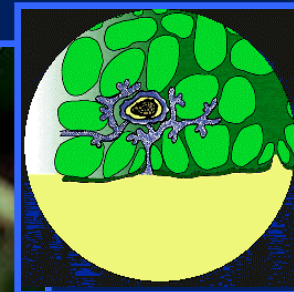


Managing Downy Mildew Winning the war!



P.A. Magarey
Magarey Plant Pathology
Loxton, South Australia

1. Overview

Downy mildew

... it needs water

and warmth!

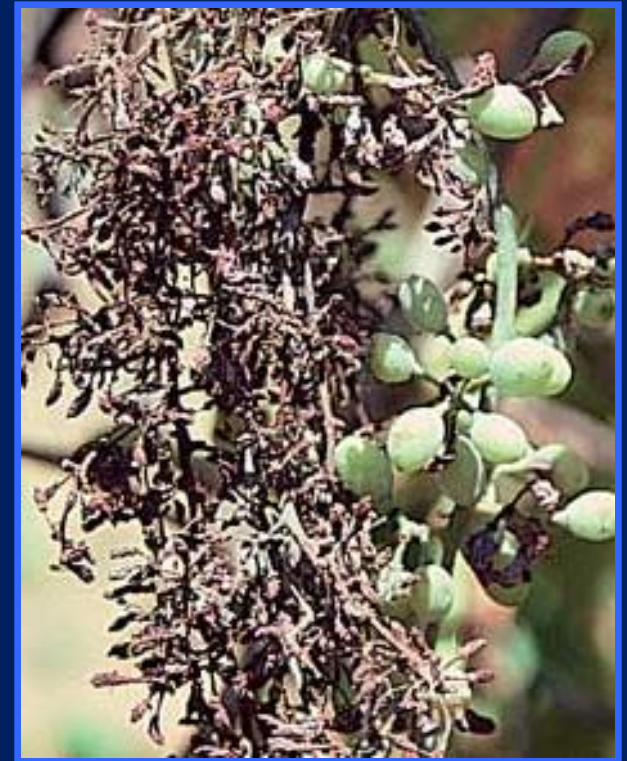
- it was considered a fungus

... now an algae



Downy mildew

- ... needs warm wet weather
- it could be called
‘Down-hill’ Mildew
- in contrast with
‘Powdery-dry’ Mildew
- which spreads without
water



3. Manage the Disease

3.2 Prepare for the battle

- Survey the battlefield
- Monitoring
 - the local weather
 - AWS
 - the vineyard
 - Eyes and feet
- Target, Timing, Technique



Where to monitor?

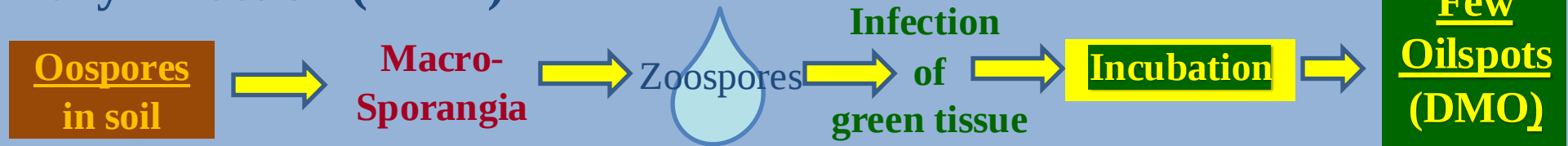
- previously infected areas
- representative vines in blocks
- susceptible varieties
- wet and sheltered sites
- dense canopies
- sprayed areas to check for effective control

How to monitor?

- check 200+ vines – 95% confidence
- examine both aspects of canopy
- scan as many leaves as possible
- take a hand lens to look for the downy spores and some flagging tape to tag spots of interest

