some are more significant than others and especially area's that the chemical control was used. There is no regrowth around the chemical sprayed spots and our findings gives us the impression that the chemical spraying does work. • **Regrowth** – unfortunately, sites that was not controlled either by spraying or weeding have spread or started in another area close by, this is more prominent on Diya section (section before the building). • **Control** – sprayed escort (new weed control chemical) a week ago and waiting on the outcome of this second spraying. One point that we picked up was, on low lying controlled (sprayed) growth area, tiaea has dried up right down to the soil (good sign) and a bit more work is needed on higher host plant growth (eg rats tail plant - purple) where it's dried up but tiaea is still hanging on the plant which could course the dried up seeds to airlift. Will be devising a plan to attack this issue. **Overall inspection**, indicates that chemical control is good for wide coverage controlling. Hand weeding is properly the hardest way but could also be the worst because of a lot of handling of the Tiaea – pulling, shaking sand/soil off, and carting host plants with Tiaea on. Kiikii sites are non-crop areas, so chemical could be used on a mass control method.			
2/12/214	Mark Sherwin	Private Property, next to Diya Jonassen's section	Initial Coverage 10% Area: 36x21m = 756m2 20x4m = 80m2 Total area: 836m2 5% total coverage controlled from initial coverage	driveway hedge and mauku area has 5% new & regrowth (no improvement – no spraying made on this site)	Chemical spraying Agriculture - Anau Manarangi

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	Diya Jonassen	Private Property, next to Jon Jonassen building site.	Initial Coverage 15% Area: 56x18m = 1008m2 10% total coverage controlled from initial coverage	sprayed spots showing good control but about 5% new growth (biggest control result)	Chemical spraying Agriculture - Anau Manarangi
	David Jonassen	Private Property, around boundary and limited inside section	Initial Coverage 10% Area: 39x16m = 624m2 5% total coverage controlled from initial coverage	very good control showing and 3% new growth (better result)	Chemical spraying Agriculture - Anau Manarangi
	Tekeu Framhein	Private Property, around boundary and limited inside section	Initial Coverage 10% Area: 45x33m = 1485m2 5% total coverage	sprayed spots showing good control but about 5% new growth (good result)	Chemical spraying Agriculture - Anau Manarangi
	Carl Framhein	Private Property, around boundary and limited inside section	Initial Coverage 20% Area: 90x37m = 3330m2 5% total coverage	Sprayed spots showing good control but about 5% new & regrowth (good result).	Chemical spraying Agriculture - Anau Manarangi
	Brad Fraser	Big Joe (Iro) Shop, back road, left turn on back road. Kauare	Initial Coverage 40% Area: approx. 40x40 = 1600m2 5% total coverage,	Sprayed spots showing good control but about 3% new & regrowth	Chemical spraying Agriculture - Anau Manarangi
	Heath Heather	Rauroa road, Back road entrance to Sam Samuel's plantation section.	NIL	NIL	Chemical spraying Agriculture - Anau Manarangi

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