

Horticulture Innovation Australia

Final Report

Banana Bunchy Top Virus - Phase 2

Jim Pekin
Australian Banana Growers Council Inc

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Fax: (02) 8295 2399

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Keywords

Banana; Banana Bunchy Top Virus; BBTV: disease; Management; Eradication;

Summary

Phase 2 of the National Banana Bunchy Top Project was conducted from July 1, 2012 to June 30, 2015. It was the second phase in a 10 year plan aimed at eradicating Banana Bunchy Top Virus (BBTV) from Australia.

Why is the banana industry concerned about Bunchy Top? It is the most serious virus disease of bananas; badly affected plants will not produce fruit and if left unchecked a plantation will become completely infected through the movement of infected banana aphids, which carry the virus. In Australia the disease is confined to South East Queensland (SE Queensland) and Northern New South Wales (NSW) meaning that over 95 percent of the industry (Far North Queensland, Southern NSW zone, Western Australia and Northern Territory) is free of the disease. Controlling BBTV and excluding it from the major production areas was a major focus of the Project.

Target audiences included the growers themselves, surrounding neighbours of commercial plantations and the community at large. Project activities were targeted to minimise the impact of BBTV on growers and to protect growers in uninfected areas. This phase aimed to preserve area and subzone freedom, eradicate the disease from other subzones and contain and suppress the disease in remaining subzones.

While there is no resistance to BBTV in any commercially acceptable cultivars, the life cycle of the disease is well understood and early detection and removal in commercial plantations is an effective means of control. Early detection of Bunchy Top is difficult so trained professional inspectors were deployed by the Project to detect and destroy infected plants properly.

Project inspectors followed a planned surveillance strategy inspecting every plantation within the BBTV infection zone at a frequency determined by the level of infection within that plantation.

During Phase 2, the data showed a trend towards plantations in NSW moving from the "infected" categories to "free" and "provisionally free", however five plantations returned to the "high infection" category. This may be attributed to the proximity and number of backyard bananas in valleys just over the border in Queensland and the partial loss of inspection in that state which weakened the perimeter surveillance security around commercial plantations in northern NSW and SE Queensland.

The Project also funded research to determine how long the virus can remain in the plant before symptoms develop (latency) and developing improved destruction methods for infected plants and the aphid vector during cooler slower growing conditions – this is subject to ongoing field investigations and glasshouse trials.

The communications activity during Phase 2 delivered material to key target audiences. But in terms of behavioural change, there were no measurement tools to assess this.

Feedback from the field inspectors is that there is a constant need to keep reminding the community of the threat of Bunchy Top and that more community engagement is needed to get support to control the disease.

Eradication remains a feasible goal in the NSW BBTV zone, provided that it is supported by a positive regulatory environment. During the latter part of Phase 2 it became clear that the biggest threats to achieving eradication were preventing infection from backyard and feral banana plants and the Biosecurity Queensland policy on regulatory compliance.

Plans must be made over a longer term to preserve the gains made to date, and to continue to make progress against interim goals.

Introduction

Bunchy Top has plagued the banana industry in Australia since the 1920s after infected planting material was introduced from Fiji in 1913. It was the pioneering research by Dr C J Magee in the mid-1920s that established that the disease was caused by a virus that was transmitted by the banana aphid (*Pentalonca nigronervosa*).

Dr Magee's research and recommendations provided the basis for a successful containment strategy and replanting program based on the following lessons learned since the 1920s –

- Exclusion of the disease from unaffected or lightly affected areas and eradication of infected plants from lightly and heavily affected areas.
- Diseased plants in areas surrounding commercial plantings must be removed to avoid re-infection.
- Control must be backed by a regulatory system based on legislation.
- The success in detecting diseased plants was directly related to the number of inspections.
- Eradication from defined areas is possible. The virus was eradicated from Innisfail in north Queensland twice and from three areas in NSW.

In NSW, trained Bunchy Top detectors were employed since the 1930s and funded from grower levies to detect and destroy infected plants in all plantations in the infected areas. The control programs were supported by state legislation and regulations which covered compulsory destruction of infected plants, penalties for weedy or neglected plantations, and a planting permit approval system to supply planting material from approved sources.

In Queensland, it had been the grower's responsibility to find and destroy infected plants, supported by regulatory inspectors enforcing regulations to report and destroy infected plants. Control over the movement of planting material, regulatory activities, research and communication activities were under the supervision of the Banana Industry Protection Board (BIPB) until 2003/04. Since the demise of the BIPB, and the consequent reduction in regulatory compliance, a resurgence of Bunchy Top infection occurred.

The banana industry reduced Bunchy Top infection levels to the lowest in 60 years through a previous five year project funded by Horticulture Research and Development (the forerunner to HAL) from 1993 to 1998 (FR 626 and FR 06026). However it failed to achieve eradication due to the level of funding and regulatory compliance in NSW and Queensland. As a result a resurgence of Bunchy Top occurred particularly in SE Queensland.

The introduction of compulsory levies in the Australian banana industry in 2007/08 provided the opportunity to fund a national Bunchy Top control and eradication program which began in 2009.

Using Dr Magee's findings and reviewing current research and field investigations, Dr John Thomas, Australia's world leading expert on Bunchy Top disease, produced the scientific basis for the current BBTV project in 2009 in his review "*Strategies for the control and ultimate eradication of Banana Bunchy Top virus*".

These strategies for control and eradication focused on two major requirements –

- Frequent inspections, preferably at the interval before four new leaves are produced (ideally two leaves)
- Eradication of nearby external sources of infection including intensive surveillance within 100-200 metres of infected plantations.

Preventing spread to the major production areas in Far North Queensland has been a high priority. If an uncontrolled incursion occurred there, production losses of 90% could result within 10 years. An independent economic analysis¹ calculated the value of produce that could be saved by excluding Bunchy Top from the major production areas ranged from \$17.9 - \$27 million annually.

Coordinating a national control program where NSW and Queensland have historically two very different surveillance and regulatory environments was a challenge to the Project, in both Phases 1 and 2, but Dr John Thomas, concluded that "the Australian program remains the only effective BBTV control program in the world."

Methodology

Strategies for the control and eradication of BBTV for this project were proposed by Dr John Thomas (May 2009) in his review of the scientific basis for the current detection and eradication procedures used in New South Wales and Queensland.

Key findings of the review shaped the methodology of the Project. These included –

1. The average distance of spread by aphids is 15.2 metres.
2. About 66% of new infections occur within 20 metres of the nearest source of infection, and 99% occur within 86 metres (Allen 1987).
3. The average time between infection of a plant and spread by aphids from this plant was equivalent to the time taken for 3.7 leaves to emerge.
4. With a constant source of external infection from smallholder plantings (e.g. backyards), the incidence of Bunchy Top in commercial plantations could not be prevented, even with weekly inspection and eradication cycles.
5. Roguing of plants within a 5 or 10 metre radius of an infected plant (a bullring) would not be required if inspections occur at interval required to produce four new leaves.
6. Separations of 100 metres or greater from the source of infection significantly limits recurring infection from outside the plantation.
7. Regular and efficient inspection cycles are the predominantly important factor in Bunchy Top control.

¹ Dr David Cook (et.al-2012), University of Western Australia and the CRC for National Plant Biosecurity

8. Bunchy Top symptoms are difficult to detect in the one or two leaf stage. Preventing spread from an infected plant will be achieved if Bunchy Top is detected and plants destroyed at this stage. Specialist detectors are trained to detect BBTV at this early stage.
9. Injections to kill the plant and prevent aphid spread should be further investigated.

From these findings modifications were introduced to improve the efficiency of the existing system for this project, notably –

- Abolishing ‘bullringing’ as this practice removes many healthy plants and creates gaps within the plantation, making management operations difficult. It is unpopular with growers and research shows that Bunchy Top can be reduced effectively by increasing the inspection frequency.
- Injection of glyphosate herbicide and a systemic insecticide as separate injections to effectively kill banana plants and aphids without the disturbance created by the old ‘cut up and kero’ method of destruction. Trials were also initiated to develop a more effective and safer replacement for Dimethoate systemic insecticide.
- Inspections of buffer areas surrounding each commercial plantation for at least 100 metres. In high risk and strategically located areas buffer zones were increased to 1-2km radius.
- Maintaining effective and visible decontamination of vehicles and equipment to prevent the spread of diseases, particularly Panama disease.

A comprehensive database and surveillance priority system was developed at the start of Phase 1 of the Project to ensure every plantation within the Bunchy Top zone was inspected at a frequency according to past infection levels and the risk to neighbouring plantations. Delimiting surveys were conducted to the north of the known Bunchy Top zone in SE Queensland and to the south in NSW, to ensure the extent of infection was known.

During Phase 2, all commercial plantations in NSW and SE Queensland within the Bunchy Top infection zone were categorised and inspected according to their infection status.

Infection categories -

- | | |
|----------|--|
| A | No Bunchy Top recorded |
| B | No Bunchy Top for two years (provisionally free) |
| C | No more than 1 Bunchy Top in previous 12 months |
| D | More than 1 Bunchy Top in previous 12 months |
| E | More than 10 Bunchy Top in previous 12 months |

Inspection Frequency –

- | | |
|------------------|--|
| A | One inspection per year |
| B & C | 2 – 3 inspections per year |
| D & E | Every four weeks in growing season (9-10 inspections per year) |

New digital technologies were introduced to ensure infection data was recorded accurately and systematically. Personal Data Assistance (PDA) units were used by each inspection team to record the accurate location of infected plants within the plantation, the number of infected leaves, treatments applied and cadastral information on the property and owner details.

Inclusion of a specialist mapping and surveillance data base inspector, Mr Barry Sullivan, enhanced the efficiency of the project management. High definition imagery also assisted in the planning of surveillance activities.

Unfortunately a trial on the use of new technologies such as infra-red spectral reflectance imagery designed to identify individual banana plants in residential and feral situations and expedite ground survey work was not sufficiently accurate to warrant its use.

Project communications were essential to the success of Phase 2. Conducted by consultant Mr Neville Sloss from Green PR, the activities supported the following objectives –

- To keep growers informed of the progress of the project via ABGC publications and communications.
- To inform and educate the community about the disease through a variety of targeted activities throughout the Bunchy Top zone.

To reach growers apart from the direct contact, articles for industry publications were produced and to reach community audiences local press, regional media and printed materials and videos were utilized, as well as community shows and events.

Biannual meetings of the Project Reference Committee (PRC) were held to provide direction during Phase 2. The PRC included the Project Leader (ABGC), one grower representative, one HAL representative, one regulatory representative from NSW and one from Queensland from Biosecurity agencies.

An independent mid-term review was conducted to review the progress of Phase 2 in July-August 2014 by Fiona Macbeth (Blackwood and Kemp, Consultants).

Outputs

Over the three years of Phase 2 the following outputs were completed:

Surveillance

- Number of commercial plantation inspections conducted -1960 - in NSW covering a total plantation area of 8184.67 ha averaging 233.8 ha per month. (240 growers across 800 ha)
- Number of commercial plantations inspections conducted in SE Queensland – 1209 - with the total number of infections being 576. (43 growers across 121 ha)
- Number of non-commercial and backyard inspections conducted in SE Queensland – 5342. The total number of bunchy top infections was 986 clumps comprising 7816 stems.
- Number of inspection hours by NSW inspection teams conducting inspections in SE Queensland – 1584 hours since December 2013 (following the reduced inspection capability in SEQ).
- Surveillance data collected on each plantation included in central data base and inspection management schedules adjusted according to infection data.