The Disease Cycle

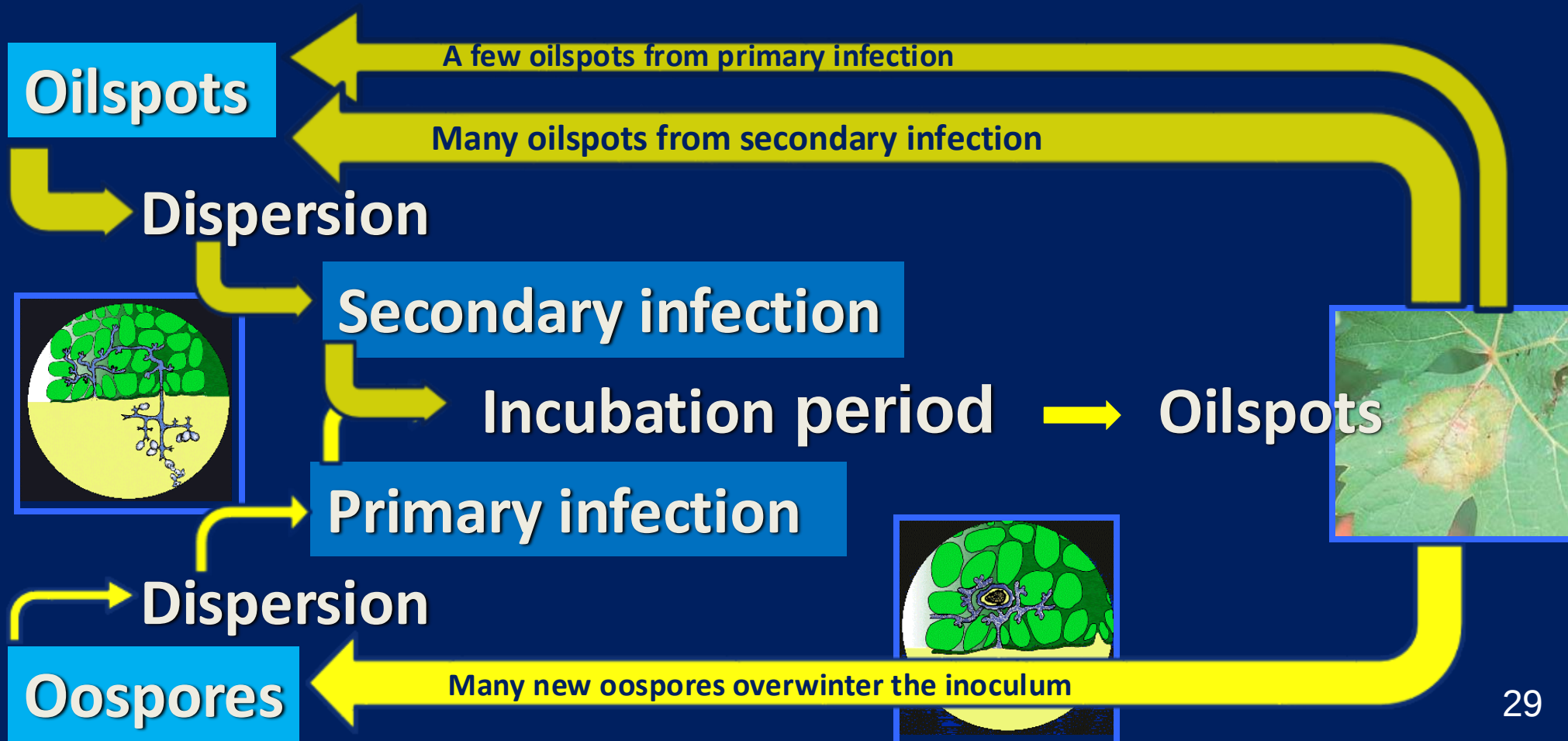
Primary Infection (DMP)



Secondary Infection (DMS)



The Disease Cycle



Primary Infection

- when the pathogen moves from the soil to vine

- a rule of thumb

10:10:24

- temperature $\geq 10^{\circ}\text{C}$
- rainfall $\geq 10 \text{ mm}$
- over 24 hours

10:10:24 in detail

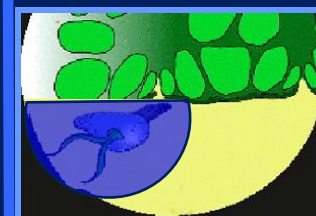
All this only if $T^{\circ}\text{C} \geq 8^{\circ}\text{C}$

