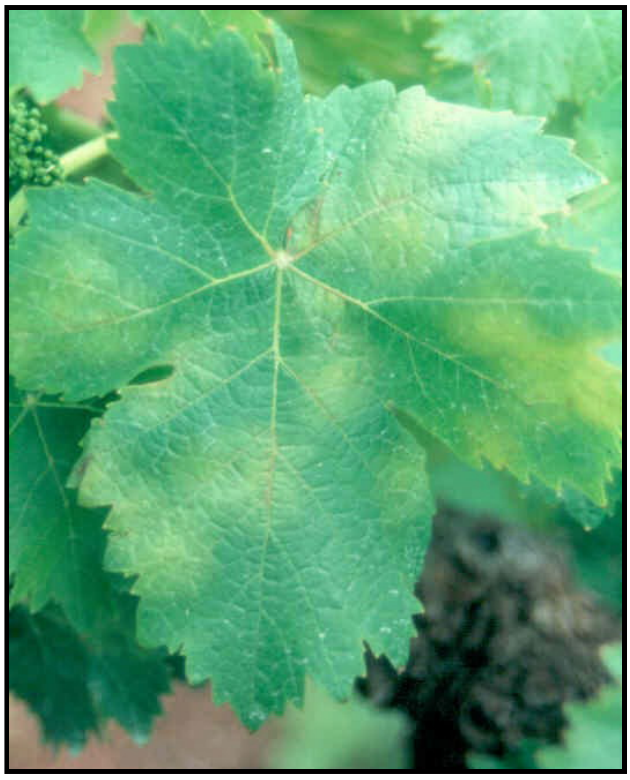
Riverland Wine Industry Development Council Inc.

Australian Government
Grape and Wine Research and Development Corporation

# Downy Mildew Action Plan – A regional model



## FINAL REPORT to
**GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION**

**Project Number: RT 04/18-4**

**Principal Investigator:** Julie Sippo/Tim Smythe

**Research Organisation:** Riverland Wine Industry Development Council

**Date: 20th October 2006**




# Riverland Downy Mildew Action Plan

## Preparedness and response guidelines for the Viticulture Technical Group

The Riverland Wine Industry Development Council (RWIDC) facilitates the Riverland Viticulture Technical Group (RVTG), which prioritises wine industry research, development and extension projects for the Riverland.

In January 2005, the RVTG identified the need for the best downy mildew strategies to be in place for season 2005-06. The RVTG formed a sub-committee to develop the project proposal with funding granted by the Grape and Wine Research and Development Corporation.

For more information about the Riverland Viticulture Technical Group or for copies of this document


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## KEY ACRONYMS AND ABBREVIATIONS

**DMAP –** Downy Mildew Action Plan

**PHOSACID –** Phosphorous Acid

**RDMAC –** Riverland Downy Mildew Action Committee

**RWIDC –** Riverland Wine Industry Development Council

**RVTG –** Riverland Viticulture Technical Group.

## FOREWARD

In preparing this document the Riverland Viticulture Technical Group recognises a co-ordinated management approach is required to improve regional preparedness for downy mildew control. In doing so we acknowledge that pressure from downy mildew will vary from season to season and control strategies will need to accommodate this variation.

From a statistical perspective nation-wide downy mildew epidemic events occur every nine or so seasons and the last major event was in 1992-93. Since then, winegrape plantings in the Riverland and nationally have increased substantially; further supporting the need for a coordinated approach to the implementation of world best management practice in the control of downy mildew.

There are a number of issues that require careful consideration when developing a management plan. Fungicide stock control and logistics provide some of the bigger hurdles. Products such as Ridomil Gold MZ have a limited shelf life and are only transported to Australia once a year. Whilst Phosphorous Acid products have had restrictions placed on them due to concerns over residue management and it's perception in export markets.

During the formation of this plan an event was simulated based on the conditions that prevailed during the 1992-93 downy mildew epidemics. Named "Fluffy Goose", the desktop exercise involved 22 participants, including grape growers, plant pathologists, wine company agronomists, chemical resellers, chemical suppliers, industry organisations and the Bureau of Meteorology. The exercise provided a unique opportunity to gather all of the different industry sectors for a comprehensive discussion and it demonstrated how quickly available chemicals can be depleted under extreme circumstances.

On a positive note, we now have better communication with growers through services such as CropWatch, CropWatch Online, and local media. Many wineries have their own e-mail and fax services allowing more rapid dissemination of information to growers.

Given this, the Downy Mildew Action Plan (DMAP) outlined in this document is designed to assist growers and regional industry minimise the impact of downy mildew each season. In particular, the intent is to reduce the potentially devastating crop loss that has occurred in epidemic years.

The Plan will be implemented by the Riverland Downy Mildew Action Committee (RDMAC), which consists of the following:

- Chair: Chair of Riverland Viticulture Technical Group
- Plant Pathologist: Peter Magarey, SARDI, Loxton
- Riverland Viticulturalist: Peter Burne, CCW Cooperative, Berri
- Bureau of Meteorology (BOM): Andrew Watson, State Regional Officer, Adelaide
- Winemaker: Paul Kassebaum, Regional Manager Hardy Wine Company, Berri
- Chemical industry representative: Russell Mudge Merchandise Manager Elders, Barmera.
- RWIDC Executive Officer: Tim Smythe, Berri

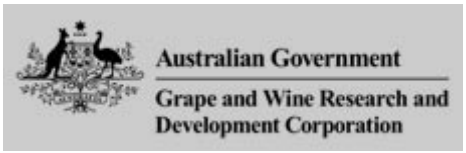
**ACKNOWLEDGEMENTS**

The RDMAC acknowledges the kind support and technical expertise of Gary MacPhie, Emergency Operations manager, PIRSA, who helped in the establishment of the RDMAC.

Many thanks must go to Vanessa Narbeth (previously with CRCV as the Regional Viticare Trials Coordinator - Riverland) for her efforts in collating and authoring much of this document.

Julie Sippo (previously with RWIDC and now with DPI Victoria) spent many hours collecting data and coordinating resources; without her efforts the DMAP would have struggled for existence.

Peter Magarey, SARDI, Senior Plant Pathologist and Peter Burne, CCW, Senior Viticulturalist assisted greatly with the editorial review. Their time, experience and expertise were also greatly appreciated.




**This project was funded in part by the Grape and Wine Research and Development Corporation.**

# 1 SUMMARY

## 1.1 Need for the plan

During the 1992-93 growing season, there was widespread downy mildew infection in South Australia and other wine grape growing districts in Australia. This led to a severe deficiency in the supply of fungicides and vignerons struggled to deal with the extent of the epidemic. Thanks to an urgent application and the timely intervention of the Federal Minister of Foreign Affairs, supplies of chemicals were 'fast tracked' for delivery from China to Australia so that the threat was able to be largely contained.

Historically, severe downy mildew events occur roughly every 9 years (nationally). The Riverland Viticulture Technical Group believes the region (and the nation) needs to be more adequately prepared for this situation when it next arises.

## 1.2 Aim of the plan

The Riverland Downy Mildew Action Plan establishes guidelines for the wine industry to; prepare for and, respond to, Downy Mildew events. The purpose of the plan is to:

- Provide policy and guidelines for the consistent management of Downy Mildew events by appropriately trained personnel;
- Improve the technical validity of underlying assumptions in the development of strategies to respond to Downy Mildew events;
- Provide a focus for training personnel in operational response procedures;
- Provide standard operating procedures for personnel involved in response management;
- Establish a protocol document able to be implemented by other regions for their management of this disease.

The plan contains provisions to:

1) Inform, educate and support growers
2) Ensure timely access to appropriate chemicals
3) Coordinate regional response to downy mildew events

## 2 INTRODUCTION

### 2.1 Disease description

Downy mildew is a major disease of grapevines and in abnormally wet seasons can cause severe loss and much grower anxiety. It is now established in all Australian viticultural regions and the offending pathogen is the fungus *Plasmopara viticola*. Disease development is favoured by warm wet weather, especially in late spring and early summer.

Severe infection by downy mildew kills bunches, reduces yields and berry sugar content and may cause defoliation. The exposed berries are then subject to sunburn. In addition, the buds forming for the next season can be less winter hardy and produce substantially less crop.

### 2.2 Economic Impact of Downy Mildew

The economic impact of an epidemic season without appropriate planning will be enormous. In some cases, losses can be up to 100% in individual vineyards if severe infection is not controlled near flowering.

The economic impact of downy mildew has two components:

1) The direct loss of crop from disease; and
2) The cost of attempts to control it.

We are estimating that in a normal year downy mildew costs 4% of gross value of production, and in a wet year, 14%. The data used for our estimation are from 2005 as sourced from the Phylloxera and Grape Industry Board of South Australia *viz.* Riverland gross value of production was $231m and Australia, $1.4 b.

**Average Year**

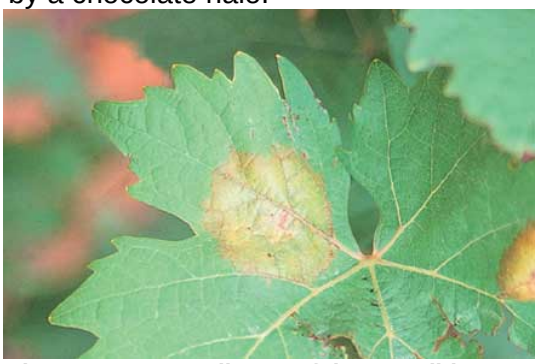
| | **Crop Loss** | **Control Costs** | **Total $ million** |
|---|---|---|---|
| Riverland | 6.9 | 2.3 | 9.2 |
| | | | |
| Australia | 42.0 | 14.0 | 56.0 |
| | | | |

**Wet Year**

| | **Crop Loss** | **Control Costs** | **Total $ million** |
|---|---|---|---|
| Riverland | 22.6 | 9.7 | 32.3 |
| | | | |
| Australia | 137.2 | 58.8 | 196.0 |
| | | | |

## 2.3 Symptoms

The first sign of disease is the appearance of slightly yellow oilspots on leaves, sometimes surrounded by a chocolate halo.



**Picture 1: Young oil spot of downy mildew. Note the chocolate halo.** ***Photo credit: Peter Magarey***

Over time, the spots enlarge and merge to cover most of the leaf.



**Picture 2: Rapidly growing oil spots often merge to infect much of the leaf.** ***Photo credit: Peter Magarey***

As the leaves mature, they develop some resistance to disease. The veinlets limit the growth of the fungus, causing a tapestry-like appearance on affected leaves. The underside of the oilspots will have a distinct white down visible if secondary infection conditions have occurred. Rarely, oily brown areas will develop on shoots and tendrils. Affected flower clusters turn an oily brown, and can die rapidly.



**Picture 3: White down (spores) may develop after infection.** ***Photo credit: Peter Magarey***

Berries are susceptible to infection until they reach pea sized, after which they are usually resistant.



**Picture 4: Berries infected soon after flowering develop a purple hue, shrivel and fall.** ***Photo credit: Peter Magarey***

## 2.4 Disease Lifecycle

Downy mildew begins with primary infection when spores are splashed from the soil to the leaves.

There are 3 Steps in the disease progress:

**I. Primary Infection**

Spores splash from soil to foliage
Primary infection can occur at any time during the season if at least 10 mm of rain and/or irrigation falls and the temperature is at least $10^0$C during a 24 hour period.
***Rule of thumb***: 10:10:24 is a guide to when primary infection occurs BUT there are specific conditions that must prevail:

From Hours 1–16: rain is needed to wet the soil
From Hours 17–24: rain is needed to splash spores to the foliage (from the soil) and wet leaves for at least 2 hrs (45°C hour's leaf wetness).

**Note:** Not all 10:10:24 events will lead to disease! Specific conditions are required.

**II. Oil spots**

Oil spots generally appear within 5 –7 days of an infection event, however, on occasion they can take longer (up to 20 days) depending on temperature. Oil spots are the driving force of disease proliferation and if left uncontrolled can cause immense damage - providing conditions are favourable for disease development.