- Surveillance data for NSW commercial plantations. (See Appendix 1)
- Infection data - NSW hot spot plantations compared to total infections. (See Table in Outcomes)
- NSW bunchy top plantation area and infection categories table. (Appendix 2)
- Surveillance data summary table – SE Queensland commercial plantations. (Appendix 3)
- Surveillance data summary table – SE Queensland backyards. (Appendix 4)
- SE Queensland infection data – area by infection category. (See Table in Outcomes)
- Plantation details – SE Queensland (Appendix 5)
- Destructions of abandoned and neglected plantations conducted in strategic risk areas – e.g. Tallebudgera valley (SEQ), Stokers Siding (NNSW).
- Number of planting permits issued – NSW by the Project Manager:
 - 128 for 2012/13,
 - 117 for 2013/14 (57 commercials and 60 non-commercials totalling 51597 plants).
 - 66 for 2014/15
- Meetings with Queensland Biosecurity authorities to discuss improving regulatory support for the project, training of field staff.
- Input provided to NSW DPI Biosecurity on proposed changes to regulations relating to banana diseases.
- Maps prepared to assist strategic management of the Bunchy Top project included examples such as:
 - Key hot spot target areas and buffer zones.
 - Queensland/NSW border area location of plantations, and Bunchy Top inspections conducted (example Appendix 6)
 - Location of all NSW commercial growers in Bunchy Top zone (Appendix 7)
 - Inspection map NSW Nov 2013 – Feb 2014 (Appendix 8)
 - NSW buffer zones around commercial plantations (Appendix 9)

Communication:

- Bioversity International, Infomusa@ feature article "*Australia's 100 years war on Bunchy Top*". (Appendix 10)
- Various news releases (an example is in Appendix 11)
- Articles for local newspapers and councils (example Appendix 12)

- Articles for Community club newsletters (example Appendix 13)
- Segment on ABC's "Gardening Australia".
- Video – short and long versions for use on website, You Tube and at presentations.
- Attendance at shows each year including Queensland Garden Expo, Nimbin Show, Farm Fantastic, Murwillumbah Show
- Production of a general and a schools poster (Appendices 14 & 15)
- Update of general information brochure (Appendix 16)
- Hotline 1800 telephone number for reporting of suspect bananas
- Website information on ABGC website

Research

- Remote sensing trial conducted by Dr Kasper Johansen, University of Queensland in 2013. Costing \$32,000, funded by Bunchy Top project. (See Scientific Refereed Publications)
- Latency research and trials conducted to improve methods of plant and aphid destruction during cooler months. (See Scientific Refereed Publications).
- Field and glasshouse trials, from Dr John Thomas and Dr Kathy Crew. Outputs of this research were:
 - Knowledge that genetic variation between virus isolates is extremely limited.
 - Improved destruction methods with the incorporation of Pulse penetrant to aid in the uptake of injected chemicals and an understanding of how long treated plants may remain infectious.
 - Research identifying possible latency mechanisms of the disease.

Management

- Monthly Reports. These were submitted to the Project Leader summarizing all activity and project highlights.
- Milestone Reports. These were produced every six months according to the Project schedule.
- Project Reference Committee meetings. Reports were presented to this committee at each meeting.

Outcomes

NSW Commercial Plantations

The following Table shows the number of plants detected as infected with BBTv annually.

Total Annual BBTV infections since start of the Phase 1 Project

Phase I		Bunchy Top infections
Year 1	2009/10	812
	2010/11	521
	2011/12	382
Phase I Total		1715

Phase II		Bunchy Top infections
	2012/13	392
	2013/14	345
	2014/15	348
Phase II Total		1085

Summary of Progress – Phase 2

NSW BUNCHY TOP PLANTATIONS Area x Infection Category

Infection Category	Start of Phase 2 31 July 2012		31 December 2012		31 December 2013		31 December 2014		End of Phase 2 30 June 2015	
	Plantations	AREA (ha)	Plantations	AREA (ha)	Plantations	AREA (ha)	Plantations	AREA (ha)	Plantations	AREA (ha)
A	71	237.1	79	215.21	84	244.83	89	241.34	86	243.04
B	74	222.27	83	289.93	88	324.59	80	286.36	74	252.80
C	47	186.17	37	115.89	27	70.65	35	139.52	46	174.97
D	22	112.53	24	100.29	21	101.46	25	75.26	22	83.87
E	7	36.88	6	50.41	10	57.81	9	68.66	12	93.26
Total	221	794.95	229	771.53	230	779.34	238	811.14	240	847.94

Infection categories

- A** No Bunchy Top recorded
- B** No Bunchy Top for two years (provisionally free)
- C** No more than 1 Bunchy Top in previous 12 months
- D** More than 1 Bunchy Top in previous 12 months
- E** More than 10 Bunchy Top in previous 12 months

Inspection Frequency

- A** One inspection per year
- B & C** 2 – 3 inspections per year
- D & E** Every four weeks in growing season (9-10 inspections per year)

Summary of Progress – Phase 2

**QUEENSLAND BUNCHY TOP PLANTATIONS
Area x Infection Category**

Infection Category	Start of Phase 2 31 December 2012		End of Phase 2 30 June 2015	
	No. Plantations	AREA (ha)	No. Plantations	AREA (ha)
A	25	75.7	27	93
B	3	15.4	7	30
C	1	0.8	0	0
D	2	10.5	5	12
E	6	15.4	4	15
Total	37	117.8	43	150*

* NOTE: Latest data supplied 30 June 2015 shows total area is 121.4ha. The discrepancy is probably due to the phasing out or abandonment of several plantations which are no longer “commercial”.

Since start of this Project (Phase II):

- The provisionally free (Category B) NSW plantation area increased by 30.5ha.
- The number of Category C plantations in NSW decreased by one and area increased by 11ha.
- Category D plantations in NSW remained at 22 with the area decreasing by 29ha.
- Five more NSW plantations were added to the Category E, increasing the area by 56ha.
- The Revised NSW Plant Disease Regulations were gazetted in December 2013 following technical input from the Bunchy Top project and ABGC grower directors. NSW DPI Biosecurity actively sought input from the project and industry prior to the formulation of the new regulations designed to be more effective and simpler.
- In SE Queensland the number of Category B (provisionally free) plantations increased from 3 to 7, increasing the area from 15.4 to 30ha.
- Category D Queensland plantations increased from 2 to 5 with a marginal increase in area from 10.5 to 12 ha.
- The number of high infection category plantations fell from 6 to 4 and the total area of Category E plantations remains at 15 ha in SE Queensland.

Communications

- BBTv media releases issues were generally used by local community papers increasing awareness of local issues regarding Bunchy Top– (see examples, Appendices 17 & 18).
- Presence at shows enabled inspectors to speak to hundreds of people about the disease and increase community awareness in targeted communities.
- Regular updates were provided through the HIA-funded ABGC publications including the e-Bulletin, Australian Banana News (example -Appendix 19) and Australian Bananas magazine (examples – Appendices 20 & 21)
- The Bunchy Top videos were viewed more than 3,200 times on You Tube.
- Several calls per week were taken on the Hotline and referred to inspectors for follow-up. Callers were also referred to the Bunchy Top website for more information.
- The article in *Subtropical Gardening* (see Appendices 22 & 23) went to over 10,000 subscribers, while the ABC's Gardening Australia segment would have been seen by more than 600,000 viewers, many in the Bunchy Top zone.
- Posters were distributed to schools by inspectors in SE Queensland and by mail to schools in

NSW. The general poster was distributed also out to garden centres in SE Queensland with the support of the Nursery & Garden Industry of Queensland.

- Engagement with local communities was undertaken, with information being used by the Gold Coast Organic Growers Group in their newsletter, and a presentation was made to the Caboolture Gardening Club with around 50 members attending.

Research

The outcomes from research conducted by Drs Thomas and Crew were:

- Improved destruction methods. Incorporation of Pulse penetrant will aid future treatment of infected plants and reduce spread of virus from treated plants.
- Findings of research into latency. A hypothesis for the basis of BBTv latency has been established. Further detailed work is required to test this hypothesis and understand the mechanisms underlying restriction of virus infection within the corm.

Evaluation and Discussion

This phase established that eradication of Bunchy Top in the heavily urbanized areas of SE Queensland is not possible. Priority was directed to protecting commercial plantations by conducting surveillance within the plantation and in the perimeter surrounding the plantations.

The use of the plantation category system with associated frequency of inspections allowed for movement up and down in categories as infections were found or not detected. Importantly, it enabled inspectors to respond rapidly and increase surveillance so plantations had the greatest chance of getting Bunchy Top under control. The system did mean that it was two years after an infection before it could be provisionally free.

While this strict regime did mean a degree of fluidity in the figures, overall the trending was positive and moving in the right direction, following on from the progress made in Phase 1."

As there are budget limitations for the next BBTv project (Phase 3), there will be at best retention of some BBTv free zones and others with various levels of infection in SE Queensland. At the epidemiological level the virus spreads as best it can subject to control strategies. If these controls are relaxed there is an inevitable increase in spread.

At the end of Phase 2 research into latency was still being conducted by Dr John Thomas and Dr Kathy Crew, with some funds provided from this project. There is field evidence to suspect that meristematic tissue may support the virus until that growing point is initiated by the plant. This may cause a time lag of up to three years in some cases. If proven, the consequence of this finding would mean that plants adjacent to previously known infected plants would have to be monitored for a period of three to four years.

The National Bunchy Top Project is making progress towards protecting commercial growers however it the resources required to completely eradicate the disease are not available. It is suggested that plans

be made over a longer term to preserve the gains made to date and to continue to make progress against interim goals.

Despite the limited resources available to achieve the BBTV eradication goal, eradication remains a feasible goal in the NSW BBTV zone. This is where over 80% of subtropical eastern Australian banana production occurs and it is currently supported by a positive State regulatory environment. The biggest threats to achieving the eradication goal however are preventing infection from backyard and feral banana plants and the policy on regulation and compliance activity in SE Queensland.

The hard lessons of the past and the sound scientific advice of our leading scientists (Drs Magee, Allen, Muirhead and Thomas) show that control of BBTV must be backed by a supportive regulatory system. Otherwise it will inevitably cause BBTV to spread, and result in enormous cost to industry in loss of production. It is imperative to exclude the virus from the major production area in North Queensland.

Recommendations

The experience in Phase 2 of the Bunchy Top Project results in the following recommendations:

- Phase 3 needs to maintain the inspection regime that has proven successful in the NSW zone over the past six years. Retaining the inspection team and levels of inspections will provide the potential for eradicating Bunchy Top from commercial plantations in NSW.
- From the research undertaken by Drs Thomas and Crew the following recommendations resulted:
 - Inspections of plantations and backyard plantings in the southern border area of SE Queensland should be maintained to provide an effective buffer to the viable NSW commercial plantations adjacent to the state border. This will require BQ to continue to approve the current limited powers to project inspectors from NSW to enter properties and destroy infected plants in SE Queensland and conduct community engagement activities involving demonstrations. Incorporation of.
 - Pulse penetrants should be incorporated in future treatment regimes and chemical dosage according to plant size investigated.
 - Further research into replicating disease latency under controlled conditions to confirm hypothesis, and investigation of the underlying mechanisms.
- Further research involving field investigations and glasshouse trials are also continuing to develop improved methods of destruction of banana plants and the aphid vector, particularly during the cooler, slow growing months. This is when injected plants can remain infective for up to 40 days following injection of Glyphosate and Imidocloprid systemic insecticide.
- Community engagement is absolutely critical to the success of the eradication goal, particularly as a new regulatory environment is due to be introduced into Queensland in 2016. It will be vital in helping to maintain control of the disease in SE Queensland plantations.
- The planned reduction in regulation in Queensland would put the onus on the grower and other individuals to address their general biosecurity obligation (GBO). Despite this, trained inspectors are a vital tool in helping commercial growers in that State survey and act upon Bunchy Top in

their plantations.