Rainfall or
irrigation to
wet soil

2-3 mm
if soil
wet

Rainfall
to splash

Primary
Infection



16 hrs
soil wetness

45⁰ C-hrs
leaf wetness

T_0



Oospores germinate
in warm, wet soil

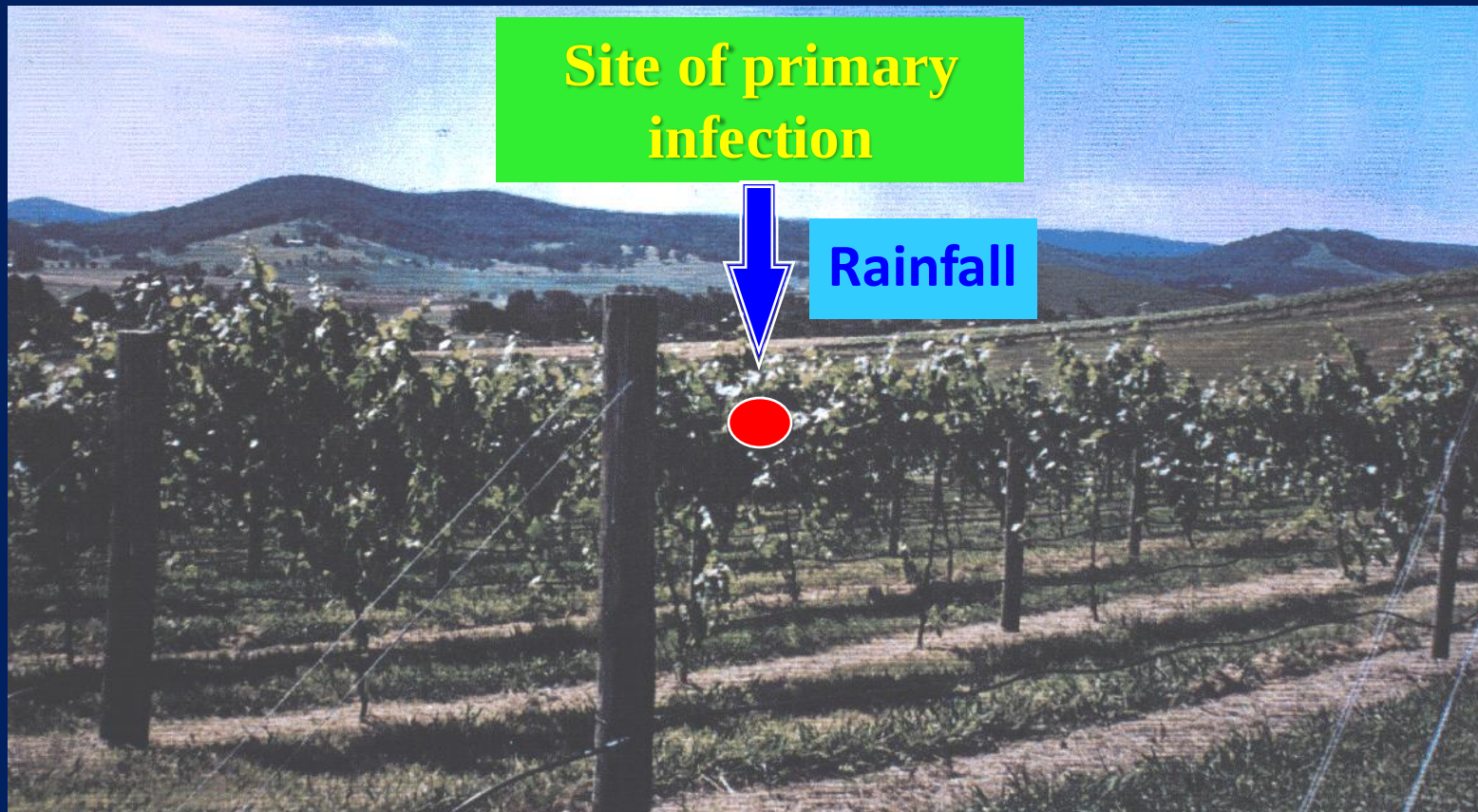
T_{16}

Zoospores released
after 16 hrs



T_{24}

Primary Infection - begins