**III. Secondary Infection**

Spores spread from leaf to leaf/bunch.
Requires a warm, humid night:

- a viable oil spot
- at least $13^0$C
- 98% Relative Humidity and darkness for 4 hrs
- then wet leaves and bunches for at least 2 hrs

**Note:** Downy mildew spreads in secondary infection when spores are splashed from leaf to leaf and leaf to bunch.

**Monitor:**

Often downy mildew is not detected until the disease spreads and more oilspots are visible. Rapidly growing oilspots often merge to infect much of the leaf.

Monitor more closely after oilspots are predicted by the incubation calendar, CropWatch (Horticulture hotlines) or AusVit™, especially in spring and early summer. Vigilance is required as the incidence level following a primary infection is generally very low – often only one spot per 50m of vine canopy.

Oil spots can resemble sun spots, powdery mildew oils spots or herbicide damage and visual diagnosis can be difficult. Confusion can be avoided through the use of a simple 'bag test'. This test creates conditions that resemble secondary infection conditions and enable the mildew to sporulate. Suspected diseased leaves are placed in a sealed plastic bag containing a few drops of water. The bag is placed in a dark, warm (18°C min.) position overnight, and then examined for white down on the underside of the leaves.

**Note:** Flowers and young berries are very susceptible to infection. Though the rachis remains susceptible, berries bigger than pea-size (5-6 mm diam.) are resistant.

Infection near flowering can kill bunches, which then turn brown. Later, diseased bunches blacken and fall. Some berries may survive. Berries infected after flowering develop a purple hue, shrivel and fall while infection of berry stalks shrivel the berries. White down (spores) may develop after infection.

## 2.5 Control

### 2.5.1 Cultural

Cultural control only assists in the control of disease. It does not prevent disease. Methods include those that encourage rapid drying of the canopy. Management systems that allow good aeration (of the canopy) will also enhance spray coverage and penetration.

### 2.5.2 Biological

To date, there are no useful biological treatments registered for downy mildew control.

### 2.5.3 Chemical

Traditionally, the disease has been managed by a combination of pre-infection (protectant) and post-infection (eradicant) fungicides.

**Pre-infection fungicides include:**

- Copper based formulations
- Dithiocarbamate (e.g. Mancozeb®)
- Quinone (Delan®)
- Chlorophenyl (Bravo®)
- Azoxystrobins (Amistar®, Cabrio®)

These fungicides must be applied as close as possible prior to infection conditions occurring (3-7 days). Effective spray coverage is essential. However, rainfall and overhead irrigation can redistribute some of these chemicals on the foliage and reduce the level of control – this will need to be considered when determining effective management options.

Post-infection fungicides include:

- Phosphonate (Agriphos®, Phosacid® etc.) - *restrictions on use currently exist*
- Phenylamide (Ridomil Plus®, Galben M®)

These fungicides are best applied immediately after an infection event and before the appearance of oilspots.

## 3 MANAGEMENT AND ADMIISTRATIVE ARRANGEMENTS

There are four phases of the Downy Mildew Action Plan:

1. Investigation
2. Standby
3. Response
4. Recovery

### 3.1 The Investigation Phase.

This involves identification of disease risk and the parameters to trigger an escalation to the Standby phase. Risks and actions considered in this section are:

- CropWatch message. At the end of August each year the CropWatch service sends out a description of the CropWatch message explaining; how it is developed and, how to use it as a vineyard management tool.

***CropWatch*** *is a disease and pest risk management information service which uses vineyard pest and microclimatic data to provide a weekly fax and e-mail message for Riverland grapegrowers.*

- Downy Mildew Fungicide Availability Risk. In any downy mildew event the area that will need to be sprayed must be determined. Therefore, there is a need to establish an estimate of stocks held on farm.
    - This will be achieved through pre-season stock surveys, distributed via fax, by wineries, to as many growers as possible (see 5.1 - 5.3 pre-season stocks survey template). In the future wineries may choose to make this mandatory.
    - The *Viticulturalist* will calculate an estimate of the area that needs to be sprayed with the use of the templates supplied in Appendix (5.1 – 5.3) and by the information on chemical stocks sold by the Chemical Reseller.
- Pre-season Projected Weather Risk. The *Bureau of Meteorology (BOM)* provides the *Plant Pathologist* with a long range (3 month) projected weather forecast at the request of the *Executive Officer*.
- Growing Season Risk. Vines are at risk from budburst, but risk of downy mildew needs to be assessed for each variety to determine when the vineyard susceptibility warrants a control, i.e. when is there sufficient shoot growth for disease risk in favourable weather?
    - The *Viticulturalist* will draw on the resources of vineyard monitoring services, winery liaison staff and vineyard managers.
    - The *Plant Pathologist* will assess the risk of disease with information provided by the *Viticulturalist* on the extent of shoot growth in relation to the risk of infection in each locality.
    - On a monthly basis the *Bureau of Meteorology* provides the *Plant Pathologist* a new long range forecast. This may occur more regularly in wetter years and the frequency of receipt will be determined by the *Plant Pathologist*.
- CropWatch Message Risk. These will be sent out to each registered grower on the recommendation of the *Plant Pathologist* in agreement with the *Viticulturalist*.

### 3.2 The Standby Phase.

**This covers alert, standby and incident readiness. This phase ensures that the Riverland Downy Mildew Action Committee is ready to respond to any Downy Mildew incident and includes:**

- Engaging industry and other stakeholders in planning;
- Convening RDMAC meetings as required;
- Pro-active risk assessments and "what if" scenarios based on 1992-93 events.
    - *An example of this occurred in October 2005, when a simulated epidemic of downy mildew was conducted ('Fluffy Goose' – see forward)*
- Product identification (preventatives, alternatives and eradicants i.e. pre- and post-infection fungicides);
- Paperwork e.g. registrations for potential alternative products lodged for a quick response;
- Grower planning and risk management;
- Review of chemical manufacturer's and supplier's databases;
- Monitoring stocks of downy mildew fungicides;
- Extension program development to support and educate growers.
- Alert by the *Bureau of Meteorology* to all media if there is greater than 75% probability of an immanent primary or secondary infection; risk as adjudicated in discussion with the *Plant Pathologist*. The *Executive Officer* is advised. A CropWatch downy mildew alert message may also be distributed, on advice of the *Plant Pathologist*.

### 3.3 The Response Phase

This is triggered by:

- Lack of downy mildew fungicide, where demand significantly exceeds stock (pre or post-infection products);
- Disease risk and/or;
- Notification that an alert has been released.

The Response phase aims to:

- Ensure timely and appropriate communications to all sectors of the grape industry - to maximise the effectiveness of controls;
- Ensure timely access to necessary chemicals in the event of a wet spring, by tracking and sourcing domestic and international product;
- Develop applications and implement emergency importation of chemicals if needed.

#### 3.3.1 Activating the Loxton Operations Centre

The first action in response will be the activation of the Operations Centre at request of the Chair or his/her delegate. Requirements of the Operations Centre are:

- Free, immediate access to a meeting place on demand;
- Availability of Phone, mobile phone, fax and fax broadcast facilities, email and web;
- Media and operations contacts for all;
- Administration officer on-site. Communications person onsite. Designated phone line, with its own listing. Own dedicated website (part of CropWatch Online) and hub for communications;
- Photocopying facilities;
- Office equipment as appropriate;
- Computer and printer;
- AusVit software;
- Database of growers/stakeholders.

### 3.3.2 Activities during the Response phase:

- The Bureau of Meteorology provides within-season forecasts (e.g. wet conditions within the next seven to ten days);
- Chemical industry representative provides advice from fungicide manufacturers;
- Chemical industry representative provides information from resellers;
- Chemical industry representative recalculates stocks using stock inventory and demand sheet;
- Viticulturalist provides grower and vineyard progress information from surveys;
- Viticulturalist provides information from AWRI and wineries RE: fungicide recommendations;
- Plant Pathologist provides disease epidemiological and other information as needed.

This process should also allow for the implementation of selected activities of the Extension program, which may be tailored to meet the requirements of specific localities.

### 3.3.3 Action for lack of fungicide:

- Riverland Downy Mildew Action Committee meeting called by any member by contacting Executive Officer;
- Executive Officer convenes meeting or phone linkup;
- Meeting assesses situation to determine level of response;
- Seek winery response and action;
- Re-assess fungicide stocks;
- Activate extension plan;
- Advise growers via CropWatch and media as appropriate;
- Advise wineries;
- Determine need for sourcing more stock;
- Village meetings to discuss management options i.e. grower presentations specific to each locality/district within the region.

### 3.3.4 Action for disease risk:

- Plant Pathologist liaises with Bureau of Meteorology and Viticulturalist to determine if trigger point reached for an infection event;
- Plant Pathologist provides disease epidemiological and other information as needed;
- Riverland Downy Mildew Action Committee convened and determines response level;
- Recalculate chemical stocks;
- Source more stock as needed;
- Advise chemical suppliers;
- Advise CropWatch and media as appropriate;
- Determine action needed at each locality;
- Village meetings if extreme risk is current;
- Re-assess response level and scale up and down as necessary.

### 3.3.5 Communications response (regional)

- Ensure media communications accommodate standard media deadlines, e.g. Standard press releases due by midday.
- TV, radio and press
- Winery distribution

**3.4 The Recovery Phase** of the plan:

- Provides for advice and support for growers who may have experienced crop loss or incurred debt in their response to the disease.

It should be noted that the actions described in this document are advisory in nature and, in the course of an emergency, variations may occur.

### 3.4.1 Recovery Activities

These may commence before the conclusion of the response phase.
In this phase the Riverland Downy Mildew Action Committee is responsible for:

- A situation analysis, monitoring and reporting on a continuing basis to National Downy Mildew Action Committee (if and when established) or to national grape industry representatives as appropriate in the meantime.
- Liaison between stakeholders
- Facilitation of technical services e.g. financial counseling, viticultural recommendations
- After the incident response is completed, the Chair should convene the Riverland Downy Mildew Action Committee for a hot debrief (within a week to two weeks), this should include sharing the lessons learned with others.
- The final debrief needs to be held several weeks after the incident response has been completed. The Recommendations may be used to improve and update the Downy Mildew Action Plan.

### 3.4.2 Extension program:

| |
|---|
| AIM: Consistent information from service providers and standardisation of message and extension processes e.g. CropWatch and fax advisory services, field days, viticulture visits etc. |

Resources needed:

- Up-to-date fact-sheet on Downy Mildew in print and on-line media
- CropWatch and CropWatch Online services including SMS alert function.

Village meetings may be in either a series or targeted at specific localities, addressing such issues as:

- Medium and long term forecast concerns e.g. in relation to disease risk, crop susceptibility, weather forecasts, spray and disease management advice and chemical availability
- Grower concern/interest
- Any major disease management event e.g. lack of stock, resistance
- Other disease management issues e.g. too wet to access vineyard.