- Introduction of GBOs without effective regulatory enforcement would lead to the further spread of BBTV within the current infection zone by infected aphids and planting material but also potentially to the north, to threaten the expanding production areas around Bundaberg and the major production areas. The movement of planting material should therefore be actively controlled and backed by regulation.

Scientific Refereed Publications

Johansen, K., Sohlback, M., Sullivan, B., Stringer, S., Peasley, D., Phinn, S., 2014. Mapping Banana Plants from High Spatial Resolution Orthophotos to Facilitate Eradication of Banana Bunchy Top Virus. *Remote Sensing*, ISSN 2072-4292. pp 24.

Cook D.C et al, 2012. Predicting the Benefits of Banana Bunchy top Virus Exclusion from Commercial Plantations in Australia, *Plos One*, Volume 7, Issue 8.

Intellectual Property/Commercialisation

No commercial IP generated.

References

Investigation on the Bunchy Top Disease of the Banana, McGee C.J.P., 1927

Framework for the Australian Banana Bunchy Top Eradication Program, Muirhead, Dr. F, August 2008

Strategies for the control of Banana Bunchy Top Virus, Thomas Dr.J.E., February 2009

External Review of the National Bunchy Top Virus Management Project – Phase 1 Project Management, Margetts, J, January 2012

Review of Project BA12006 - Banana Bunchy Top Virus – Phase 2, Macbeth,F, Blackwood & Kemp Pty Ltd., 2015

Acknowledgements

The dedication and passion of David Peasley to manage this national project was unsurpassable.

The Project also acknowledges the dedication, professionalism and commitment of the inspection team. The team included Grant East, Wayne Shoobridge, Tom Maher, Joshua Chapman, Samantha Stringer and Barry Sullivan working in both states for the entire duration of Phase 2.

The input of Barry Sullivan into the mapping and database development for the Project was invaluable. Samantha Stringer showed exceptional ability in communicating with the general public and the media.

The importance of communications became more important as Phase 2 progressed and thanks to Neville Sloss for his input in communications activity as well as strategic support for the management of the Project.

Dr John Thomas and Dr Kathy Crew provided excellent technical support to the Project through field investigations and trials.

It is important to mention the excellent cooperation given by commercial banana growers to the inspection team in the field.

Appendices

1. Surveillance data summary table – NSW commercial plantations.
2. Infection data - Hot spot plantations compared to NSW total infections
3. Surveillance data summary table – SE Queensland commercial plantations.
4. Surveillance data summary table – SE Queensland backyards.
5. Plantation details – SE Queensland
6. Map - Queensland/NSW border area location of plantations, and Bunchy Top inspections conducted
7. Map - Location of all NSW commercial growers in Bunchy Top zone
8. Map - Overall inspection map, NSW
9. Map – NSW Buffer zones – commercial plantations in NSW Bunchy Top zone
10. Bioversity International, Infomusa@ feature article "*Australia's 100 years war on Bunchy Top*".
11. Example news release
12. Editorials for local newspapers & councils (example)
13. Editorials for Community club newsletters (example)
14. Schools poster
15. General poster
16. General information brochure
17. Media clipping example 1
18. Media clipping example 2
19. Australian Banana News example clip
20. Australian Bananas article example 1
21. Australian Bananas article example 2
22. Subtropical Gardening Magazine clipping example 1
23. Subtropical Gardening Magazine clipping example 2

SURVEILLANCE DATA SUMMARY – Phase II**NSW COMMERCIAL PLANTATIONS**

MONTH	NO. BT INFECTIONS DETECTED	NO. PLANTATIONS RECORDING INFECTIONS	TOTAL NO. PLANTATIONS INSPECTED	TOTAL PLANTATION AREA INSPECTED (ha)
August 2012	9	7	84	305.55
September 2012	8	3	27	103.9
October 2012	14	12	43	176.16
November 2012	39	11	45	231.99
December 2012	60	10	40	166.31
January 2013	64	14	54	241.63
February 2013	55	9	40	137.87
March 2013	51	11	60	230.62
April 2013	34	14	61	252.49
May 2013	27	10	59	301.41
June 2013	10	5	58	242.76
July 2013	21	13	77	227.84
August 2013	49	10	71	216.88
September 2013	23	8	50	180.33
October 2013	25	14	75	298.0
November 2013	47	13	76	273.0
December 2013	28	10	47	223.5
January 2014	42	17	46	215.61
February 2014	21	10	57	228.84
March 2014	29	11	48	187.42
April 2014	25	13	55	248.1
May 2014	24	14	48	220.26
June 2014	19	14	72	268.2
July 2014	13	11	92	342.95
August 2014	2	2	35	161.72
September 2014	5	4	70	314.0
October 2014	43	11	58	249.32
November 2014	39	14	52	214.03
December 2014	84	17	41	261.27
January 2015	46	20	55	240.68
February 2015	28	14	60	286.32
March 2015	42	24	64	283.92
April 2015	19	10	39	194.9
May 2015	20	7	49	238.72
June 2015	20	10	52	218.17
TOTAL	1085		1960	8184.67

Appendix 2

BBTV INFECTION DATA – NSW COMMERCIAL PLANTATIONS
(Including chronic Hot Spot plantations as % of NSW total)
1 August 2012 – 30 June 2015

MONTH	PLANTATION NO + (BT COUNT)	HOT SPOT TOTAL	NSW TOTAL	% OF NSW TOTAL
August 2012	65001 (3), 15111 (1), 40031 (1)	5	9	55.0
September 2012	65001 (6)	6	8	75.0
October 2012	15111 (2), 65001 (1), 62041 (1)	4	14	28.6
November 2012	65001 (10), 62041 (7), 15111 (6)	23	39	59.0
December 2012	15111 (18), 65001 (14), 62041 (7)	39	60	65.0
January 2013	65001 (21), 15111 (9), 40031 (4)	34	64	53.1
February 2013	65001 (12), 15111 (4), 40031 (4)	20	55	36.4
March 2013	62041 (13), 65001 (9), 40031 (5), 15111 (3)	30	51	58.8
April 2013	65001 (10), 15111 (7), 40031 (3)	20	34	58.8
May 2013	15111 (7), 62041 (5), 40031 (2), 65001 (1)	15	27	55.6
June 2013	62041 (3), 15111 (2), 40031 (1)	6	10	60.0
July 2013	15111 (1), 40031 (1), 65001 (1)	3	21	14.3
August 2013	40031 (3), 15111 (1), 65001 (1)	5	49	10.2
September 2013	15111 (2), 40031 (1), 65001 (1)	4	23	17.4
October 2013	62041 (3), 15111 (2)	5	25	20.0
November 2013	15111 (4), 62041 (2), 65001 (1), 40031 (1)	8	47	17.0
December 2013	15111 (7), 40031 (5)	12	28	42.8
January 2014	40031 (4), 15111 (3), 62041 (1), 65001 (1)	9	42	21.4
February 2014	15111 (5), 62041 (1), 65001 (1)	7	21	33.3
March 2014	40031 (5), 15111 (4)	9	29	31.0
April 2014	15111 (5), 40031 (3)	8	25	32.0
May 2014	15111 (4), 40031 (1), 62041 (1)	6	24	25.0
June 2014	40031 (2)	2	19	10.5
July 2014	15111 (2), 65001 (1), 62041 (1)	4	13	30.8
August 2014	15111 (1)	1	2	50.0
September 2014	15111 (2), 40031 (1)	3	5	60.0
October 2014	15111 (8), 40031 (2)	10	43	23.3
November 2014	62041 (5), 15111 (3), 40031 (2)	10	39	25.6
December 2014	73031 (41)-new hot spot, 15111 (8), 40031 (2)	51	84	60.8
January 2015	73031 (13), 15111 (4), 40031 (2)	19	46	41.3
February 2015	73031 (7), 62041 (3), 40031 (2), 15111 (1)	13	28	46.4
March 2015	73031 (4), 62041 (2), 15111 (2), 40031 (2)	10	42	23.8
April 2015	73031 (5), 40031 (3), 15111 (1)	9	19	47.4
May 2015	15111 (2)	2	20	10.0
June 2015	73031 (8)	8	20	40.0
TOTAL		420	1085	Ave.38.7%

* Plantations destroyed

SURVEILLANCE DATE SUMMARY – Phase II
SE Queensland – COMMERCIAL PLANTATIONS

MONTH	NO. BT INFECTIONS	NO. OF PLANTATIONS RECORDING INFECTIONS	TOTAL NO. PLANTATIONS INSPECTED
August 2012	54	5	9
September 2012	-	-	-
October 2012	-	-	-
November 2012	28	5	9
December 2012	84	2	9
January 2013	34	2	8
February 2013	15	2	8
March 2013	9	3	8
April 2013	40	6	6
May 2013	8	3	18
June 2013	22	3	5
July 2013	5	3	7
August 2013	26	3	11
September 2013	38	6	11
October 2013	2	2	10
November 2013	15	3	9
December 2013	14	3	7
January 2014	15	4	9
February 2014	15	3	8
March 2014	2	2	8
April 2014	15	4	8
May 2014	6	2	8
June 2014	1	1	9
July 2014	5	4	9
August 2014	21	6	15
September 2014	17	5	9
October 2014	21	6	15
November 2014	7	5	9
December 2014	27	6	8
January 2015	22	5	9
February 2015	11	5	9
March 2015	9	5	10
April 2015	8	4	11
May 2015	1	1	22
June 2015	4	4	9
TOTAL	601		320

SURVEILLANCE DATE SUMMARY – Phase II

SE Queensland - BACKYARDS

MONTH	NO. BT INFECTIONS		NO. OF INSPECTIONS	NO. LOCALITIES INSPECTED
	Clumps	Stems		
September 2012	30	168	-	6
October 2012	60	319	315	11
November 2012	41	257	132	9
December 2012	40	591	104	17
January 2013	75	620	221	11
February 2013	41	388	209	7
March 2013	122	882	494	11
April 2013	58	313	133	8
May 2013	35	450	253	6
June 2013	22	271	33	6
July 2013	49	368	270	14
August 2013	59	467	175	19
September 2013	29	222	240	6
October 2013	13	78	139	19
November 2013	10	42	155	6
December 2013	18	65	299	7
January 2014	50	402	227	9
February 2014	12	112	31	2
March 2014	20	192	212	6
April 2014	45	273	287	9
May 2014	10	104	185	5
June 2014	10	80	22	5
July 2014	22	226	155	6
August 2014	26	170	179	4
September 2014	11	52	214	17
October 2014	9	124	104	6
November 2014	29	180	158	7
December 2014	13	116	50	3
January 2015	11	276	106	4
February 2015	6	51	40	4
March 2015	3	20	60	2
April 2015	6	51	40	4
May 2015	3	20	60	2
June 2015	8	36	40	1
TOTAL	986	7816	5342	