Primary Infection - result

! Primary oilspot te

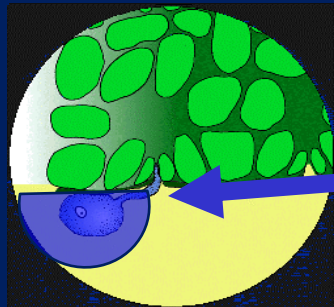


*"After you've had 10:10:24,
a wet warm night can spread it more.*

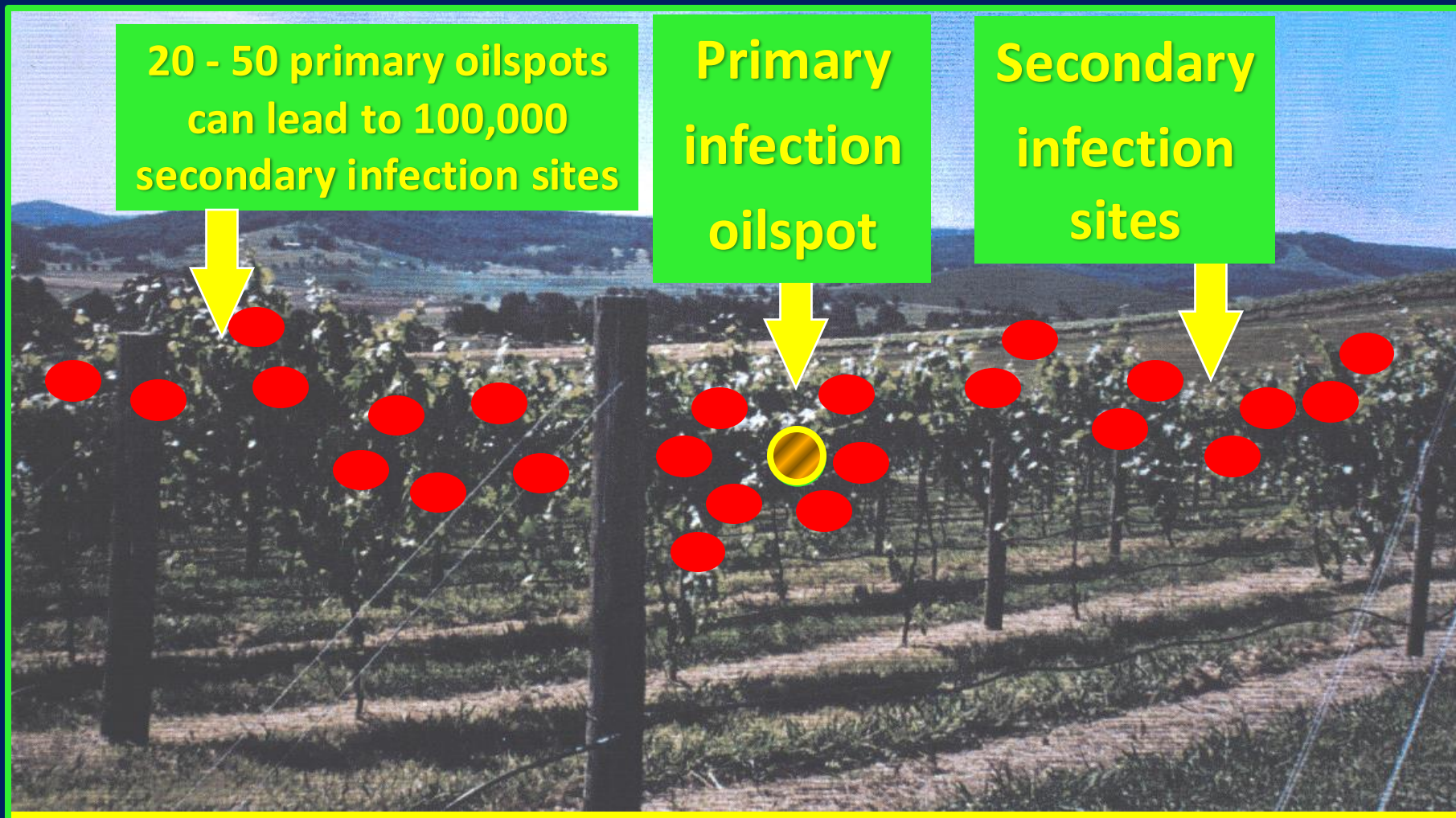
*If you've got oilspots on your leaves,
wet warm nights can spread disease."*