## 4 STANDARD OPERATING PROCEDURES

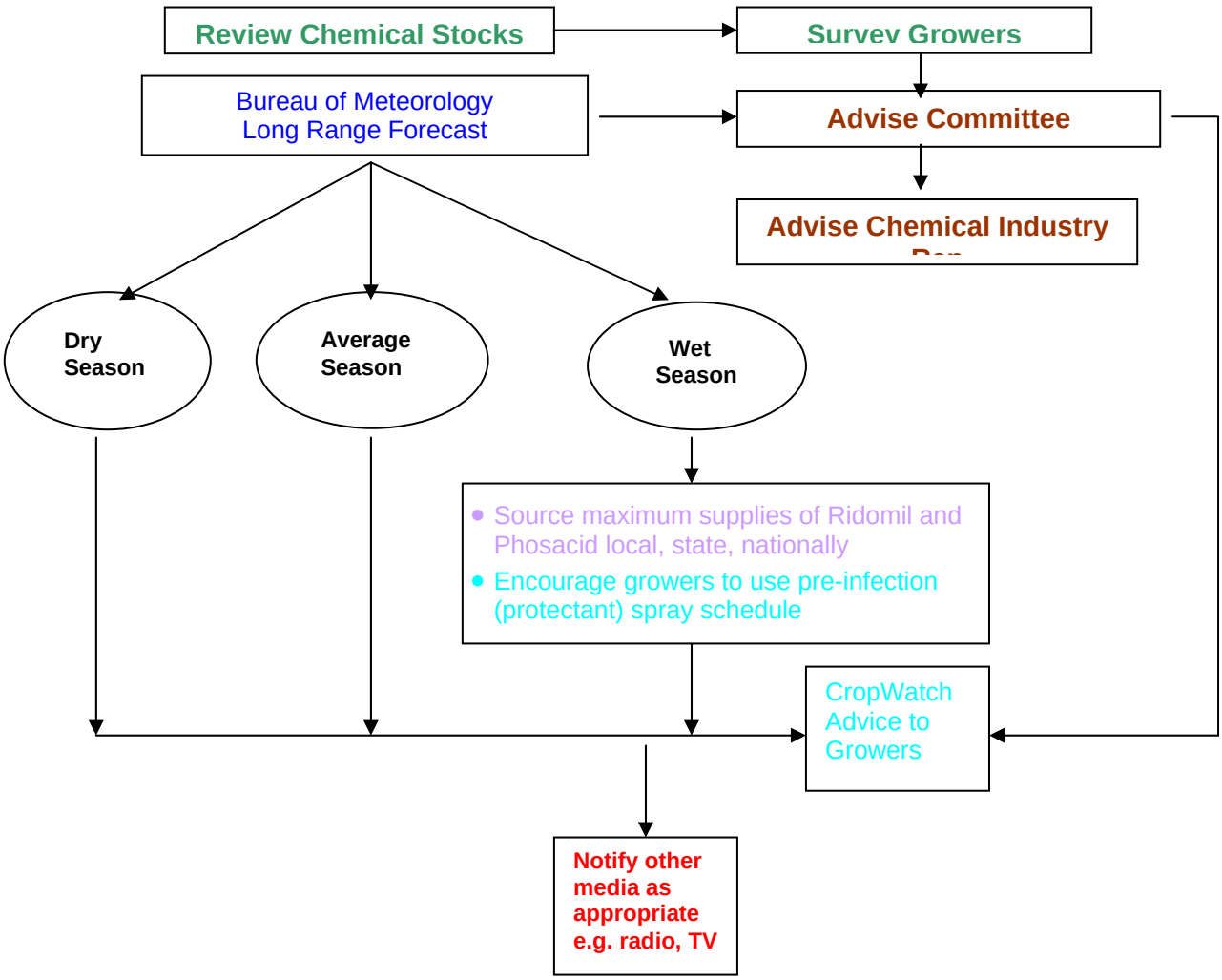
**Standard Operating Procedures by Role**


4.1 Flow chart overview
4.2 Chair
4.3 Executive Officer
4.4 Viticulturalist
4.5 Plant Pathologist
4.6 Bureau of Meteorology
4.7 Chemical Reseller
4.8 Winemaker
4.9 CropWatch Representative

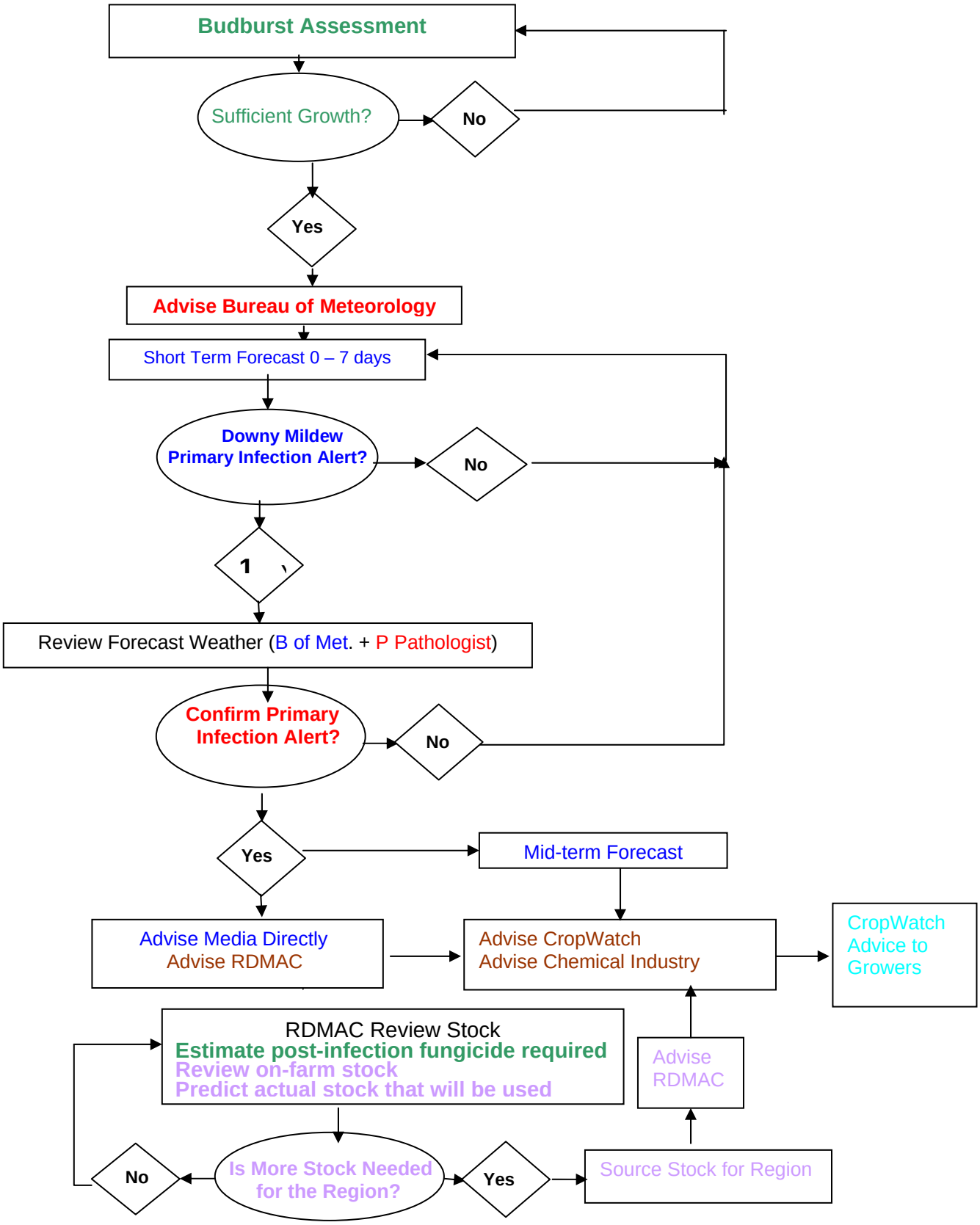

## 4.1 Grapevine Downy Mildew Action Plan Flow Diagrams Overview

Chair
Executive Officer
Viticulturalist
Plant pathologist
Bureau of Meteorology
Chemical Reseller
Winemaker
CropWatch Service Provider

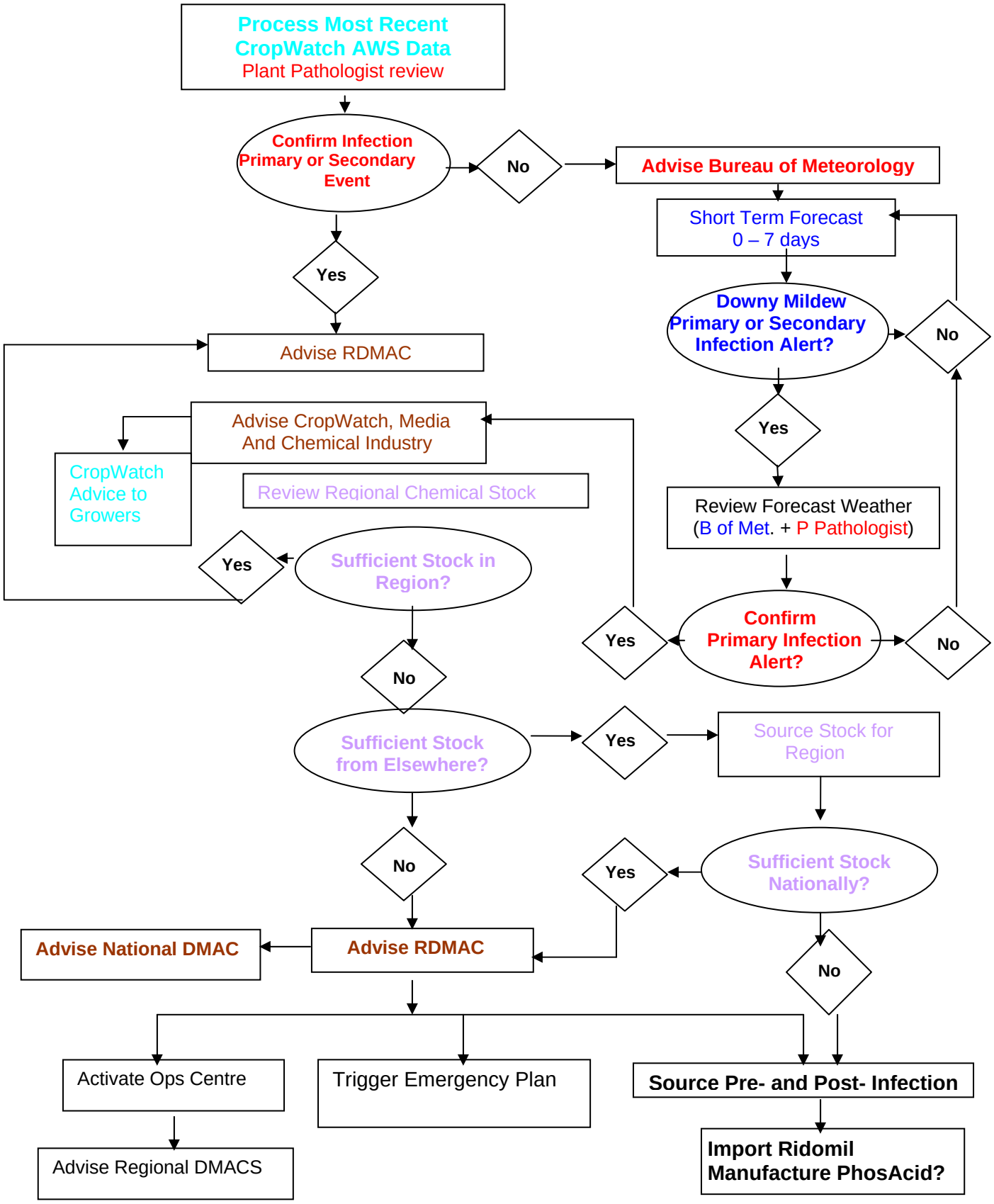
**Phase 1: Investigation - from 30th June Each Year**



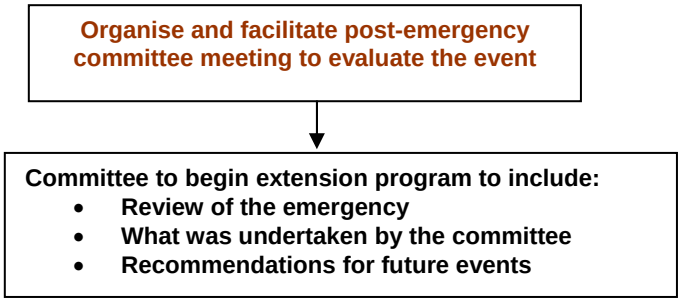
## Phase 2: Standby from 1st September Each Year