PLANTATION DETAILS

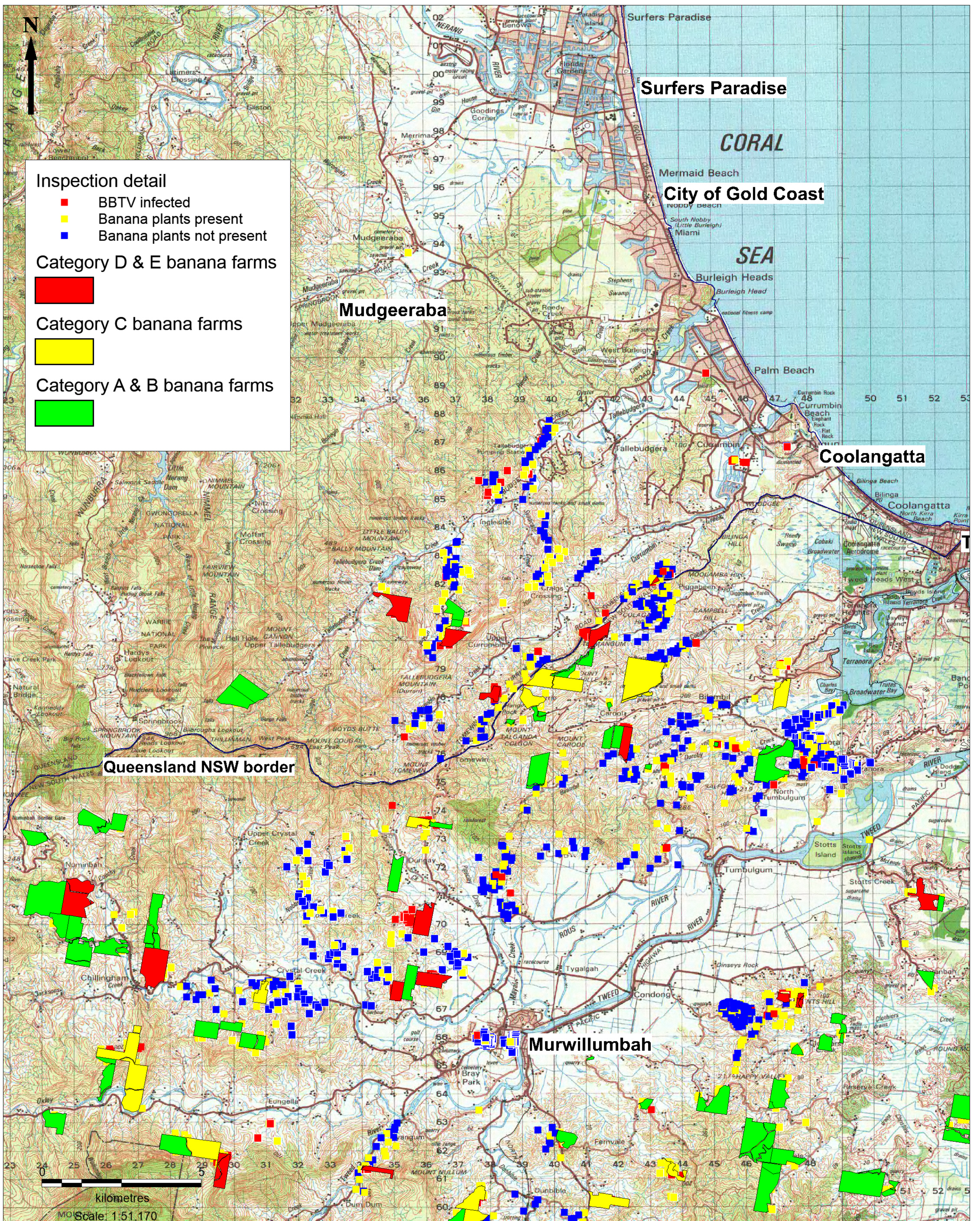
SE QLD

Bunchy Top zone *	No. Growers	Area in ha
Morton Bay Region Growers (Wamuran, Caboolture)	30(69%)	86.23 (71%)
Sunshine Coast Region Growers (Yandina, Montville, Palmwoods))	6	13.96
Gold Coast Region (Currumbin, Tallebudgera valleys)	5	19.0
Brisbane region (Cleveland, Redland Bay, Upper Brookfield)	2	2.22
Total	43 growers	121.41ha

***NOTE:** The above list comprises the current data collected by the SEQ project inspection team as at 30 June 2015. A significant proportion of these plantations are not considered “commercial” due to their weed status and neglect. There is no longer an accurate current register of growers in SE Qld held by Biosecurity Queensland (DAFQ). As some of these plantations are too weedy to inspect or access has been denied, the bunchy top status cannot be verified.

Special Zone – (Bunchy Top free)

Zone	No. Growers	Area in ha
Bundaberg, Gin Gin	14	138.46ha



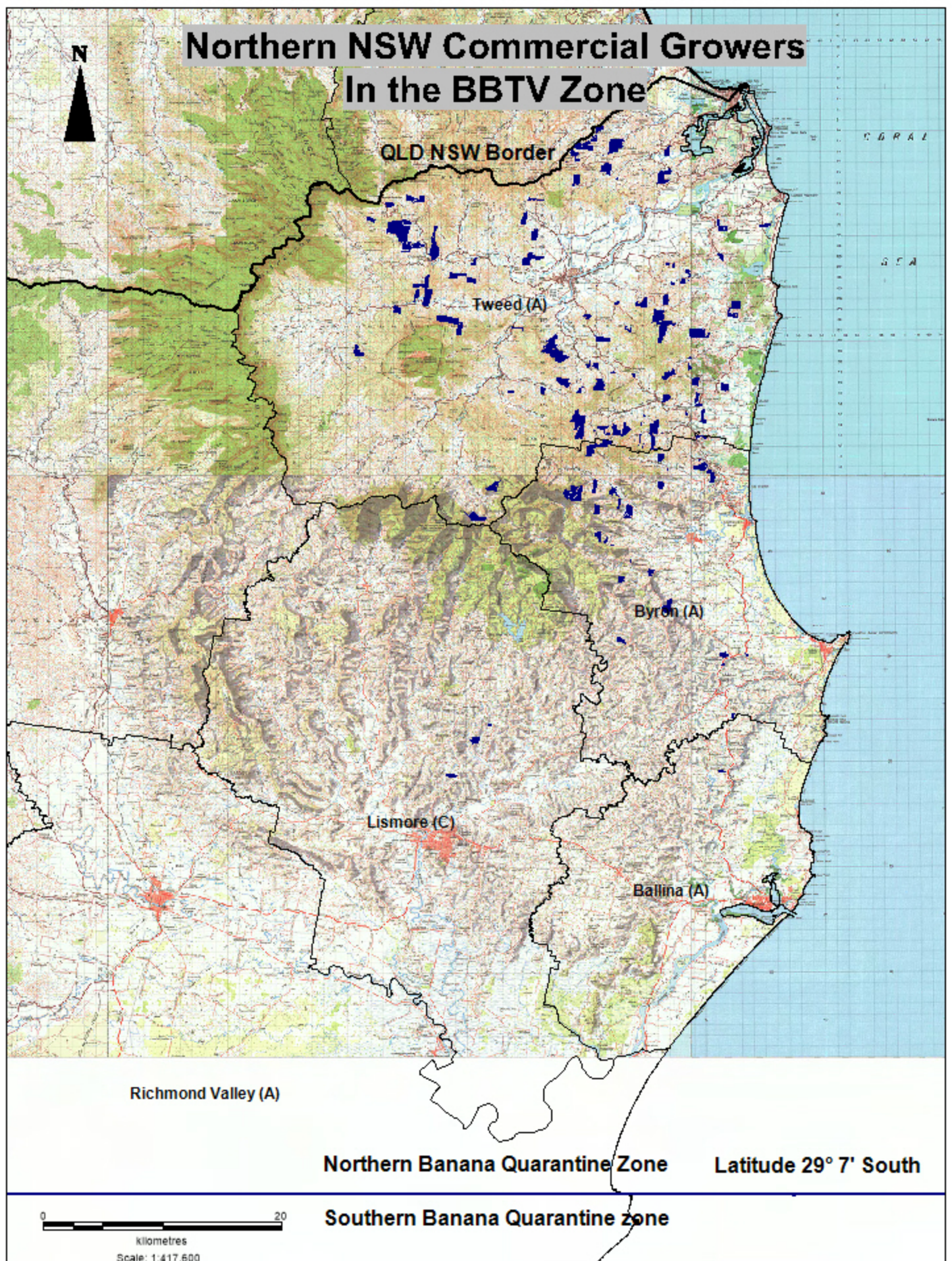
Digital data supplied by Australian Banana Growers' Council (ABGC).
 Projection and datum: Geographics, GDA94
 Map produced by ABGC 2015.

Queensland NSW border area farms and BBTV inspections

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Northern NSW Commercial Growers In the BBTV Zone



Digital data supplied by Australian Banana Growers' Council (ABGC).

Projection and datum: Geographics, GDA94

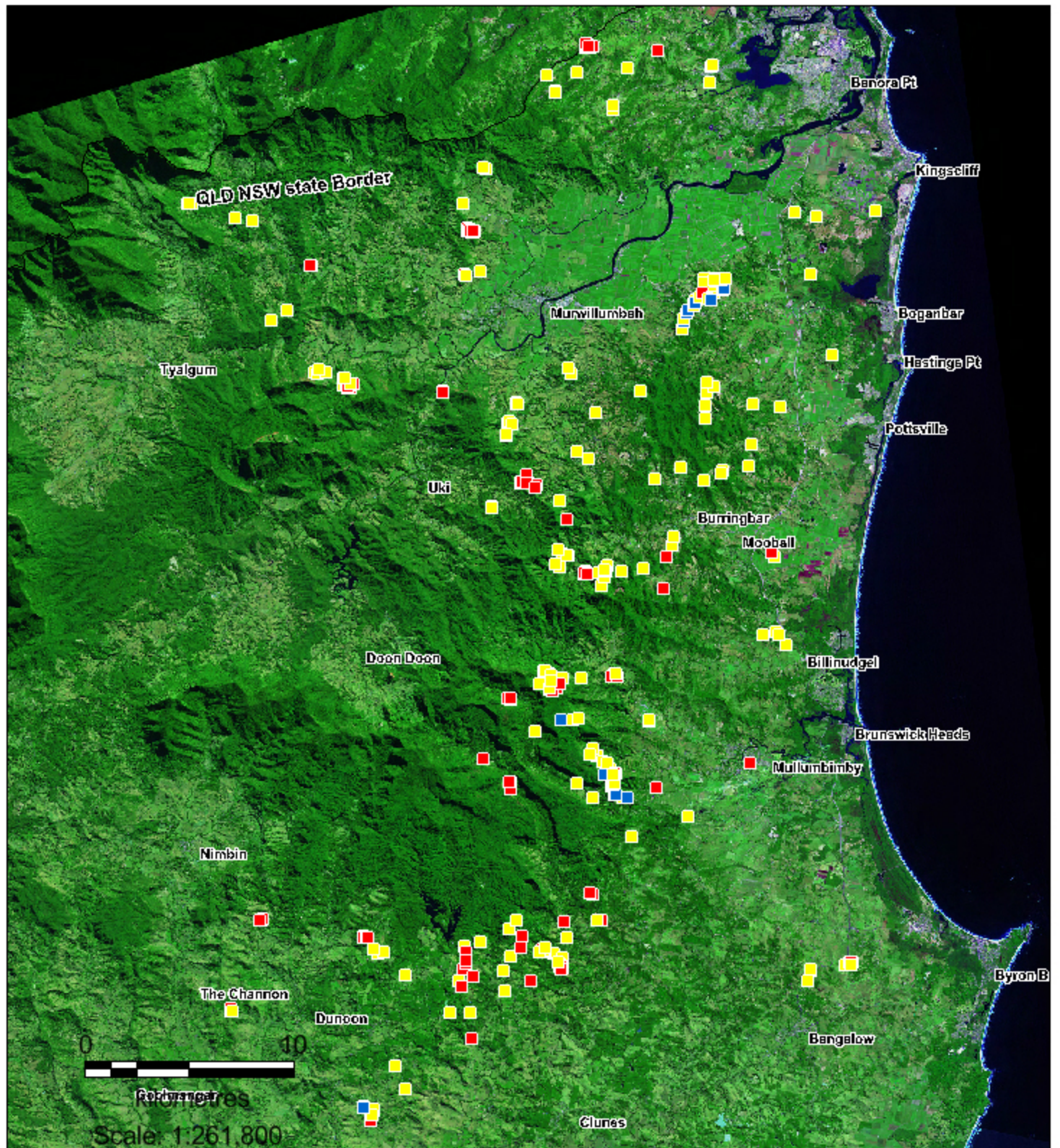
Map produced by ABGC 2014.