Secondary Infection

1. Oilspots must be present
2. Sporulation (spore production) occurs if:
 - $\geq 98\%$ RH
 - $\geq 13^{\circ}\text{C}$
 - ≥ 4 hr darkness
3. Infection occurs if:
 - leaves wet for $\geq 2-3$ hr at dawn



Secondary infection



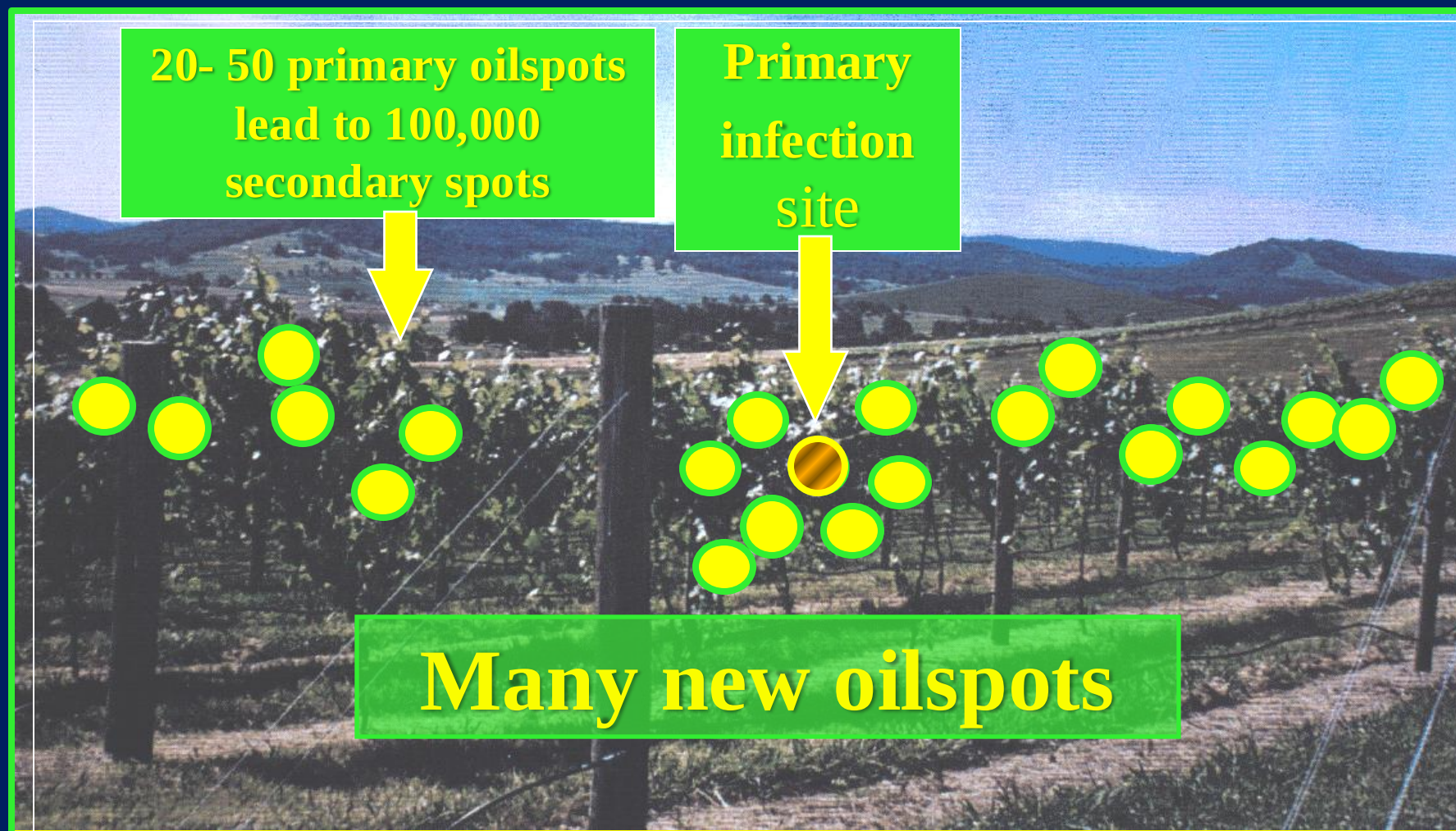
Incubation Period

Remember:

- Downy can not spread until oilspots appear
- This is the time to spray post-infection fungicides

***“If you’ve got oilspots on your leaves,
wet warm nights can spread disease.”***

Secondary infection



Summary of Downy Mildew, the Disease

***Clickhere for
Downy Mildew Video Clip***

3. Manage the Disease

3.4 Controlling the disease

The 3 *T*'s of good spraying

- *Type*
- *Timing*
- *Technique:*
 - coverage
 - dose - rate x quantity

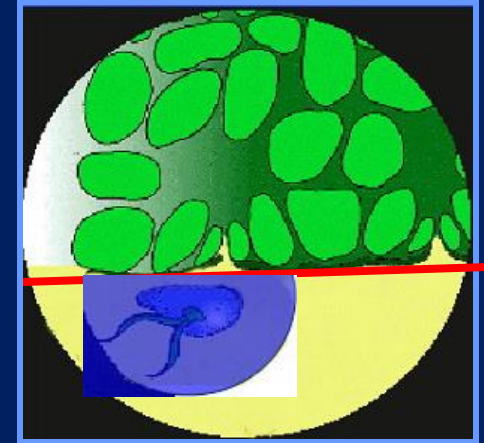
Crucial to get it right



Pre-infection sprays (protectants)

Prevent infection - provide a protective barrier – like a shield

- stop spores germinating
- best applied as close as possible before infection
- cover undersides of leaves
- must re-spray to cover new growth
- Note: most Group M (multi-Site) fungicides remain on the surface of the foliage



Pre-infection sprays (protectants)

These include ...

Group (previously)

- copper-based M1 (Y)
- dithiocarbamate M3 (Y)
(mancozeb, metiram, thiram and ziram)
- phthalimide (captan) M4 (Y)
- chlorophenyl (eg Bravo[®]) M5 (Y)
- quinone (eg Delan[®]) M9 (Y)
- strobilurins (eg Amistar[®], Flint[®] and Cabrio[®]) 11 (K)
- cinnamic acid (Acrobat[®]) 40 (X)

Post-infection sprays (eradicants / systemics)

- kill the downy mildew pathogen
- have systemic qualities, and so are ...
- absorbed quickly - rain-fast within 2-3 hrs, thus...
- stop the growth of the fungus inside vine tissue
- But, like surgeon's hands, are more expensive
- best applied as soon as possible after infection and before oilspots appear (= usually within 5 days)
- good coverage is important



Post-infection sprays (eradicants / systemics)

- **Phenylamide (eg Ridomil Gold[®]) – Group 4 (D)**
 - resistance has been reported overseas
 - use only 1-2 times per year
- **Phosphonate (eg Foli-R-Fos[®]) – Group 33 (Y1)**
 - at present, not for use on export wines
 - does not protect the vine
 - tank mixing with 2 or 3 other fungicides is OK

Spray Timing

Monitor the Weather

'Low-tech'

- maximum/minimum thermometer
- rain gauge/ manual calculations
- difficult and often inadequate!

'Hi-tech'