## Phase 3: Response - After an Infection Alert has Been Given



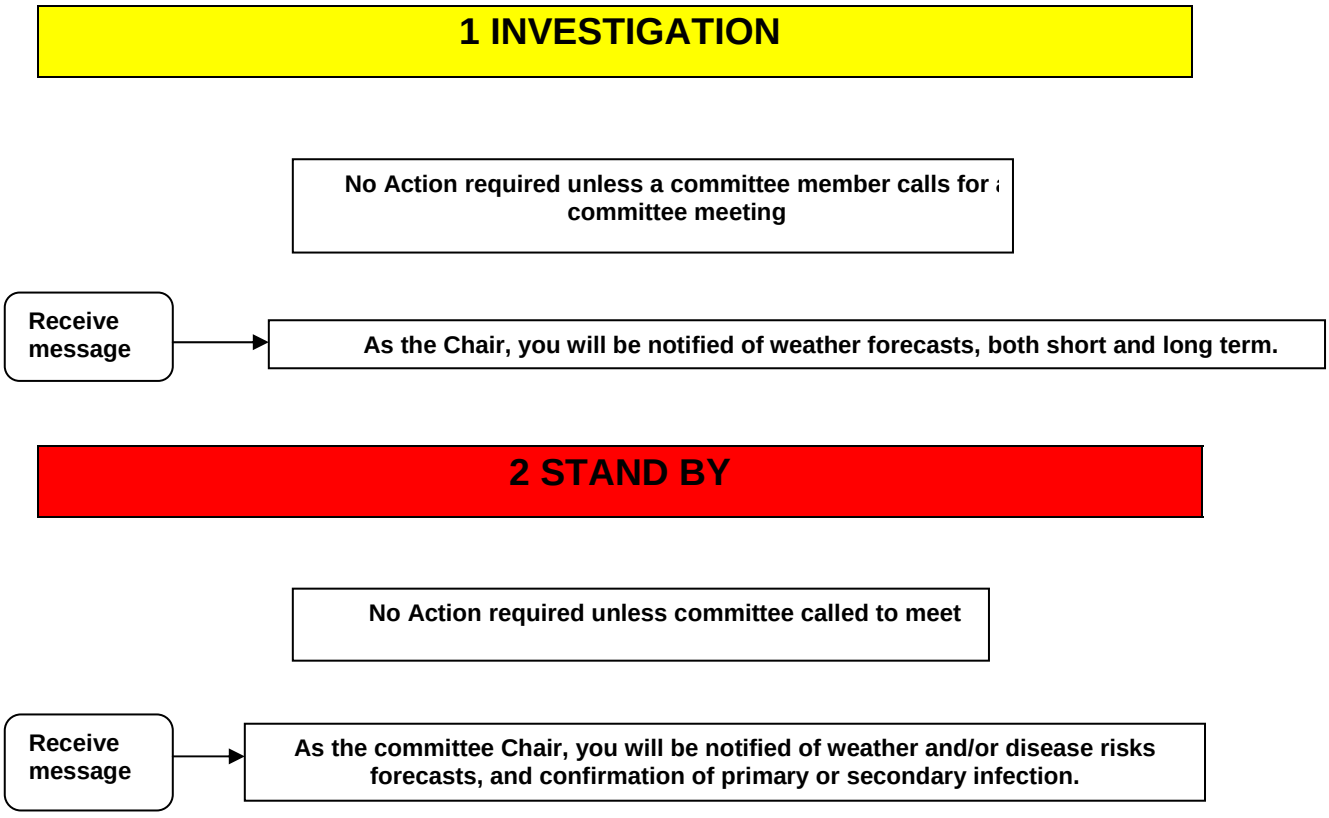
## Phase 4: Recovery



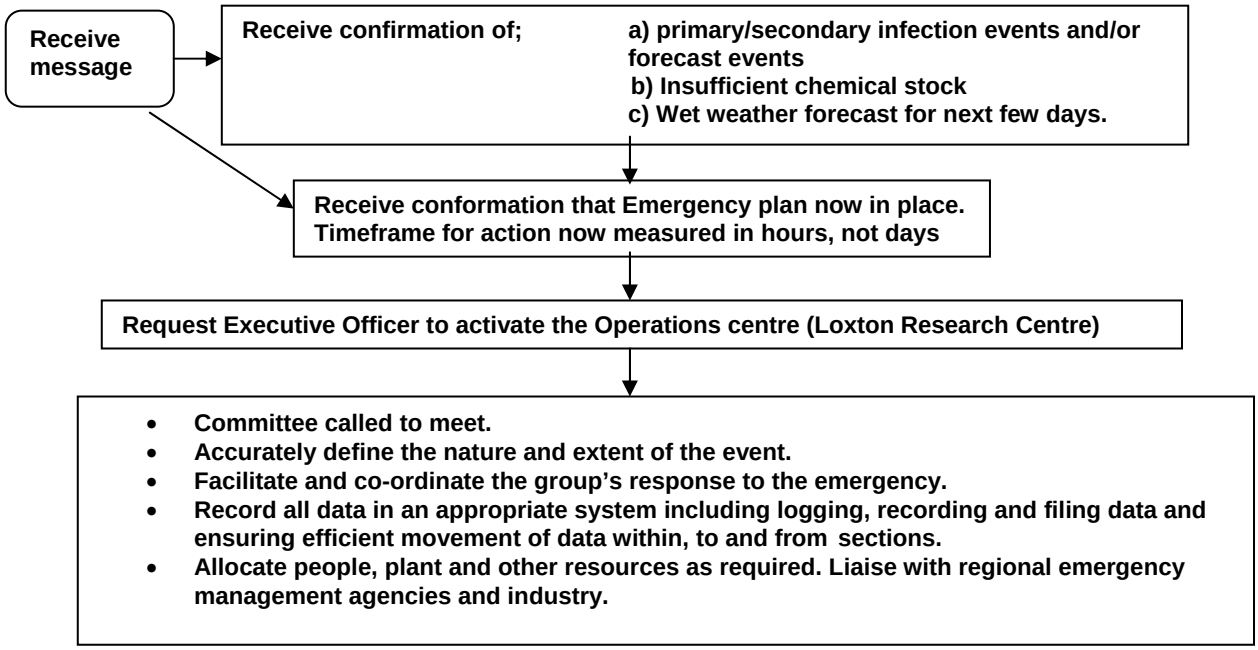
## 4.2 Role Of Chair Of Riverland Downy Mildew Action Committee

### Role Overview

- **Ensure proper and timely function of the Riverland Downy Mildew Action Planning Committee, where appropriate convening meetings, ensuring appropriate delegates or their substitutes, attend a guiding smooth and effective operation of the Downy Mildew Action Plan.**
- **Ensure that accurate and timely advice is provided to the Minister, industry stakeholders and the public.**
- **Delegation and decision-making.**
- **Authority to replace anyone on committee and pull in extra expertise as needed.**
- **Escalation decision as well as scaling down. Role will vary according to the nature and size of the event in terms of risk to the effective operation of the plan**



# 3 RESPONSE




# 4 RECOVERY

As necessary, convene and attend post-emergency committee meeting to evaluate the event and the effectiveness of RDMAC's response to it.

### 4.3 Role Of Executive Officer

**Role Overview**

- **Provide administrative support and coordinate group resources**
- **Ensure timely collection and distribution of briefing reports from committee members**
- **Assist in developing grower messages from CropWatch. Assist with extension program, both pre- and post- season.**

**At any stage call a meeting of Committee if requested to do so by any member.**

## 1 INVESTIGATION

**Request long range forecast from the Bureau of Meteorology (BOM)**

↓

**Advise all members of Regional Downy Mildew Action Committee of forecast**

## 2 STAND BY

**Receive message** →

**Upon confirmation of primary infection alert from Plant Pathologist ensure notification of:**

- **All Committee members**
- **CropWatch**

## 3 RESPONSE

**Receive message** →

**Upon confirmation of primary or secondary infection alert from Plant Pathologist notify:**

- **All Committee members**
- **CropWatch**

**Receive message** →

**Upon receiving report of INSUFFICIENT stock from Chemical supplier notify:**

- **All Committee members**
- **CropWatch**

**Receive message** →

**Upon advice from Chair, activate the Loxton Operations Centre**

**Receive message** →

**Trigger Emergency Plan. All committee members to be involved. Timeframe for action is now hours, not days.**

↓

- **Call Committee to meet.**
- **Accurately define the nature and extent of the event and assist the group's response to the emergency.**
- **Will Winemaker allow the emergency use of Phosacid?**
- **Help co-ordinate the emergency importation of chemicals, including the logistics of rapid transportation and delivery to growers.**
- **Does the committee require the assistance of others e.g. local politician?**

# 4 RECOVERY

**Organise and facilitate post-emergency committee meeting to evaluate the event and the response of the RDMAC's to it.**

↓

**Facilitation of technical services and extension program, e.g. financial counselling, viticultural recommendations to growers etc.**

## 4.4 Role Of Viticulturalist

### Role Overview

- **Provide all the viticultural knowledge, advice and field observations as necessary for the DMAP committee to meet its goals.**
- **A link between the committee and the other viticultural officers in the region.**
- **A link between the committee and the grape growers of the region.**
- **Ongoing assessment of the downy mildew disease status in the region's vineyards and active communication of that status to the pathologist and the other committee members.**

## 1 INVESTIGATION

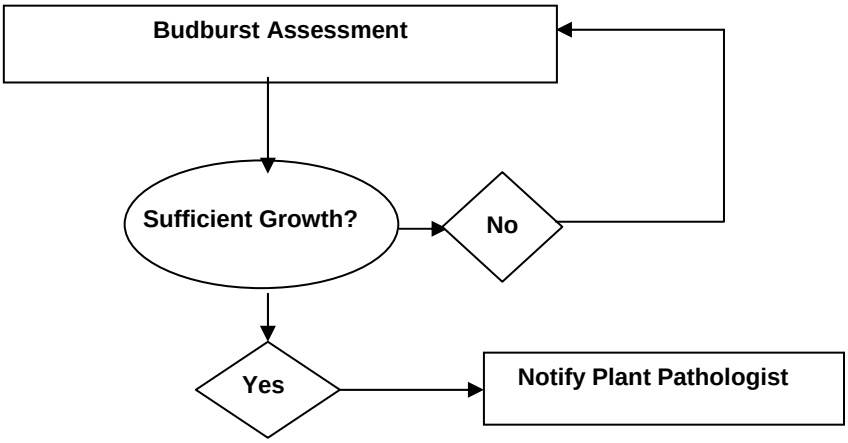
**Conduct a survey of the on farm downy mildew fungicides stocks at the 30th June each year (Use questionnaire 5.2)**