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Commercial Banana Growers

Region





Northern NSW BBTV inspections November 13 to February 14

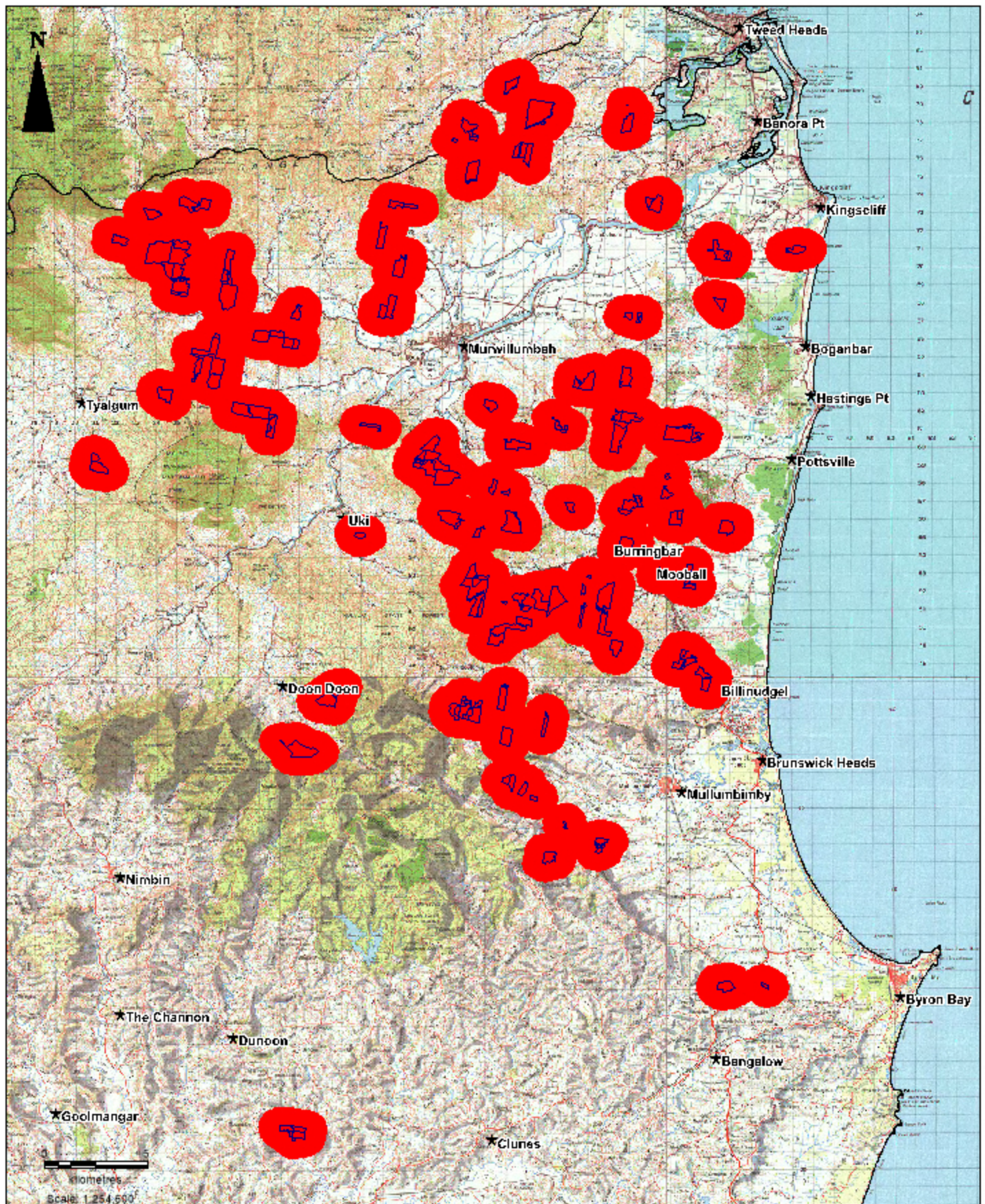
Digital data supplied by Australian Banana Growers' Council (ABGC)
Projection and datum: Geographics, GDA94
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Banana inspections

- Bananas present and inspected
- Bananas present and infected with BBTV
- Property visited bananas not present or unknown





BBTV Farms 1km Buffer Map Northern NSW 2014

Digital data supplied by Australian Banana Growers' Council (ABGC).
Projection and datum: Geographics, GDA94
Map produced by ABGC 2014.

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NSW Banana Growers in BBTV Zone

 Region

1 Km Grower Buffers

Buffers contain 4674 properties in total

 Region



Australia's Hundred Years War on Bunchy top

Australia has embarked on an ambitious plan to eradicate Bunchy top from its territory.

In the 100 years since the *Banana bunchy top virus* (BBTV) arrived in Australia, the control measures put in place have been remarkably effective in preventing the virus from following its host to northern Queensland, where more than 90% of the country's bananas are currently grown. With fewer plantations left in the [Bunchy top](#) zone further south, and a greater distance between them, the prospects for eradicating the disease from commercial plantations have never been better according to David Peasley, the manager of the National Bunchy Top Project. "We got the disease under control in commercial plantations", says Peasley. "The problem is that they are getting infections from banana plants in gardens and hobby farms. To eradicate Bunchy top from Australia, we also need to control it in people's backyards."

Bunchy top was first reported in 1913 in the Tweed River area of New South Wales, near the border with Queensland. It seems that the virus had arrived in suckers imported the year before from Fiji, where the disease had been present since at least 1889. As virologist [James Dale](#) later [noted](#): "This supposedly single introduction began a saga unequalled in the history of plant pathology in Australia".

Unmasking the enemy

At the time, the high price paid for bananas was driving a rapid expansion of banana-growing areas that in turn was increasing the demand for planting material and with it, the involuntary and mostly unrecognized spread of bunchy top. At first, farmers thought they were dealing with some kind of weather-related plant malformation. In those early years the disorder was known as 'Cabbage Top' or 'Curly Top'. As it spread southward into New South Wales and northward into Queensland, nearly wiping out the industry, it became apparent that the problem was far more serious than originally thought.

In 1924, the state governments of New South Wales and Queensland created the Bunchy Top Investigation Committee to conduct research on the disease. The scientists were set up with a laboratory, a glasshouse and experimental plots near the epicentre of the outbreak. By 1927, plant pathologist Charles Magee had [demonstrated](#) that the causal agent was a virus, that it was transmitted by the banana aphid and infected planting material, and that it damaged the phloem region of the vascular system. A remarkable feat considering how little was known about plant viruses at the time. The virus itself was not isolated until the late 1980s.

Based on the results of his investigations, Magee put forward recommendations to prevent the introduction of the disease to BBTV-free areas and to rehabilitate infected areas. The basic tenets include registration of all banana plantations; establishment of quarantine zones; restrictions on the movement of planting material; regular inspection of banana plantations; prompt destruction of infected plants; replanting with BBTV-free planting material; and extension programmes to disseminate information about the disease and its control.

Controlling the virus

The recommendations were quickly implemented. In New South Wales, they led to a 6-fold increase in the area under bananas between 1928 and 1934. By 1935, however, the number and severity of outbreaks was on the rise again. For one thing, the inspectors hired to enforce regulations could not keep up with the rapid expansion of the area under bananas. Then the prices paid for bananas fell, forcing many farmers to abandon their plantations. By then it had also become evident that most farmers were unable to recognize the early symptoms of a Bunchy top infection.

To remedy the situation, the control campaign was reorganized as a collaborative effort between the industry, which funded the hiring of inspectors through a voluntary levy on production, and the Department of Agriculture, which hired and trained them. From that point on, the number of infected plants declined rapidly and eventually stabilized at a low level.

Infection levels also declined in Queensland, where a buffer zone was established north of the BBTV zone to protect the production areas of northern Queensland. The movement of banana material to any part of the state north of that buffer zone was strictly prohibited. The only time the isolation of the north was breached is in 1954, when the virus was spotted in Innisfail and promptly eradicated.

Both states also came close to eradicating the disease from the BBTV zone when the five-year Banana Plant Health Improvement Project further reduced infection levels. Peasley believes that had the project not been stopped in 1998, they would have extirpated the virus. Instead, success was once again followed by a resurgence of the disease, particularly in southeast Queensland, where cutbacks dramatically reduced the number of inspectors dedicated to Bunchy top.

The introduction in 2007 of a compulsory levy provided the impetus for taking another, and hopefully final, stab at the disease. Funded by [Horticulture Australia](#), using the national banana levy and matched funds from the Australian Government, the National Bunchy Top Project is managed by the [Australian Banana Growers' Council](#). Phase 1 of the proposed 10-year time frame to eradicate Bunchy top from Australia was launched in July 2009.

Eradicating the virus

To give the project every chance of success, a six-person Bunchy Top team authorized to operate in both New South Wales and Queensland was set up and the frequency of inspections in the BBTV zone was stepped up. Even the disease-free plantations (no Bunchy top ever recorded) get an annual visit. The provisionally free plantations (no Bunchy top in the previous 2 years) and those that had only one case in the previous 12 months are inspected 2 to 3 times a year. The high-risk plantations, those that had more than one case in the previous year, are inspected between 9 to 10 times a year, including every 4 weeks during the summer growing season.

Four weeks is the time it takes in the summer for a plant to produce four leaves, which more or less corresponds to the incubation period. Experiments had previously shown that the first symptoms usually appear in the third or fourth leaf to emerge after the plant has become infected. However, since the rate at which leaves emerge varies with temperature, from one a week in the summer to about one a month in the winter, the incubation period is better expressed as 3.7 leaves. Destroying

an infected a plant at this stage almost guarantees that aphids will not have had time to transmit the virus to other plants.

Each inspector was also handed a PDA (personal digital assistant) to record the location of the infected plants, along with other details that are then used to adjust the inspection schedule. In New South Wales, where there are 216 plantations totalling 782 hectares in the BBTV zone, the new regime of inspections has so far translated into a 31% reduction in the number of high-risk plantations, while the number of BBTV-free plantations increased by 12%. The greatest impact is expected to come from completely destroying 'hot spot' plantations (more than 10 infections in the previous 12 months), which account for the majority of infections. At the end of July 2012, there were two of them left in New South Wales.

In Queensland, where there are only 39 commercial plantations totalling 107 hectares in the BBTV zone, the difficulty doesn't lie in eradicating the virus from commercial plantations but from the area's estimated 800,000 backyard gardens and hobby farms. Just finding out which ones have banana plants, let alone infected ones, is a challenge in itself. In residential areas, inspectors traditionally look over fences for the presence of banana plants and then ask their owners for the permission to check them. They may soon just phone them up to arrange an inspection. Remote sensing technologies are taking advantage of the spectral reflectance signature of banana leaves to distinguish them amongst the vegetation. The location of the banana plants can then be matched with their owners' name and contact details using local cadastral maps. Remote sensing technologies are also making it easier to locate remote 'feral' banana plants, which are destroyed regardless of whether they are infected or not.