- automatic weather station (AWS)
- Dmodel (AusVit) to predict disease events



Monitor the Weather

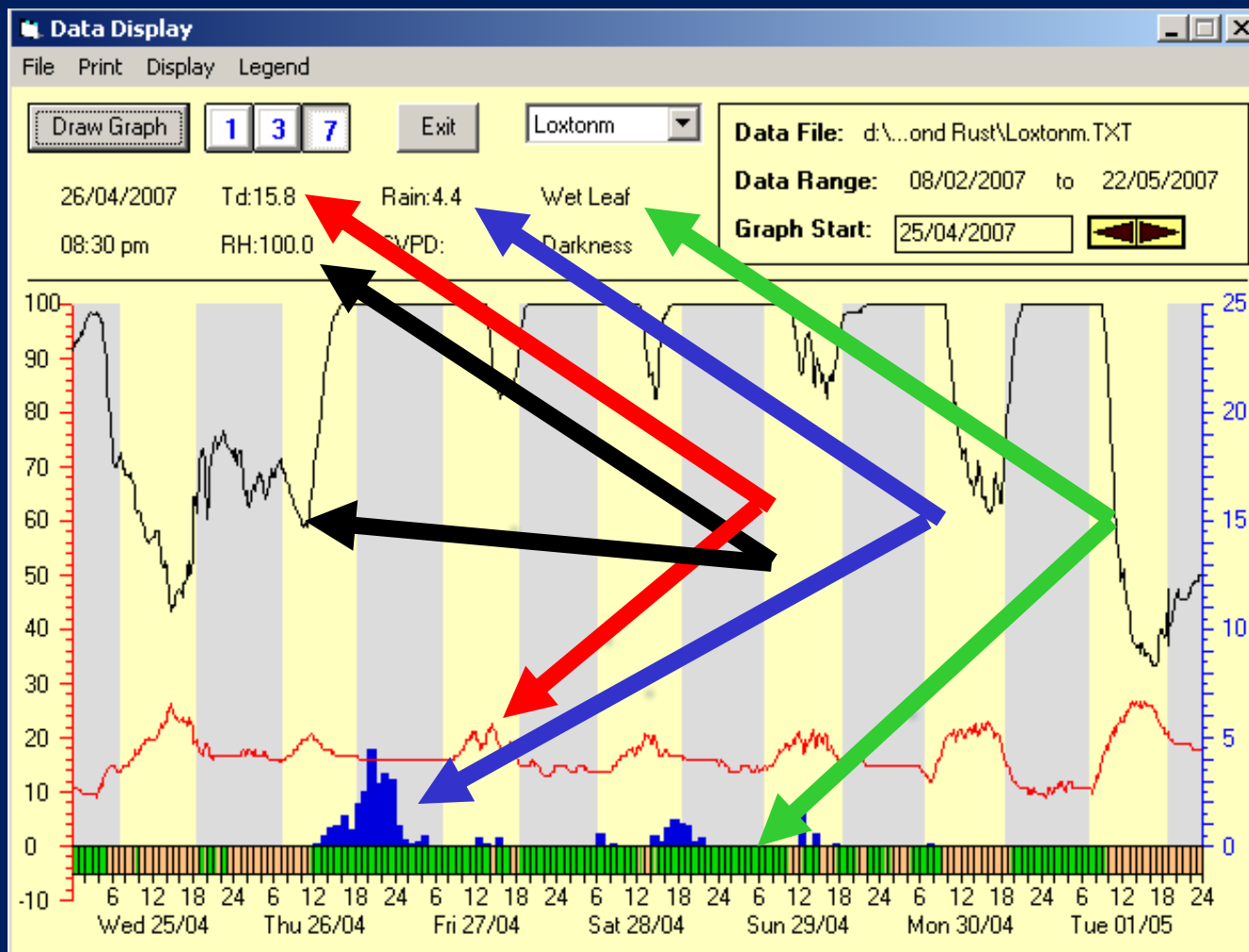
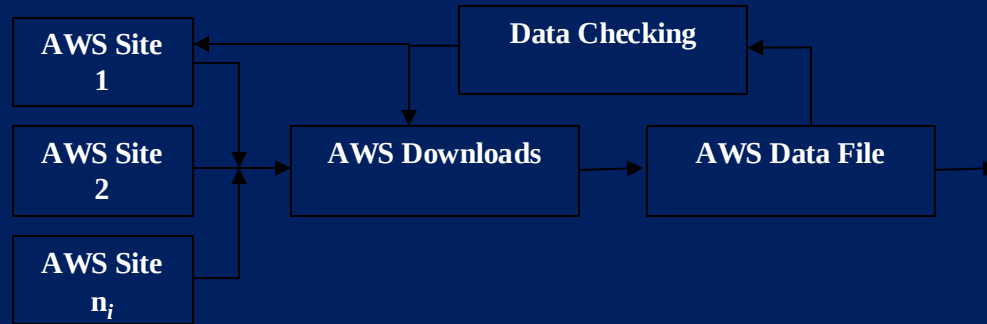