↓

**Advise the Executive Officer of available fungicide stocks by August 15th.**

## 2 STAND BY

**1. Assess plant growth**

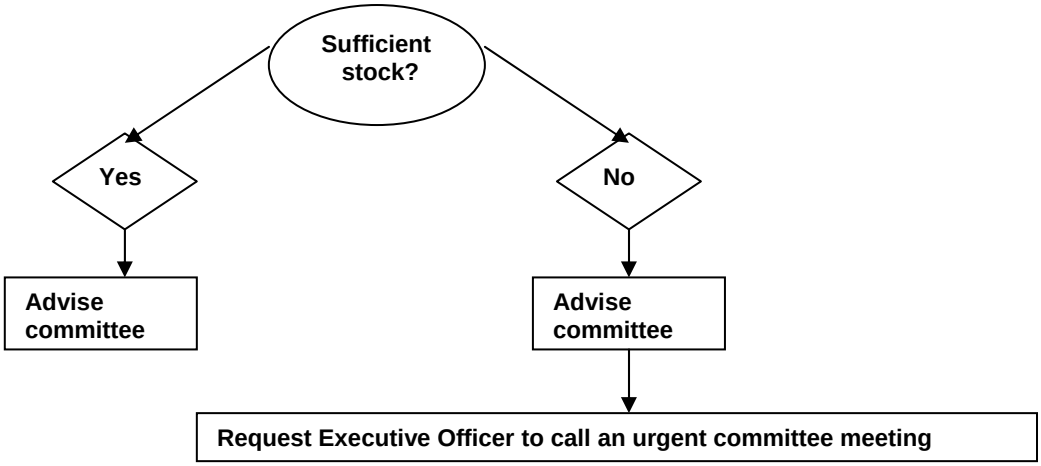



**2. Estimate post-infection fungicide required.**

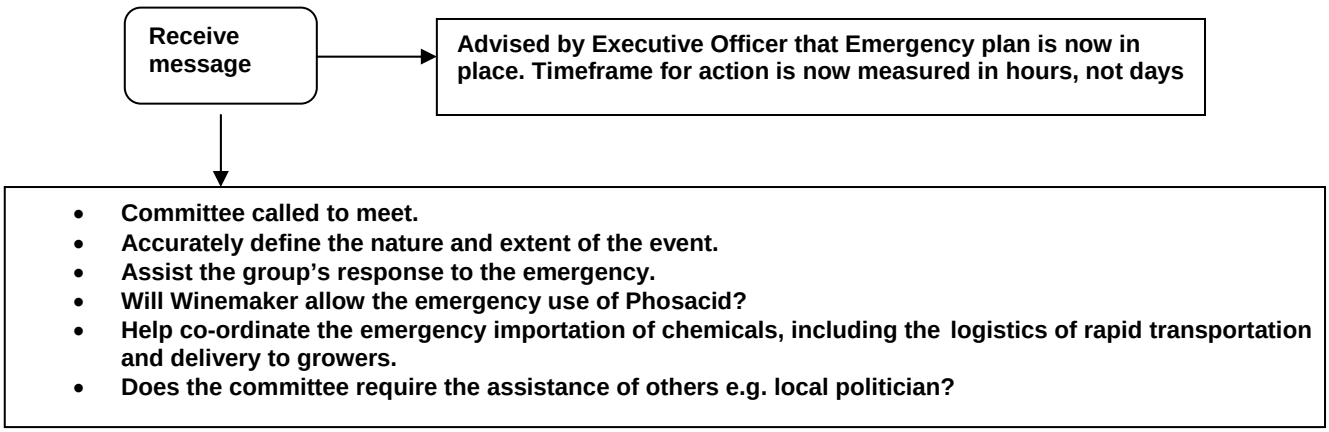
**Upon EVERY confirmation of infection by Plant Pathologist calculate the amount of relevant fungicide necessary to control the disease. (Use DMAP Calculation sheet 5.5**

↓

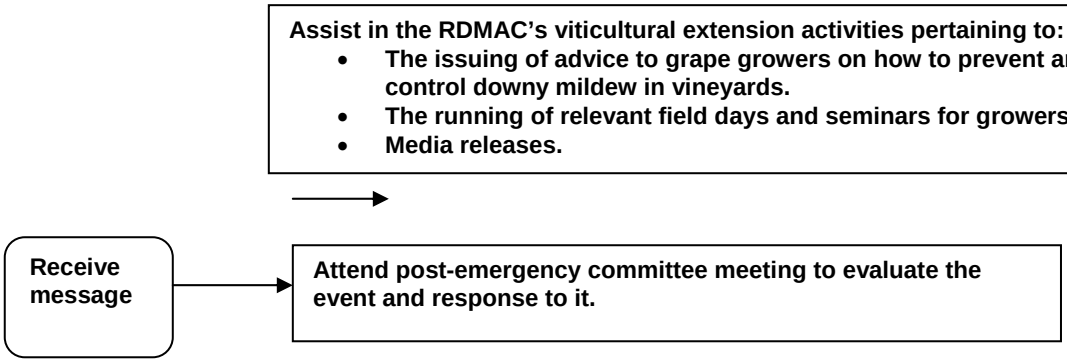
**Contact the Chemical reseller to review fungicide stock levels.**




## 3 RESPONSE




## 4 RECOVERY



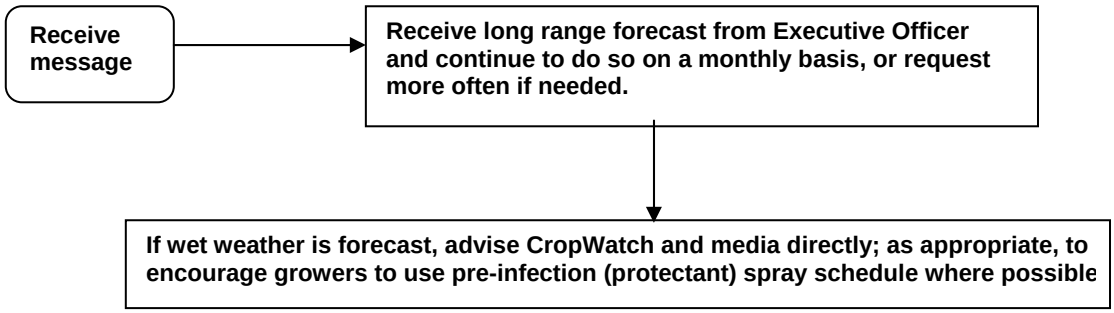
## 4.5 Role Of Plant Pathologist

### Role Overview

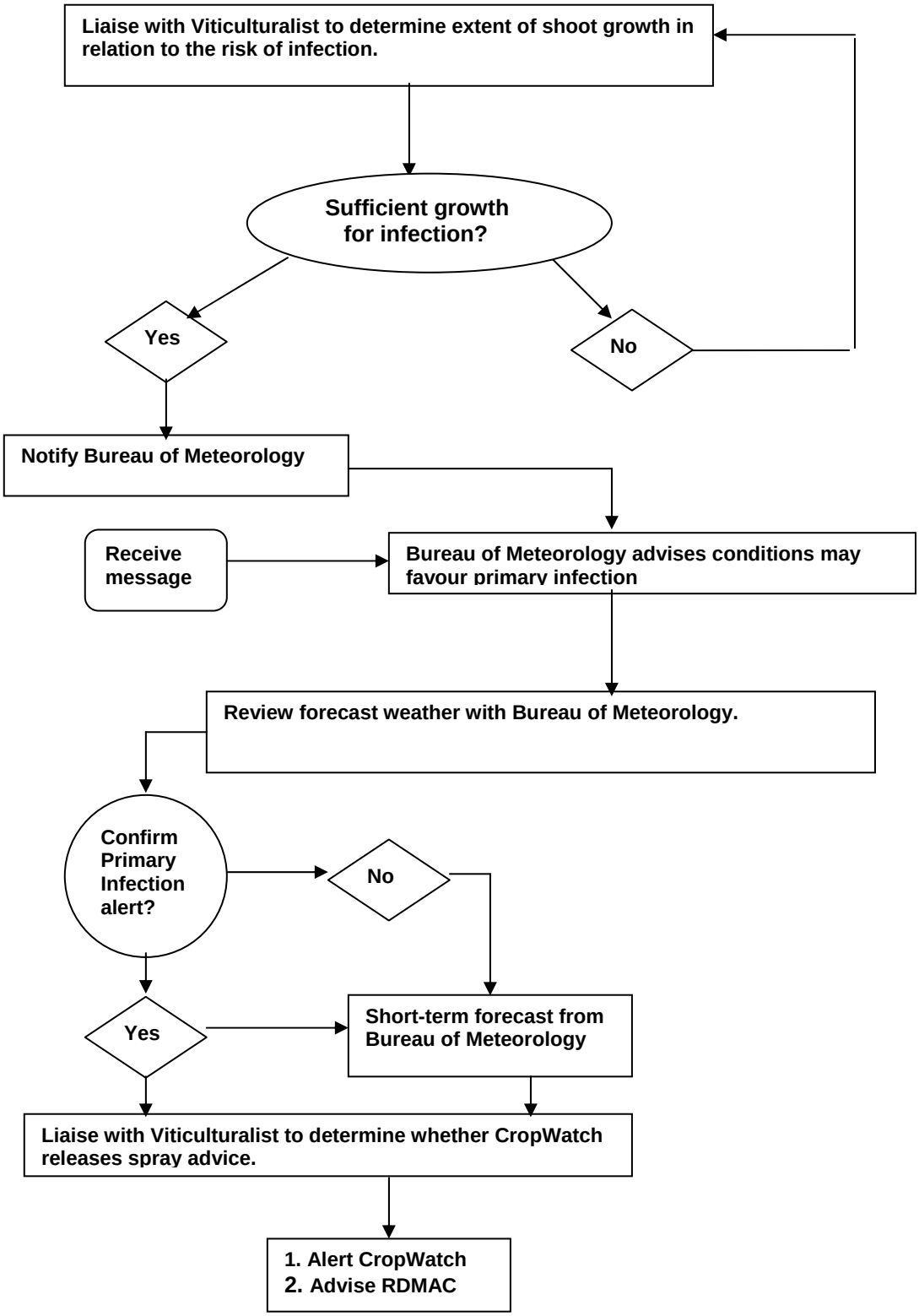
- **Plant Pathologist is to provide information on:**
  - **the pathogen, inoculum build up, disease predictions, the most up to date disease strategies and recommendations;**
  - **the disease risk in a 1-4 day outlook, 4-30 day outlook, 30 day plus outlook;**
  - **the requirement for pre- and post-infection sprays;**
  - **Spray coverage and influence of rain on spray schedules.**

# 1 INVESTIGATION

**Assist CropWatch Message Service Provider in delivering an introductory fax to registered growers at the start of the CropWatch service each year. Growers should be informed so that they know the process behind Downy Mildew alerts.**



# 2 STAND BY


Liaise with Viticulturalist to determine extent of shoot growth in relation to the risk of infection.
Sufficient growth for infection?
Yes
No
Notify Bureau of Meteorology
Receive message
Bureau of Meteorology advises conditions may favour primary infection
Review forecast weather with Bureau of Meteorology.
Confirm Primary Infection alert?
No
Yes
Short-term forecast from Bureau of Meteorology
Liaise with Viticulturalist to determine whether CropWatch releases spray advice.
1. Alert CropWatch
2. Advise RDMAC

# 3 RESPONSE

- Review risk of an event (primary and/or secondary) having occurred.
- Discuss with CropWatch and Viticulturalist to determine content of CropWatch message.

↓

Advise Bureau of Meteorology whether or not event confirmed.

↓

Advise Executive Officer

Receive message →

Receive conformation that Emergency plan now in place. Timeframe for action now measured in hours, not days

↘

Activation of the Operations centre (Loxton Research Centre)

↘

- Committee called to meet.
- Accurately define the nature and extent of the event.
- Assist the group's response to the emergency.
- Will Winemaker allow the emergency use of Phosacid?
- Help co-ordinate the emergency importation of chemicals, including the logistics rapid transportation and delivery to growers.

***Does the committee require the assistance of others e.g. local politician?***

# 4 RECOVERY

Participate in committee meeting after event.

Assist with extension program if needed

## 4.6 Role Of Bureau Of Meteorology

### Role Overview

- Provide short, medium and long-term forecasts.
- Provide an increased level of service in times of outbreak.