The project realizes that Bunchy top cannot be eradicated from high population areas without the support of the general public, which is why it is also investing in a comprehensive communication campaign. Many owners of banana plants are not even familiar with the distinctive advanced symptoms of the disease, which are often attributed to a nutritional deficiency of some sort. Many are also unaware of the risk of spreading the virus when they swap banana plants with their neighbours. The campaign is also trying to dispel some entrenched myths, like the belief that Lady Fingers (the local name of a Pome cultivar) don't get Bunchy top. The misconception apparently stems from a recommendation to plant Lady Fingers instead of Cavendish because the cultivar is less attractive to aphids and taller, making it easier for inspectors to spot banana plants. Australians are also being educated on the latest methods to destroy infected plants. In the 1980s, the plants were doused with kerosene and chopped up, until it was realized that the practice contributes to the dispersal of aphids as they flee for cover. The recommended method is to inject an herbicide directly into the plant to destroy it and a systemic insecticide to kill the aphids.

Tying up loose ends

Despite the knowledge and experience acquired over a century of living with Bunchy top, some questions remain unresolved. For example, field inspectors have noticed Bunchy top symptoms on plants that used to be next to an infected plant, except that it had been destroyed six months to two years before. It seems to happen frequently enough to raise the possibility of a dormancy period. John Thomas, a virologist at the University of Queensland, is testing the possibility that the virus might be hiding in one of the eyes (growing tips) of the rhizome. As he explains, "aphids prefer

Appendix 10

feeding on young shoots or at the base of the plant but it's possible that some of them feed on the rhizome. It's probably a rare event, but if it happens, it's possible that the virus remains in the rhizome and that the disease only develops when the particular meristem the virus is in starts growing". Thomas and his colleagues are inoculating healthy rhizomes to see whether disease symptoms are suppressed.

Thomas is also testing how long it takes for the systemic insecticide to reach the parts of the plants on which the aphids are feeding. "In the lab, we are feeding leaves from plants that have been injected with an herbicide and an insecticide to aphids. The aphids should die but the dose in the leaf doesn't always readily kill them." Thomas thinks that it may explain why some plants develop Bunchy top six months after a neighbouring plant has been destroyed.

Meanwhile, an analysis conducted in 2012 by David Cook, an economist at the University of Western Australia, has put a value on preventing the spread of Bunchy Top to the major production areas of northern Queensland. The study estimates that the banana industry saves between 16-27 million AUD (17-28 million USD) in annual losses. In other words, the industry could spend much more than it currently does on its campaign to eradicate Bunchy top and still get its money's worth.

Media Release

February 2015

Residents help stop the spread of one of bananas' worst diseases

Further support of residents in the Byron and Ballina shires is being sought to stop the spread southwards of Banana Bunchy Top, one of the worst viral diseases in the world to affect banana plants.

National Bunchy Top Project manager, Mr David Peasley said today that there have been isolated findings of Bunchy Top in the Byron/Ballina shires' border area on commercial plantations and on other properties in recent months.

The area is right on the southernmost boundary of the infected region, which stretches across to Lismore and all the way north to the Sunshine Coast in Queensland.

“The Bunchy Top virus has the potential to wipe out the Australian banana industry as well as stop people from having healthy home grown bananas, unless we are vigilant.”

“I would like to thank Roz Borrell of Talofa who took the trouble to contact our team to arrange an inspection. She contacted us after being concerned about plants at home,” said David.

Ms Borrell said she had learnt about Bunchy Top at a permaculture session at the Mullumbimby Community Gardens.

“I noticed some of our bananas were not forming bunches, so I went onto the bunchy top website and saw the symptoms were similar. The inspectors confirmed that so I am pleased that we have now stopped any potential spread of the disease further,” Ms Borrell said.

Aphids blown in the wind after feeding on infected plants carry the virus. It is also spread by transplanting infected suckers, so any infected plants pose the risk of spreading the disease further. The virus stunts the growth of leaves and an infected plant will not produce a healthy bunch of bananas.

“At the moment, we are inspecting in the area and have found some backyard infections in banana plants which could be as old as five years – it is likely these are the source of infection for commercial plantations. We hope that other residents will support us in our search for infected plants,” said David.

“In helping us to control the disease from spreading further, we ask people not to share any suckers with friends or family and remind people that permits are needed to move and plant bananas.”

“It is also important that people don’t destroy plants if they think they are diseased as they could unknowingly spread the disease further – we will inspect and destroy any infected plants free of charge,” he said.

Residents who think their banana plants might have Bunchy Top are advised to go to www.bunchytop.org.au for more information or call the Hotline 1800 068 371.

#

Media - for more information:

Project Manager, David Peasley, 0427 126 245

Local resident, Roz Borrell, 0421 971 921



Editorial for Local Newspapers and Council publications

HELP TO KEEP AUSTRALIA'S BANANAS HEALTHY

The world's most devastating disease for bananas may be lurking in your backyard without you even knowing.

Called Banana Bunchy Top, it affects the growth of a banana plant and stops it producing a bunch or at best a small, deformed bunch appears.

The Australia Banana Industry and the Federal Government are supporting a project with the aim of eradicating Bunchy Top in Australia and now are calling for support from the residents of theCouncil area.

"We largely have it under control in commercial plantations, but the biggest problem we now face is eradicating it from backyards and hobby farms," says the National Project Manager, Mr David Peasley.

"We have already found it through this region in home gardens, but often it goes undetected by residents as they think their bananas are just not performing."

Bunchy Top is characterised by leaves showing a more upright bunching affect but in its earlier stages it is very difficult to detect to the untrained eye.

The National Bunchy Top Project is offering a free service to inspect any suspect banana plants and assist with their destruction if needed.

"We urge people not to destroy any suspect plants, as it is critical that we control the spread of aphids which carry the disease. If disturbed the aphids can be carried by prevailing winds for many kilometres," Mr Peasley says.

Bunchy Top can also be spread by transplanting suckers – that's why a permit is needed to move banana plants.

Currently the disease is contained to the Sunshine Coast in Queensland south through to northern New South Wales with inspectors regularly visiting hobby farms and home gardeners to help them keep their bananas healthy and free of Bunchy Top.

To arrange a free inspection call the Bunchy Top Hotline on 1800 068 371 or for more information view the Bunchy Top video at www.abgc.org.au

Photos next page - for high resolution images email Neville@greenpr.com.au

Appendix 12



Photo Captions:

Above – As the leaves emerge on an infected Bunchy Top plant they bunch and stay more upright.

Right – Bunchy Top Inspector injects an affected plant. Each plant is injected with a systemic insecticide to stop aphids from spreading the disease, and glyphosate to kill the plant.

A call to help stop the spread of one of bananas' worst diseases

The support of South East Queensland's keen gardeners is being sought to stop the spread of Banana Bunchy Top, one of the worst viral diseases in the world to affect banana plants.

Banana Bunchy Top is in Australia but it is restricted to South East Queensland and northern New South Wales.

"Through the National Bunchy Top Project we are having success in controlling the disease in commercial plantations and working hard to ensure that they stay Bunchy Top free," says the Project Manager, David Peasley.

Aphids blown in the wind carry the virus after feeding on infected plants. Transplanting infected suckers also spreads the disease. The virus stunts the growth of leaves and an infected plant will not produce a bunch of bananas.

"This means that infected plants anywhere pose a risk and shows why we need the community's support in this battle."

"If the disease is allowed to go unchecked then no one will have healthy bananas. We know that keen gardeners want to make sure that we keep the spread of any disease to a minimum so we are calling on members of gardening clubs and other organisations to help us in the task," says David.

The Bunchy Top Project, which is funded by the Australian banana industry with matched funds from the Federal government, has an inspection team working across the region. You may have already met inspectors in their travels.

Gardeners and hobby farmers can help in simple ways. The disease is difficult to spot particularly in its early stages, so a start is to watch a short video on You Tube that provides a good visual introduction – simply type in Bunchy Top Australia in a You Tube search.

Banana plant/s may have Bunchy Top if:

- plants are stunted in their growth
- leaves are 'bunching' rather than spreading out
- bunches are not forming or are not developing

If you think plants may be suspect, you can help us by taking photographs of:

- the whole plant or plants, showing leaves emerging
- a close up of a younger leaf looking up towards the light to show the veins
- the stem of a leaf

They can be emailed to bunchytop@abgc.org.au This will allow our inspectors to assess your plants before organising an inspection. **But please, do not spray to kill any aphids or cut plants down before an inspection.**

Appendix 13

If you have a larger patch of banana plants or a small hobby plantation you can also help by making sure that they are free of weeds and any vegetation that could make inspection difficult.

“We also ask people not to share any suckers with friends or family and remind people that you must obtain a permit from Queensland Department Agriculture Fisheries and Forestry to move banana plants or planting material,” David said.

“It is also important that people don’t destroy plants if they think they are diseased as they could unknowingly spread the disease further – we will inspect and destroy any infected plants free of charge.”

If you would like more information go to www.bunchytop.org.au or to report suspect plants call the Hotline 1800 068 371.

#



you'll never see me if your banana plants have Bunchy top disease!

Bunchy Top is one of the worst virus diseases for banana plants anywhere in the world. And it is lurking in our region! If your banana plants at home are not producing healthy bananas, they may have Bunchy Top.



And if your banana plants have Bunchy Top, little aphids can spread the disease to everyone else's banana plants!

The only way for everyone to have healthy bananas and protect plants that are not diseased is by destroying those that have Bunchy Top. THE GOOD NEWS? - new healthy banana plants will produce great bananas within a year!



If you think the banana plants at home are sick, they might have Bunchy Top. Special inspectors can check them out for free so get Dad or Mum to call us - 1800 068 371.

Learn more about Bunchy Top - see the video on **YouTube** Just type in 'Bunchy Top Australia' or go to: <http://www.youtube.com/watch?v=QUNVlj7xkcu>





HEALTHY BANANAS FOR EVERYONE- **HELP STOP BUNCHY TOP!**



Bunchy Top is the worst disease for banana plants anywhere in the world. And it is lurking in this region!

If your banana plants at home are not producing healthy bananas, they may have Bunchy Top.

Bunchy Top can only be spread in 2 ways:

1. By moving and transplant suckers – even healthy looking suckers can carry the virus
2. By banana aphids that carry the virus and can spread the disease to everyone else's banana plants and aims to completely eradicate the disease from Australia.

YOU CAN HELP IN 3 WAYS:



1. Please do not dig up suckers and give them to friends, even next door. Everyone, even a commercial grower, needs a permit to move and or plant suckers*.



2. Call in our experts to check out your plants if you think your plants are sickly or not producing healthy bunches. It is a free service.



3. If you want to grow bananas you must have a permit and buy your plants from approved nurseries – this is to stop the spread of Bunchy Top. Call the Hotline to find out where to get them.

**WITH YOUR HELP WE CAN
BEAT BUNCHY TOP!**

The only way for everyone to have healthy bananas in backyards and to protect Australia's banana growers' livelihoods is by destroying those plants that have Bunchy Top. This should be done by trained inspectors to stop any further spread of the disease. It is also a free service.



If you think your plants might have Bunchy Top, call the Bunchy Top Hotline: 1800 068 371
Watch the video and learn more about Bunchy Top: visit www.bunchytop.org.au



Horticulture Australia*

*It is against the law in New South Wales and south East Queensland and penalties do apply. In fact, the laws were made to stop the spread of Bunchy Top.

We can win the fight with your help!