## 1 INVESTIGATION

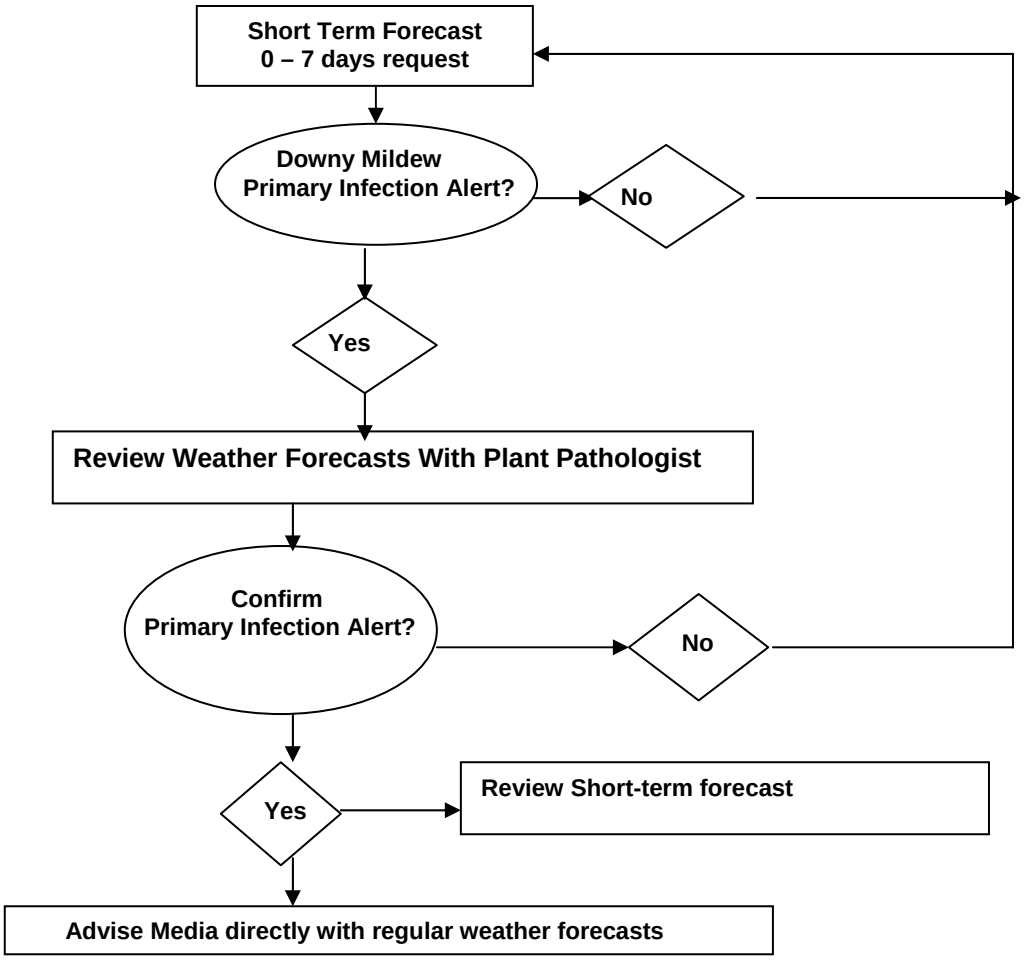
Receive message

- A long-range (3 month) weather forecast will be requested by Executive Officer.
- Provide forecasts upon request

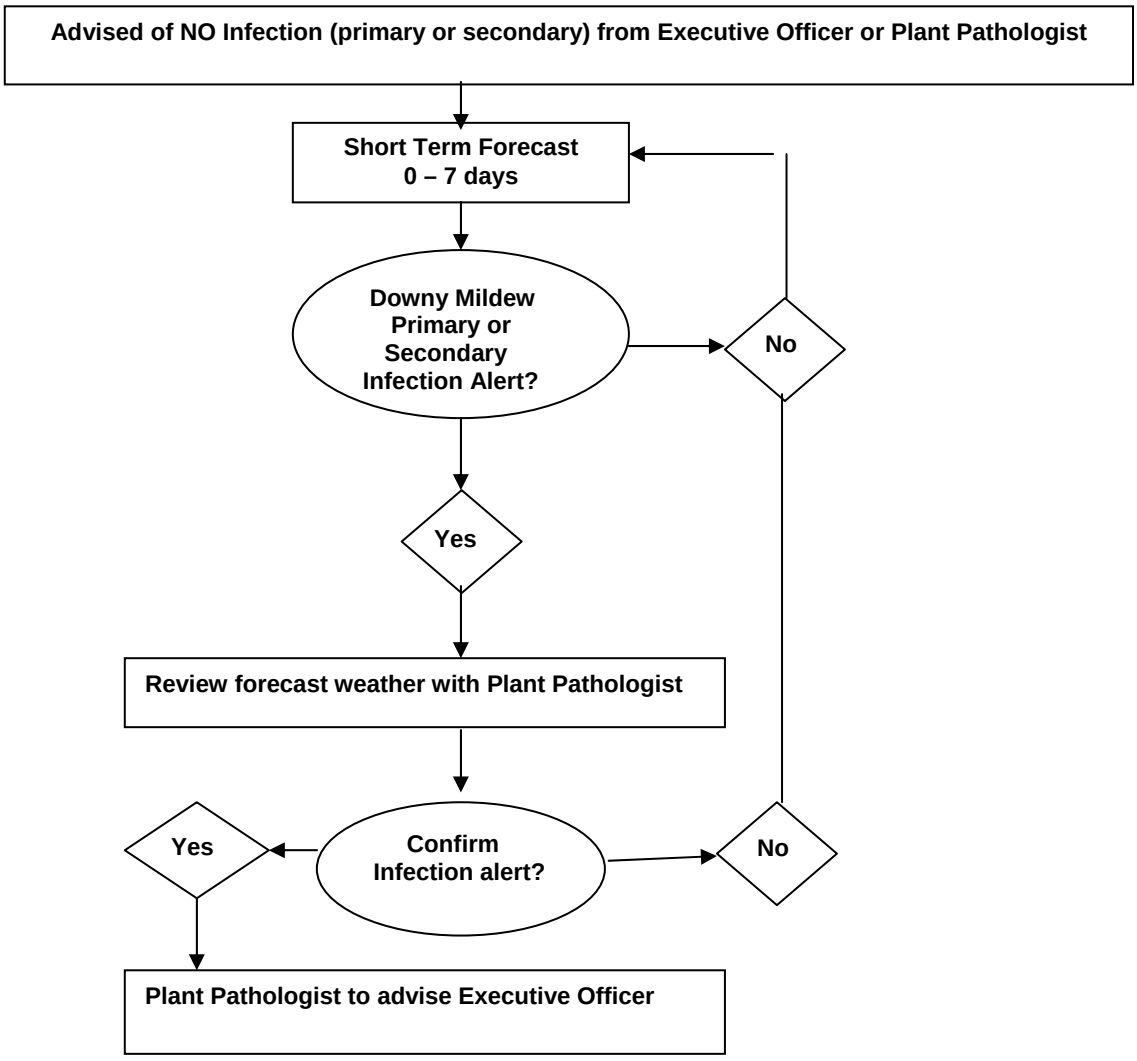
## 2 STAND BY

Receive message

- A short term (0 – 7) days weather forecast will be requested by Executive Officer.
- Provide forecasts upon request



# 3 RESPONSE




- **Committee called to meet.**
- **Accurately define the nature and extent of the event.**
- **Assist the group's response to the emergency.**
- **Will Winemaker allow the emergency use of Phosacid?**
- **Help co-ordinate the emergency importation of chemicals, including the logistics of rapid transportation and delivery to growers.**
- **Does the committee require the assistance of others e.g. local politician?**

## 4 RECOVERY

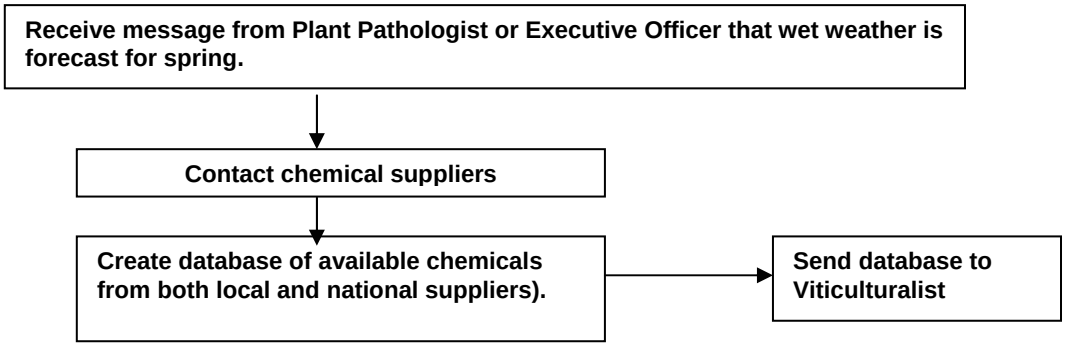
No action required unless a specific request from committee

### 4.7 Role Of Chemical Reseller

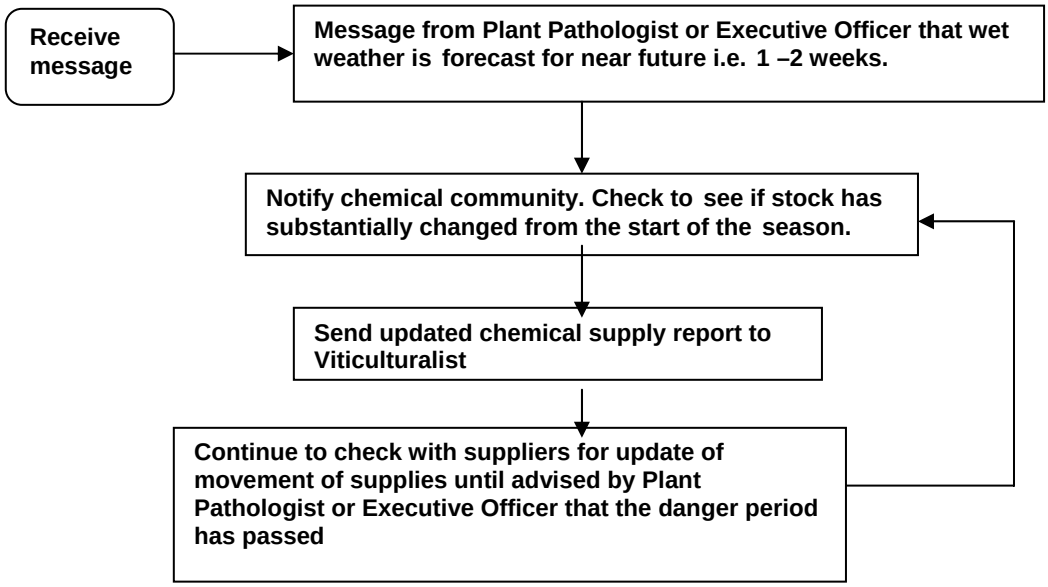
#### Role Overview

- To provide details of available fungicides, sometimes at short notice.
- Be aware of possible problems, such as transport issues.
- Provide alternative fungicide product listing for winery if needed.

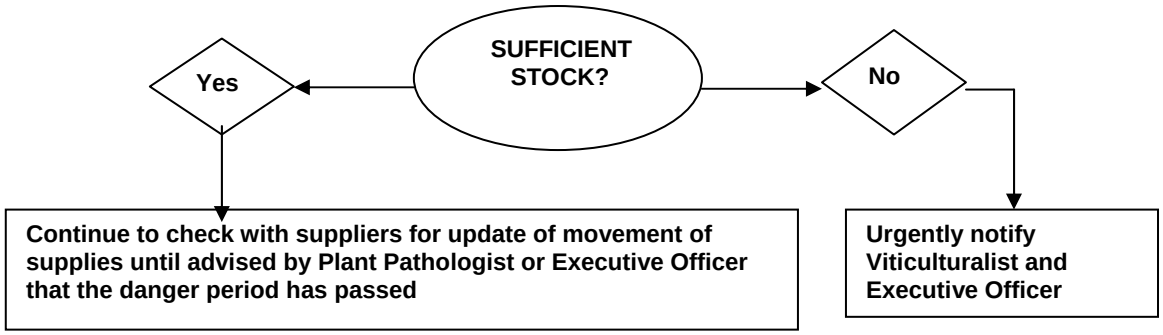
## 1 INVESTIGATION

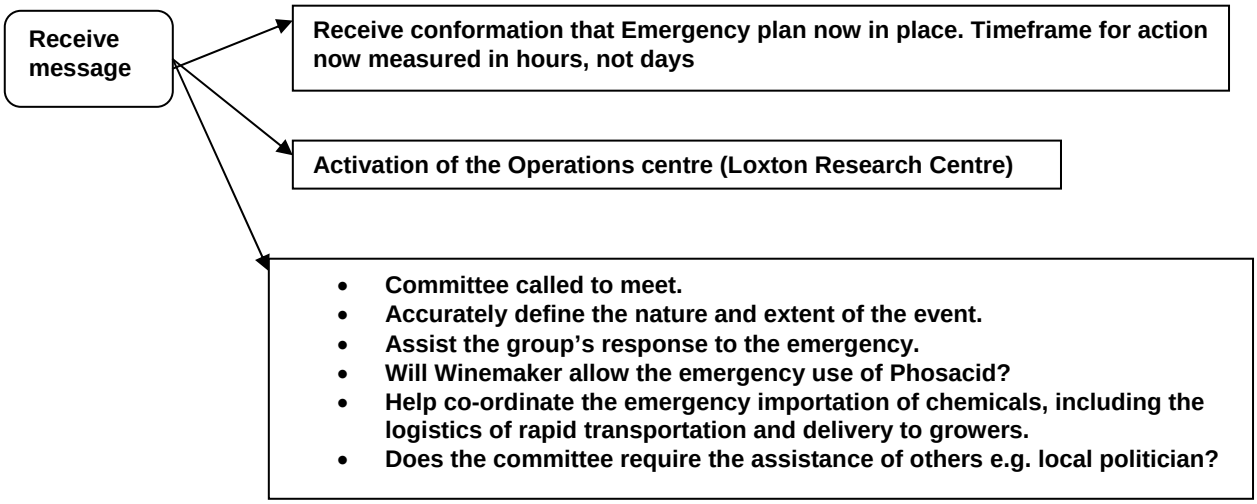



## 2 STAND BY

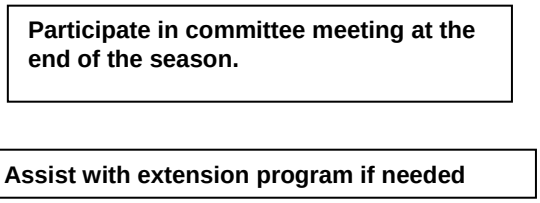


# 3 RESPONSE




# 4 RECOVERY



## 4.8 Role Of Winemaker

### Role Overview

- **Chemical selection and withholding periods, modifications to chemical needs.**
- **Specific patch/market advice.**
- **Can phosacid be used in a bad year?**
- **Knowledge of winery and market requirements.**
- **Production and consumer knowledge.**
- **Minimum Quality Standards advice.**

## 1 INVESTIGATION

**No Action required**

**As a committee member, you will be notified of weather forecasts, both short and long term.**

## 2 STAND BY

**No Action required**

**As a committee member, you will be notified of weather forecasts and confirmation of primary or secondary infection.**

## 3 RESPONSE

**Receive conformation of: a) primary/secondary infection**
**b) insufficient chemical stock**
**AND c) wet weather forecast for next few days.**

↓

**Receive conformation that Emergency plan now in place. Timeframe for action now measured in hours, not days**

↓

**As part of emergency taskforce, advise committee on acceptable alternative chemicals, e.g. Phosacid and any other issues, such as withholding periods etc.**

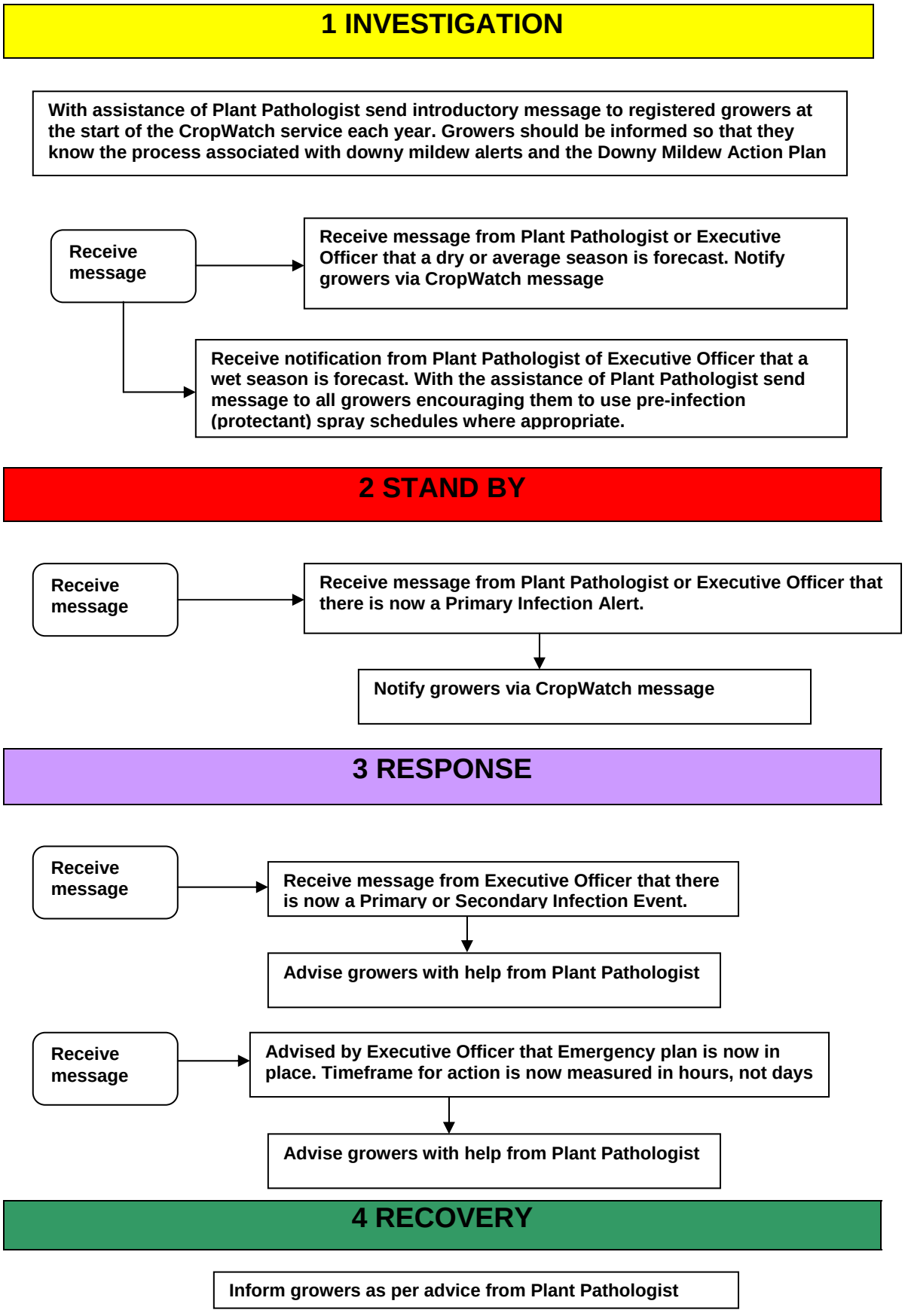
## 4 RECOVERY

**Attend post-emergency committee meeting to evaluate the event and response to it.**

## 4.9 Role Of CropWatch Service Provider

### Role Overview

- CropWatch service provider sends introductory message to registered growers at the start of the CropWatch service each year.
- Growers should be informed of the process behind Downy Mildew alerts that originate from forecast weather events and analysis of data from automatic weather stations.



# 5 APPENDIX 1

## 5.1 Sample Pre-Season Stocks Survey Letter

Dear Grower,

**RE: Riverland Downy Mildew Action Plan (RDMAP)**

I am writing to you seeking your assistance to help implement the Riverland Downy Mildew Action Plan. This is a Riverland Wine Industry Development Council (RWIDC) Viticultural Technical Committee project, which is funded, in part, by the Grape & Wine Research & Development Corporation. It has the support of the CCW Board.

The aim of the project is to manage downy mildew with the best controls to reduce the crop loss from a disease the next time the Riverland has a wet spring. While this might currently seem unlikely given the drought conditions, history shows that it will eventually occur and that the industry needs to be fully prepared.

***N.B Modify text of last sentence for each season***

A key component of the project is to develop a plan that will secure adequate chemical supplies are in the district when conditions favour the development of downy mildew. Unfortunately the current chemical supply arrangements in the Riverland will not cope with a wet spring similar to that of 1992. Without this plan serious shortages of both preventative and 'curative' chemicals will occur and major losses will result.

As part of the plan it will be necessary to estimate the quantities of both preventative and 'curative' chemicals held in stock by growers on 30th June. In addition, it is also necessary to determine what spray strategies will be adopted by growers. For these reasons we have devised the attached simple questionnaire.

We would be grateful if you could fill it out and return fax it to CCW (8583 2104).

We apologise for the inconvenience but we believe this will help us, help you. All the information will be processed in the strictest confidence and the individual sheets will be shredded after collation. The information you supply will not affect your HACCP audit.

We thank you for you cooperation with this important Riverland initiative.

Yours faithfully,

Peter Burne
Riverland Downy Mildew Action Plan Committee

## 5.2 Riverland Downy Mildew Action Plan Questionnaire – Investigation Stage

Trading Name**……..**
Telephone Number**……**

### Location of Vineyards

Please name the nearest town or locality where you grow grapes. Where there are two or more vineyards far apart please name all the localities and the total area in each locality (eg. Pike River 6 ha, Glossop 8 ha, Winkie 4ha). Please also specify the hectares that are overhead sprinkler irrigated.

| **Closest town or locality** | **Total area of vines (ha)** | **Total vine area overhead irrigated (ha)** |
|---|---|---|
| **Example only-Winkie** | *20* | *8* |
| | | |
| | | |

**Area of Vines**
Total Area Planted to Vines =…….Hectares

Total Area of Vines Overhead Irrigated =…….Hectares
Please note that we do not need to know other forms of irrigation.

Total Downy Mildew Fungicides held in stock as at 30th June 2005

Downy Mildew 'Protectants' (Pre-infection fungicides)
1. Copper Products (Copper Oxychloride + Copper Oxide + Tribasic'
   Total =…….Kg
2. Mancozeb Products (All brands containing only mancozeb)
   Total =…….Kg

Downy Mildew 'Eradicants' (post-infection fungicides)
1. Ridomil®(Both types and also Axiom Plus®)
   Total.=……Kg

2. Phosphorus Acid
   200 Formulation Total =…….Litres
   400 Formulation Total =…….Litres
   600 Formulation Total =…….Litres

In a normal dry season how many times do you expect to spray you vineyard with the following types of Downy Mildew sprays?
1. Protectant sprays (eg. Copper or Mancozeb)
   Number of sprays =……..
2. Eradicant sprays (eg. Ridomil)
   Number of sprays =…….

In a wet year how many of the following Downy Mildew sprays do you expect to apply? :
1. Protectant sprays Number of sprays =…….
2. Eradicant sprays Number of sprays =…….