Bunchy Top has been in Australia for 100 years. While it has not been eradicated, we have been able to contain it to a small area and stop the spread to other regions, particularly the major growing area of far north Queensland.

With fewer banana plantations in South East Queensland and northern New South Wales, we are having success in controlling the disease in commercial plantations.

But we know that Bunchy Top exists in backyards and hobby plantations so we need your help to eradicate this disease in Australia.

We have the support of the Federal Government to undertake this program and we have the world's best scientists on our side helping to develop our strategies.



Bunchy Top Inspector Samantha Stringer safely destroys an infected plant by injection

You can play a vital role to help us. If you have any doubts about your bananas, whatever variety you grow, please contact us on the Bunchy Top Hotline. Any visit or service is free of charge.

The National Bunchy Top Project inspectors

Qualified inspectors conduct home and property inspections. They are authorised to undertake the inspections, issue orders and undertake destruction of plants where agreed.

If you think your banana plant/s may have Bunchy Top, please call the Hotline 1800 068 371. We ask that you take photographs of your plant/s and a close-up of the underside of a leaf and be ready to send to us so that an initial assessment can be made.

You can send your photographs and details to the Bunchy Top team by email: bunchytop@abgc.org.au and an inspector will get back to you.

Everyone needs a permit to move bananas

By law, commercial banana growers must obtain a permit to use only planting material which has been inspected and approved as being free of Bunchy Top.

Home gardeners and hobby farmers must ensure they also obtain a permit to move banana plants and most importantly, only acquire plants from authorised nurseries to ensure plants are disease free.

Any landowner or lessee also needs to be responsible for clearing any abandoned banana plants and maintaining banana patches weed-free to allow access for inspections.



Horticulture Australia

The Banana Bunchy Top National Project is funded by Horticulture Australia Limited using the national banana levy and matched funds from the Australian Government. The project is supported by:



YOUR help is needed to rid Australia of Banana Bunchy Top



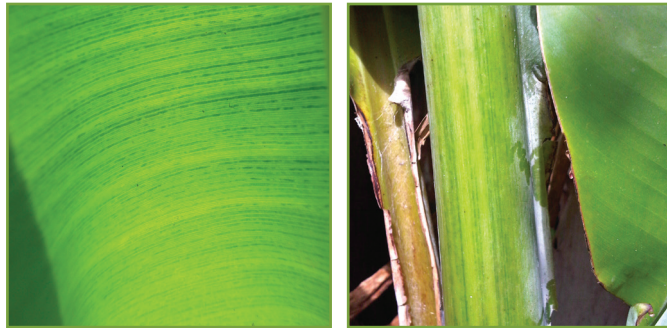
A young banana plant showing advanced symptoms of Bunchy Top including bunching of the emerging leaves

Banana Bunchy Top is the most devastating virus disease worldwide for all varieties of bananas. At present in Australia it is only found in South East Queensland up to the Sunshine Coast and in northern New South Wales.

It not only poses a major threat to Australia's commercial banana growers, but everyone wanting to grow bananas at home will not have healthy bananas if Bunchy Top is present. We need YOUR help to eradicate this disease so we all have healthy bananas.

Visit www.bunchytop.org.au and watch the video to learn more about Bunchy Top, its symptoms and its treatment **Banana Bunchy Top Hotline 1800 068 371**

What does Banana Bunchy Top look like?



In its early stages the symptoms are difficult to see to the untrained eye. The first symptom is short dark dot-dash lines appearing along the veins of the youngest leaf starting from the mid-rib. You can see these dot-dash lines best when you look upwards towards the sky through the bottom side of the youngest leaf (pictured left). Dark green stripes running along the mid-rib of the infected leaf (pictured right) may also be present.

When the disease is more advanced, each new leaf becomes shorter, narrower and stands more upright giving a 'bunched' leaf appearance – that's why it is called 'Bunchy Top'. Plant growth is stunted and the leaves roll slightly upwards and tend to become yellow or lighter green.

Bunchy Top is difficult to identify in its early stages on any banana variety including Cavendish and Lady Fingers, so trained professional inspectors should be called to identify infected plants before the disease spreads any further.

How is it spread?

Bunchy Top can only be spread in two ways:



1. By the "banana" aphid – a small black insect which looks like other aphids you see in your garden, but only the banana aphid can spread Bunchy Top, after it has fed for many hours on an infected plant (pictured left). **BUT, inspection of the plant is required as not all aphids carry Bunchy Top.**

2. By infected planting material – Well meaning people give away young plants or suckers to neighbours and friends – DON'T! This is illegal as infected material can unknowingly be spread. You must have a permit to move banana plants and only obtain plants from authorised suppliers.



NO to 'Do it yourself'

If you think your banana plant/s might have Bunchy Top do not cut them down, poison them or spray to kill any aphids.

Chopping off infected plants will not stop this virus - in fact it is likely to do the opposite as infected aphids fly away. When the next sucker grows it will definitely show signs of Bunchy Top and not yield any fruit.

A Lady Finger banana plant infected with Bunchy Top

How you can help?

If you think your banana plants, or some others you have seen, might have the symptoms of Bunchy Top, please call the National Bunchy Top Hotline 1800 068 371. A trained inspector will arrange to come and check out your plants. There is no cost to you for this service.

If they are clean, that's great. If they have Bunchy Top, then they must be destroyed and that's why it is so important to contact us to discuss the next steps to take.

The most effective and targeted way is by stem injecting with glyphosate (eg 'Round Up' or 'Zero') to kill the plant and a systemic insecticide (eg Confidor) to stop the aphids from spreading as the plant dies. We also spray a non-toxic SACOA BioPest Oil (certified for organic farming) to further control any aphid spread. If chemicals are not used, then infected plants must be physically destroyed.

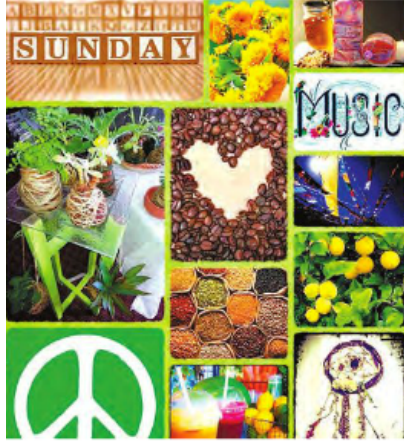
Please do not disturb the plant or plants in any way as that will spread infected aphids to healthy plants. Wait for a qualified inspector to advise on the appropriate action.



Bunchy Top Project National Manager David Peasley inspecting a leaf of an infected plant with landowners

Visit www.bunchytop.org.au and watch the video to learn more about Bunchy Top, its symptoms and its treatment **Banana Bunchy Top Hotline 1800 068 371**

Grass roots markets a hit in Cooroy



COOROY Grass Roots Market has been developed by a local family for families and local small business.

The idea of having a 'Grass Roots' market is to establish a community based market full of Homemade, Organic, Fresh, Recycled, Original, Natural & Local Stalls.

"We are a local family (Michael, Jessica & baby Violet) who love markets! We love the atmosphere, We love the fresh air. We love the talent on display. Markets are great because you get to meet the person behind the product. Our markets are fun, interactive, lively and a good alternative to shopping centres. Markets are also a good way for communities to grow and develop, and for new, young or old, sometimes raw talent to get a

start with the product they are passionate about.

"We support and provided free of charge spots at our market for fundraising and also local musicians or music students from local schools wanting to busk or perform to get themselves seen by the local community.

"Big thank you to Cooroy RSL for their support and opportunity to get this beautiful little market up and running for everyone to enjoy."

Every Sunday from 8am - 1pm, get along to the Cooroy Grass Roots Market at the Memorial Hall, grab your hot morning organic coffee, enjoy morning tea at the organic cafe, browse the bright and beautiful market stalls on offer and get your fruit/Veg too!

A call for help to stop the northern spread of one of bananas' worst diseases



THE support of residents is being sought to stop the spread northwards of Banana Bunchy Top, one of the worst diseases in the world to affect banana plants.

According to National Bunchy Top Project Inspector, Ms Samantha Stringer, this local area is one of the most critical areas in the fight against Bunchy Top in Australia.

"The Bunchy Top virus has the potential to wipe out the Australian banana industry to the north as well as stop people from having healthy home grown bananas. We have found

it recently in several backyards in the Tinbeerwah area between Cooroy and Noosa."

"This is right on the northernmost boundary of the infected area, which stretches all the way south to northern New South Wales. At the moment, we are inspecting in the area and hope that residents will support us in our search for infected plants."

The virus is carried by aphids blown in the wind after feeding on infected plants and by transplanted suckers. So any infected plants pose the risk of spreading the disease further. The virus stunts the growth of leaves and an infected plant will not produce a healthy bunch of bananas.

"Apart from helping us to control the disease from spreading northwards, we would ask people not to share any

suckers with friends or family and remind people that you must obtain a permit from Queensland Department Agriculture Fisheries and Forestry to move banana plants or planting material," Ms Stringer said.

The legislation was put in place to protect banana growers' livelihoods and home grown bananas from the spread of Bunchy Top.

"It is also important that people don't destroy plants if they think they are diseased as they could unknowingly spread the disease further - we will inspect and destroy any infected plants free of charge," Ms Stringer said. Residents who think their banana plants might have Bunchy Top are advised to go to www.bunchytop.org.au for more information or call the Hotline 1800 068 371.

hi

• Pictures

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THIS MAN RUNNING FROM THE LAW: P7



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BANDS READY TO ROCK

COURT: SES THIEF 'DIDN'T INTEND MALICE TO GROUP' P3

Bundy's bananas put to the test



DISEASE WATCH: Bunchy
Top National project's Samantha Stringer is busy checking a banana plantation in the Pine Creek area for bunchy top disease.

PHOTO: SCOTTIE SIMMONDS
BUN250712BAN2

MORE INSIDE RURAL WEEKLY: FROM P17

Francos return to win centenary cup

Franco brothers Sandro and Bruno returned to exhibiting bananas for the Coffs Show's centenary in May and won the major trophy, the Banana Cup.

The Francos had the show's champion bunch, a Cavendish bunch, and also won for for their entries of Lady Fingers.



"It was the centenary and we decided to enter on the spur of the moment," said Sandro.

"It's been a good growing season and we got lucky!"

Coffs Harbour BGA president Wally Gately said a good number of growers had turned out for the show's centenary, making the BGA's investment in prize money worthwhile.

Livio and Dennis Pilati were the most successful exhibitors with wins for best Lady Finger cartons and hand; Ducasse bunches, cartons and hands and "king" Ducasse banana.

More pictures from the Coffs Show, as well as the Macksville Show, will appear in the next edition of Australian Bananas magazine. 🍌

Left: Sandro and Bruno Franco.

Bananas raise \$21,000 for kids appeal



Banana grower and wholesaler Costa was pleased to team up with other growers to donate \$21,000 to this year's Royal Children's Hospital Melbourne appeal in April.

Michael Engeman, the Sales and Marketing Manager for Costa's banana category, is pictured at left with growers Julie and Lance Horsford and Steve Lizzio (far right). Michael thanked all growers who contributed. "Their willingness to show such generosity is fantastic for the children of Victoria," he said. 🍌

Educating gardeners about Bunchy Top

ABC TV gardening program Gardening Australia has featured a segment on the importance of controlling Bunchy Top.

Bunchy Top inspector Sam Stringer was interviewed in a segment with Brisbane-based presenter Jerry Coleby-Williams.

Sam was able to stress the importance of having a permit when it came to moving or planting bananas in the Bunchy Top zone of south east Queensland and northern New South Wales.

National Bunchy Top Project Manager, David Peasley said it was a great opportunity to educate people about Bunchy Top and the precautions that need to be taken.

"The more we can educate people about Bunchy Top, the need to destroy infected the plants and the importance of not moving suckers in the zone, the more we can protect commercial plantations." 🍌

Prospectus launched

Banana Industry Congress 2015 has launched its prospectus for sponsors and exhibitors.

Congress will be held in a capital city for the first time in 2015, convening from June 17 to 20 at the Crown Promenade at Southbank.

The prospectus is at the event's new website www.bananacongress.org.au and the event program is currently being planned.



Levy commitments

The ABGC has prepared a report on levy commitments made prior to the introduction of the national banana levy in 2008.

A copy of the report can be viewed at www.abgc.org.au on the banana industry levy page, under the projects and resources tab.

Naomi Brownrigg in IAC role

Mission Beach grower Naomi Brownrigg has been appointed to the banana Industry Advisory Committee's scientific subcommittee.

Naomi joins NSW grower Stephen Spear (Chair), north Queensland growers Adrian Crema and Matthew Abbott, NSW grower Paul Shoker and Queensland Department of Agriculture, Fisheries and Forestry Senior Development Horticulturist Stewart Lindsay.

Tweed meeting

The Australian Banana Growers' Council (ABGC) Board met with northern New South Wales growers following the May meeting of the Tweed Brunswick Banana Growers' Association.

The Board took the opportunity to speak with local growers while in NSW for a two-day Board meeting.

Backyard blitz

By Neville Sloss

blasts top Bunchy hotspot

RECENT ACTIVITY BY the Banana Bunchy Top team has confirmed important directions for the project, now in its second three-year phase.

Banana Bunchy Top National Project Manager David Peasley said the protection of commercial plantations and identifying potential sources of infection are high priorities.

"Of particular focus are non-commercial and backyard outbreaks to protect commercial plantations," Mr Peasley said.

"We are aware of the extent of the problem in south east Queensland, but only recently our concerns in northern New South Wales were also realised."

During a special awareness drive in northern New South Wales in September, Bunchy Top was found on several properties between Lismore and Byron Bay.

"One contained more infections than the total known number of infections on commercial plantations in New South Wales," Mr Peasley said.

Currently there are 360 known infections on commercial plantations – the one hobby farm property had between 500 and 600 infected plants.

The findings have now confirmed that



David Peasley (centre) inspects a leaf for Bunchy Top with property owners Grant McGifford (left) and Graham Jordan

aphids blown by the wind from these sources are likely to have been responsible for occasional outbreaks on commercial plantations in the Richmond district.

"We are keen to create buffer zones around plantations so we really need to make sure that any rural residential and non-commercial farms are clear or cleared of Bunchy Top," Mr Peasley said.

The Bunchy Top team also made a trip

to the Bundaberg growing region to confirm that area was free of the disease. After a three-day comprehensive sweep of all commercial plantations and some smaller plantings, they were confident in declaring "Bundy is Bunchy Top free". The team is confident the north-most boundary for Bunchy Top is around Cooroy in the Sunshine Coast hinterland, north of Brisbane.

Tech check seeks the lost bananas

By Neville Sloss

RESEARCH BY THE University of Queensland has now begun on the use of aerial imagery to identify banana patches and potentially infected bananas.

Australian Banana Growers' Council (ABGC) Bunchy Top Inspector Barry Sullivan has begun the project with Dr Kasper Johansen, from the Centre of Spatial Environmental Research at the University of Queensland. Dr Johansen will use sophis-



ticated recognition software to analyse aerial photography to identify banana plants.

"The task involves considerable processing time where each aerial image is examined pixel by pixel and will involve several computers working on a network," said Mr. Sullivan.

A trial area has been identified to tune the software using existing ground truth data (known areas where bananas are). They have also identified a suitable area to commence the project and conduct tests, followed by ground truthing.

The trials will commence as soon as possible.

"This type of technology could be very useful over the whole industry down the track. I think we could apply it to the yellow sigatoka project up north, future yield projections and also to locate those out-of-the-way, long-lost patches that may have dropped off current growers' lists," Mr Sullivan added.

LEFT: Dr Jasper Johansen (left) and Barry Sullivan examining aerial photographs

Changing focus on Bunchy Top

The second phase of the National Bunchy Top Project will end in June but work on the challenge to eradicate the disease from commercial plantations will continue in a planned third phase.

While extensive progress has been made in the eradication effort, Bunchy Top has not yet been completely removed from plantations in South East Queensland and northern New South Wales.

Freeing plantations from the disease and protecting them from infestations originating in backyard and feral banana plants have been the main objectives of the project.

Project Manager David Peasley said there had been substantial increases in the numbers of banana plantations free of the disease.

"Since our benchmarks were established in 2010, we have made major progress in both New South Wales and South East Queensland in controlling Bunchy Top in our commercial plantations," Mr Peasley said.

"We have monitored a large number of plantations - 230 in New South Wales and 44 in South East Queensland - and our results show the benefits of our work to categorise the plantations and make planned inspections."

The project's Phase 2 review was conducted by consultant Fiona Macbeth of Blackwood and Kemp Pty Ltd and commissioned by Horticulture Australia Ltd. Ms Macbeth said: "It is not likely that total eradication can be achieved with the current resource and regulatory restraints and within the current project ending in June 2015. However, there is a compelling economic argument to continue to contain and reduce the pest population."

Of growing importance have been communication activities to get the

"We have made major progress in both New South Wales and South East Queensland in controlling Bunchy Top in our commercial plantations."
- David Peasley

message out to the wider community, particularly in South East Queensland.

"Getting the message out to backyarders remains a critical part of the project, particularly with the likely change of regulations in Queensland where general biosecurity obligations will rest with the community and not government," Mr Peasley said.

"And critical to our success has been the commitment of our dedicated team across both states and I would like to thank them all for their efforts and the growers for their support," said Mr Peasley.

Have your bananas had their One-Shot today?

Based on Haifa's world renowned Poly-Feed, **Banana One-Shot** is a complete, fully water soluble fertiliser blend for fertigrating bananas.

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- Better growth, quality
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BANANAS

Basic Culture

- Full sun
- Sheltered, frost-free tropical, subtropical and warm temperate climates (temperatures below 10°C cause leaf damage and below 14°C reduce growth)
- Well drained organically enriched soils
- Regular fertiliser application
- Regular watering during dry periods

It is estimated that 90% of all Australian bananas are grown in Queensland, with the remainder coming from northern New South Wales, the Northern Territory and Western Australia. Home gardeners remain passionate growers in all regions where bananas produce fruit.

The young tree tends to be frost tender, but will re-shoot in the spring. Once it reaches above 2-3m it becomes more frost tolerant. From first planting, it takes approximately 12 months for a plant to produce its first bunch and another 8 to 10 months for subsequent bunches.

To prevent the spread of pests and diseases that can damage commercial crops, both home gardeners and commercial growers are encouraged to grow only plants sourced from certified nurseries that have grown the

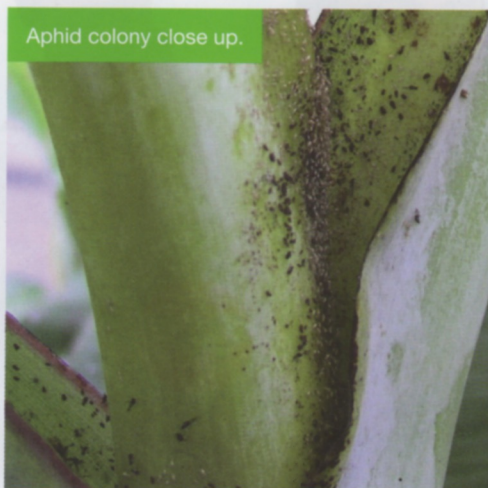
plants from tissue culture. Dividing a clump and sharing suckers with friends and other gardeners can potentially spread diseases – and it is illegal.

Around 101 years ago a viral disease called Bunchy Top was introduced into Australia from Fiji and by the 1920s it had wiped out many of the large plantations in South East Queensland. It was eventually brought under control in remaining commercial plantations but it has never been eradicated from the subtropics.

The National Bunchy Top Project was established nearly 6 years ago in order to eliminate it from commercial plantations with a view to potentially eradicating it from Australia. The project team is now helping the gardening community and hobby farmers to identify, manage and destroy infected plants. »



Look for signs of dark green streaks up midrib and dark dot-dash lines through the leaves.



Aphid colony close up.

Bunchy Top is difficult to identify in its early stages, so inspection by trained inspectors is vital to stop its spread. Two of the most popular cultivars, 'Cavendish' and 'Lady Fingers', are very susceptible to this virus.

There are only two ways that the virus can be spread – by aphids or by people.

Sap sucking aphids can carry the virus and spread the disease for several kilometres. Transplanting suckers of an infected plant can spread it further.

The National Bunchy Top Team has some simple advice for home gardeners who are concerned about their banana plants:

- If you think they might have Bunchy Top – do NOT cut them down, poison them or spray them to kill aphids
- Do NOT disturb them – aphids will fly off, and if infected, they will spread the disease further
- Call the Bunchy Top Hotline on 1800 068 371 and a trained inspector will make a time to inspect, free of charge
- If the plants have Bunchy Top the inspector can assist in destroying them or advise you how to go about it safely so that the disease is not spread further.

Residents who think their banana plants might have Bunchy Top are advised to visit www.bunchytop.org.au for more information or call the Hotline 1800 068 371.

STG

Home gardeners can grow up to a maximum of 10 banana plants or 30 pseudostems of an approved cultivar. Residential banana growers must comply with current biosecurity legislation.

There are several different pest quarantine areas along Queensland's coast and only certain banana cultivars can be grown in gardens within these areas.

Northern Quarantine Zone – 'Blue Java', 'Bluggoe' (plantain), 'Ducasse', 'Goldfinger (FHIA 01)', 'FHIA 02', 'Goly Goly Pot Pot', 'Kluai Namwa Khom' (Dwarf Ducasse), 'Pisang Ceylan' (mysore type), 'Sh 3436', 'Simoi', 'Tu-8', 'War War', 'Yangambi Km5'.

Southern Quarantine Zone – 'Blue Java', 'Bluggoe' (plantain), 'Ducasse', 'Goldfinger (FHIA 01)', 'Kluai Namwa Khom' (Dwarf Ducasse), 'Lady Finger', 'Pisang Ceylan' (mysore type).

Source: www.daff.qld.gov.au/plants/fruit-and-vegetables/fruit-and-nuts/bananas/home-growing

In other states or countries, check with your local authorities.

Additional Resources

www.australianbananas.com.au
www.daff.qld.gov.au
www.backyardbananas.com.au
www.stfc.org.au



HEALTHY BANANAS FOR EVERYONE - HELP STOP BUNCHY TOP!



Up to \$11,000 fine (NSW)

1. Please do not dig up suckers and give them to friends, even next door. Everyone, even a commercial grower, needs a permit to move and or plant suckers*.



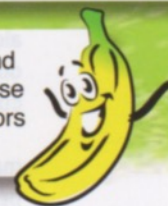
2. Call in our experts to check out your plants if you think your plants are sickly or not producing healthy bunches. It is a free service.



3. If you want to grow bananas you must have a permit and buy your plants from approved nurseries – this is to stop the spread of Bunchy Top. Call the Hotline to find out where to get them.

WITH YOUR HELP WE CAN BEAT BUNCHY TOP!

The only way for everyone to have healthy bananas in backyards and to protect Australia's banana growers' livelihoods is by destroying those plants that have Bunchy Top. This should be done by trained inspectors to stop any further spread of the disease. It is also a free service.



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