**PLEASE RETURN THIS QUESTIONNAIRE TO CCW BY FAX (8583 2104) OR BY EMAIL.**
Thank you for your help**.**

Peter Burne
Downy Mildew Action Committee

## 5.3 Stock on hand Riverland Resellers – example only

| Company | Product | Location Of product | Low Rate per Ha | High Rate per Ha | Stock lt/kg | Manufacturing Capacity per 7days | Total stock Available per 7 days | Ha @ Low Rate | Ha @ High Rate |
|---|---|---|---|---|---|---|---|---|---|
| **PhosAcid** | | | | | | | | | |
| Elders | 620 | | 1.9 | 3.9 | 2000 | | | 1053 | 513 |
| Landmark | 600 | | 2 | 4 | 1600 | | | 800 | 400 |
| Agribusiness | 600 | | 2 | 4 | 1200 | | | 600 | 300 |
| | | | | | | | **Total Ha PhosAcid** | **2453** | **1213** |
| **Metalaxyl** | | | | | | | | | |
| Elders | Copper base | | 1.5 | 2.25 | 150 | | | 100 | 67 |
| | Mancozeb base | | 2.5 | 2.5 | 100 | | | 40 | 40 |
| Landmark | Copper base | | 1.5 | 2.25 | 150 | | | 100 | 67 |
| | Mancozeb base | | 2.5 | 2.5 | 100 | | | 40 | 40 |
| Agribusiness | Copper base | | 1.5 | 2.25 | 150 | | | 100 | 67 |
| | Mancozeb base | | 2.5 | 2.5 | 100 | | | 40 | 40 |
| | | | | | | | **Total Ha Metalaxyl** | **420** | **320** |
| **Coppers / Mancozebs** | | | | | | | | | |
| Elders | Mancozeb | | 2 | 2 | 12000 | | | 6000 | 6000 |
| | Copper Oxy | | 2.5 | 2.5 | 8000 | | | 3200 | 3200 |
| | Copper Hydroxide | | 1.3 | 1.9 | 5000 | | | 3846 | 2632 |
| Landmark | Mancozeb | | 2 | 2 | 4000 | | | 2000 | 2000 |
| | Copper Oxy | | 2.5 | 2.5 | 5000 | | | 2000 | 2000 |
| | Copper Hydroxide | | 1.3 | 1.9 | 1000 | | | 769 | 526 |
| Agribusiness | Mancozeb | | 2 | 2 | 2000 | | | 1000 | 1000 |
| | Copper Oxy | | 2.5 | 2.5 | 5000 | | | 2000 | 2000 |
| | Copper Hydroxide | | 1.3 | 1.9 | 1000 | | | 769 | 526 |
| | | | | | | | **Total Ha Copper + Mancozeb** | **21585** | **19884** |

**STANDBY PHONE SURVEY**

| Surname | First name | Trading name | Covered at time of event? | When sprayed | Product used | Rate used |
|---|---|---|---|---|---|---|
| | | | | | | |
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## What made you decide to spray? (Please tick triggers)

| | |
|---|---|
| Weather forecast | |
| CropWatch Message | |
| Winery information | |
| Growth stage of vine | |
| Patches not protected | |
| Disease symptoms | |
| Other | |

## 5.4 Downy Mildew Action Plan Calculation sheet

| Riverland Downy Mildew Action Plan Calculation Sheet | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **Hundred** | **Variety** | **Variety Class** | **SumOfVarArea** | **District at Risk Yes = 1 No = 0** | **% Area needing Eradicant** | **Rate/ ha Kgm** | **Total Required** |
| Barmera | COBD | CHA AND COL | Early | 539.53 | 1 | 30% | 2 | 323.7 |
| Barmera | COBD | GORDO | Late | 173.74 | | | | 0.0 |
| Barmera | COBD | REST | Mid | 1516.22 | | | | 0.0 |
| Barmera | LOVE | CHA AND COL | Early | 90.1 | | | | 0.0 |
| Barmera | LOVE | GORDO | Late | 39.63 | | | | 0.0 |
| Barmera | LOVE | REST | Mid | 342.37 | | | | 0.0 |
| Berri | BERR | CHA AND COL | Early | 526.25 | | | | 0.0 |
| Berri | BERR | GORDO | Late | 114.07 | | | | 0.0 |
| Berri | BERR | REST | Mid | 1860.96 | | | | 0.0 |
| Loxton | BOOK | CHA AND COL | Early | 147.99 | | | | 0.0 |
| Loxton | BOOK | GORDO | Late | 42.54 | | | | 0.0 |
| Loxton | BOOK | REST | Mid | 296.65 | | | | 0.0 |
| Loxton | GORD | CHA AND COL | Early | 607.01 | | | | 0.0 |
| Loxton | GORD | GORDO | Late | 110.96 | | | | 0.0 |
| Loxton | GORD | REST | Mid | 1742.51 | | | | 0.0 |
| Loxton | LOXT | CHA AND COL | Early | 105.41 | | | | 0.0 |
| Loxton | LOXT | GORDO | Late | 8.38 | | | | 0.0 |
| Loxton | LOXT | REST | Mid | 151.33 | | | | 0.0 |
| Loxton | MOOK | CHA AND COL | Early | 273.65 | | | | 0.0 |
| Loxton | MOOK | GORDO | Late | 64.23 | | | | 0.0 |
| Loxton | MOOK | REST | Mid | 1077.07 | | | | 0.0 |
| Loxton | PYAP | CHA AND COL | Early | 451.22 | | | | 0.0 |
| Loxton | PYAP | GORDO | Late | 34.33 | | | | 0.0 |
| Loxton | PYAP | REST | Mid | 573.81 | | | | 0.0 |
| Renmark | CHAF | CHA AND COL | Early | 163.6 | | | | 0.0 |
| Renmark | CHAF | GORDO | Late | 15.66 | | | | 0.0 |
| Renmark | CHAF | REST | Mid | 487.7 | | | | 0.0 |
| Renmark | MURT | CHA AND COL | Early | 332.23 | | | | 0.0 |
| Renmark | MURT | GORDO | Late | 25.19 | | | | 0.0 |
| Renmark | MURT | REST | Mid | 1194.79 | | | | 0.0 |
| Renmark | PARC | CHA AND COL | Early | 54.03 | | | | 0.0 |
| Renmark | PARC | GORDO | Late | 8.08 | | | | 0.0 |
| Renmark | PARC | REST | Mid | 70.41 | | | | 0.0 |
| Renmark | PARI | CHA AND COL | Early | 164.15 | | | | 0.0 |
| Renmark | PARI | GORDO | Late | 17.1 | | | | 0.0 |
| Renmark | PARI | REST | Mid | 548.08 | | | | 0.0 |
| Renmark | RIT | CHA AND COL | Early | 527.89 | | | | 0.0 |
| Renmark | RIT | GORDO | Late | 31.9 | | | | 0.0 |
| Renmark | RIT | REST | Mid | 1787.07 | | | | 0.0 |
| Waikerie | BOWHILL | CHA AND COL | Early | 7.79 | | | | 0.0 |
| Waikerie | BOWHILL | GORDO | Late | 1.52 | | | | 0.0 |

| Riverland Downy Mildew Action Plan Calculation Sheet | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Location | Hundred | Variety | Variety Class | SumOfVarArea | District at Risk Yes = 1 No = 0 | % Area needing Eradicant | Rate/ ha Kgm | Total Required |
| Waikerie | BOWHILL | REST | Mid | 23.74 | | | | 0.0 |
| Waikerie | BRINKLEY | REST | Mid | 19.1 | | | | 0.0 |
| Waikerie | CADE | CHA AND COL | Early | 244.75 | | | | 0.0 |
| Waikerie | CADE | GORDO | Late | 20.89 | | | | 0.0 |
| Waikerie | CADE | REST | Mid | 444.18 | | | | 0.0 |
| Waikerie | EBA | CHA AND COL | Early | 21.93 | | | | 0.0 |
| Waikerie | EBA | GORDO | Late | 126.41 | | | | 0.0 |
| Waikerie | EBA | REST | Mid | 226.65 | | | | 0.0 |
| Waikerie | FISH | CHA AND COL | Early | 9 | | | | 0.0 |
| Waikerie | FISH | REST | Mid | 22 | | | | 0.0 |
| Waikerie | HOLD | CHA AND COL | Early | 30.89 | | | | 0.0 |
| Waikerie | HOLD | GORDO | Late | 14.8 | | | | 0.0 |
| Waikerie | HOLD | REST | Mid | 74.41 | | | | 0.0 |
| Waikerie | MARK | CHA AND COL | Early | 170.46 | | | | 0.0 |
| Waikerie | MARK | GORDO | Late | 55.36 | | | | 0.0 |
| Waikerie | MARK | REST | Mid | 471.99 | | | | 0.0 |
| Waikerie | MOBI | CHA AND COL | Early | 11.84 | | | | 0.0 |
| Waikerie | MOBI | REST | Mid | 51.84 | | | | 0.0 |
| Waikerie | MURB | CHA AND COL | Early | 1.24 | | | | 0.0 |
| Waikerie | MURB | GORDO | Late | 1.41 | | | | 0.0 |
| Waikerie | MURB | REST | Mid | 20.59 | | | | 0.0 |
| Waikerie | NILD | CHA AND COL | Early | 39.98 | | | | 0.0 |
| Waikerie | NILD | GORDO | Late | 4.4 | | | | 0.0 |
| Waikerie | NILD | REST | Mid | 141.95 | | | | 0.0 |
| Waikerie | PAIS | CHA AND COL | Early | 29.53 | | | | 0.0 |
| Waikerie | PAIS | GORDO | Late | 2 | | | | 0.0 |
| Waikerie | PAIS | REST | Mid | 55.63 | | | | 0.0 |
| Waikerie | POOG | CHA AND COL | Early | 9.02 | | | | 0.0 |
| Waikerie | POOG | GORDO | Late | 12.7 | | | | 0.0 |
| Waikerie | POOG | REST | Mid | 141.33 | | | | 0.0 |
| Waikerie | RIDY | REST | Mid | 2 | | | | 0.0 |
| Waikerie | SUNL | CHA AND COL | Early | 5.47 | | | | 0.0 |
| Waikerie | SUNL | GORDO | Late | 1.5 | | | | 0.0 |
| Waikerie | SUNL | REST | Mid | 24.15 | | | | 0.0 |
| Waikerie | WAIK | CHA AND COL | Early | 833.21 | | | | 0.0 |
| Waikerie | WAIK | GORDO | Late | 165.55 | | | | 0.0 |
| Waikerie | WAIK | REST | Mid | 1660.82 | | | | 0.0 |
| Waikerie | YOUN | CHA AND COL | Early | 9.7 | | | | 0.0 |
| Waikerie | YOUN | GORDO | Late | 1.65 | | | | 0.0 |
| Waikerie | YOUN | REST | Mid | 16.01 | | | | 0.0 |
| TOTAL | | | | 21547.23 | | | | 324 |
| | | | | | | | | |

**APPENDIX 2**

# Budget Reconciliation

| Budget | Original GWRDC Request | Original Local Contribution | Actual Expenditure | Cost to GWRDC |
|---|---|---|---|---|
| Project Coordination | $ - | $ 2,800 (in kind) | $ 3,200 | $ NIL |
| Plan Development | $ 14,000 | $ 1,400 (in kind) | $ 12,300 | $10,900 |
| Draft Plan Review | $ - | $ 3,150 (in kind) | $ 3,840 | $ NIL |
| Venue | $ | $ 560 | $ 450 | $ NIL |
| Travel Expenses | $ 5,000 | $ 600 | $ 480 | $ NIL |
| Printing and distribution of draft | $ | $ 2,000 | $ 640 | $ NIL |
| Printing and distribution of final document | $ 6,000 | $ NIL | $ 2,300 | $ 2,300 |
| Funding from other sources (PIRSA) | $ NIL | $ 800 (in kind) | $ 4,000 | $ NIL |
| **Total** | **$ 25,000** | **$ 11,310** | **$ 27,210** | **$13,200** |
| Goods & Services Tax | $ 2,500 | $ 1,131 | $ 2,721 | $ 1,320 |
| **TOTAL incl. GST** | **$ 27,500** | **$ 12,441** | **$ 29,931** | **$ 14,520** |
| | | | | |

| SUMMARY TABLE OF INCOME EXPENDITURE | |
|---|---|
| **Monies Approved** | **$27,500** |
| **Expenditure** | **$14,520** |
| **NET PROJECT** | **$12,980** |
| | |
| **Expenditure** | **$14,520** |
| **Monies Received to Date** | **$13,750** |
| **Monies Due to RWIDC** | **$ 770** |
| | |