Diagram of Disease (& Pest) Management System for Grapegrowers

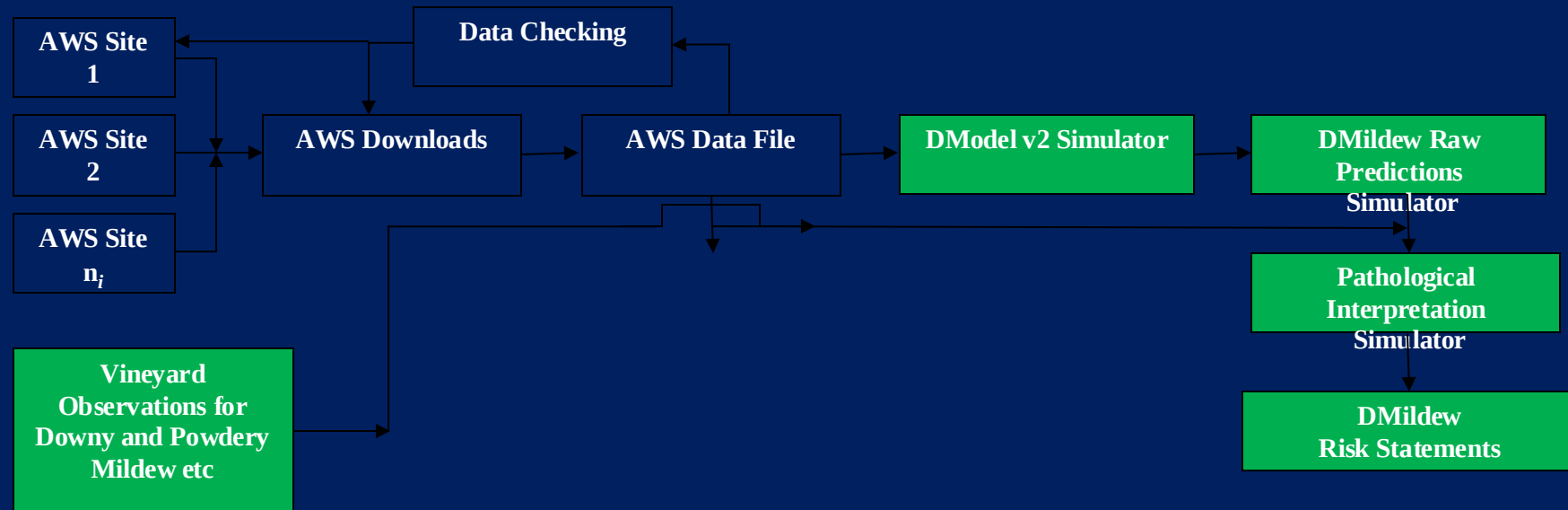


Key to Colour Codes

Weather data



Diagram of Disease (& Pest) Management System for Grapegrowers



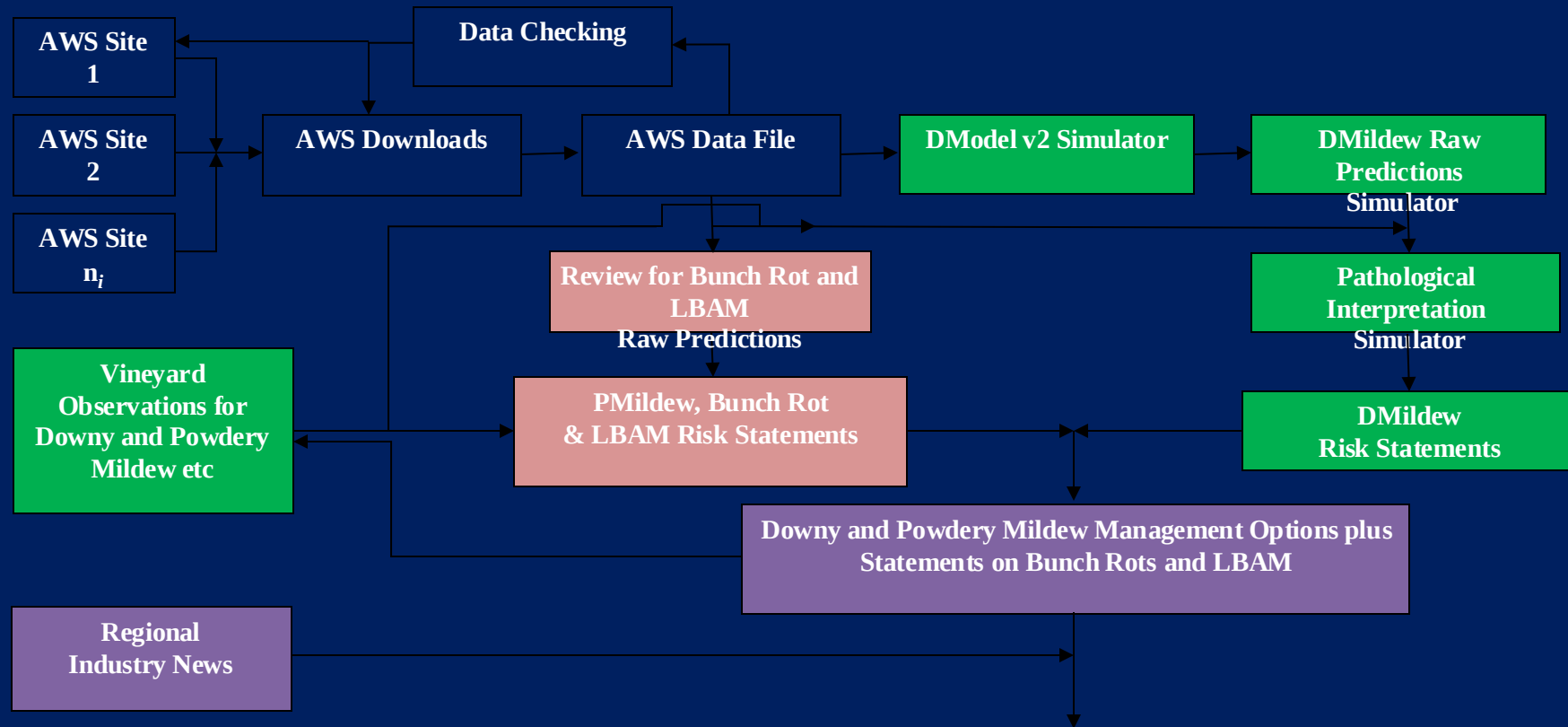
Key to Colour Codes

Weather data

Downy mildew risk assessment



Diagram of Disease (& Pest) Management System for Grapegrowers



Key to Colour Codes

Weather data

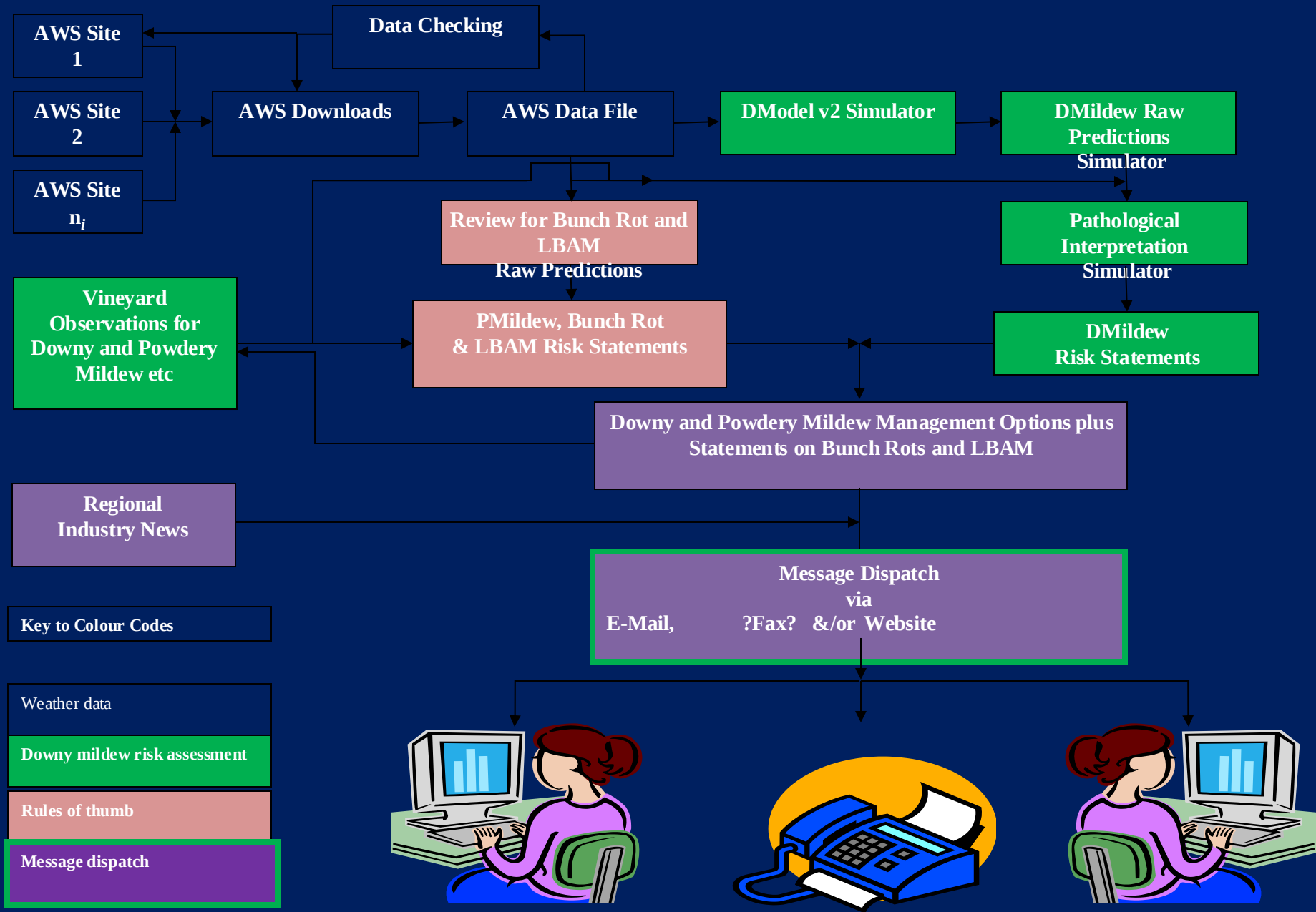
Downy mildew risk assessment

Rules of thumb

Message dispatch



Diagram of Disease (& Pest) Management System for Grapegrowers



CropWatchOnline.com

→ DOWNY MILDEW

Downy mildew, *Plasmopara viticola*, is a major fungal disease of grapevines that occurs irregularly in most grapegrowing districts



Rapidly growing oilspots often merge to infect much of the leaf. Photo credit: Peter Magarey

→ MORE INFORMATION » LOOK FOR » CONDITIONS » NOTES

LOOK FOR

Look for in leaves

- Yellow oilspots which may enlarge and merge to cover most of the leaf
- White downy growth which forms on the undersides of oilspots after a suitably warm humid night
- Oilspots which have dried out after hot weather and become brown to red-brown with an outer ring of yellow
- A tapestry-like patchwork of small, angular yellow-brown spots on older leaves in late summer and autumn

Look for in bunches

- Oily-brown flower clusters, bunches or berries. These rapidly wither and die

→ OTHER DOWNY MILDEW IMAGES

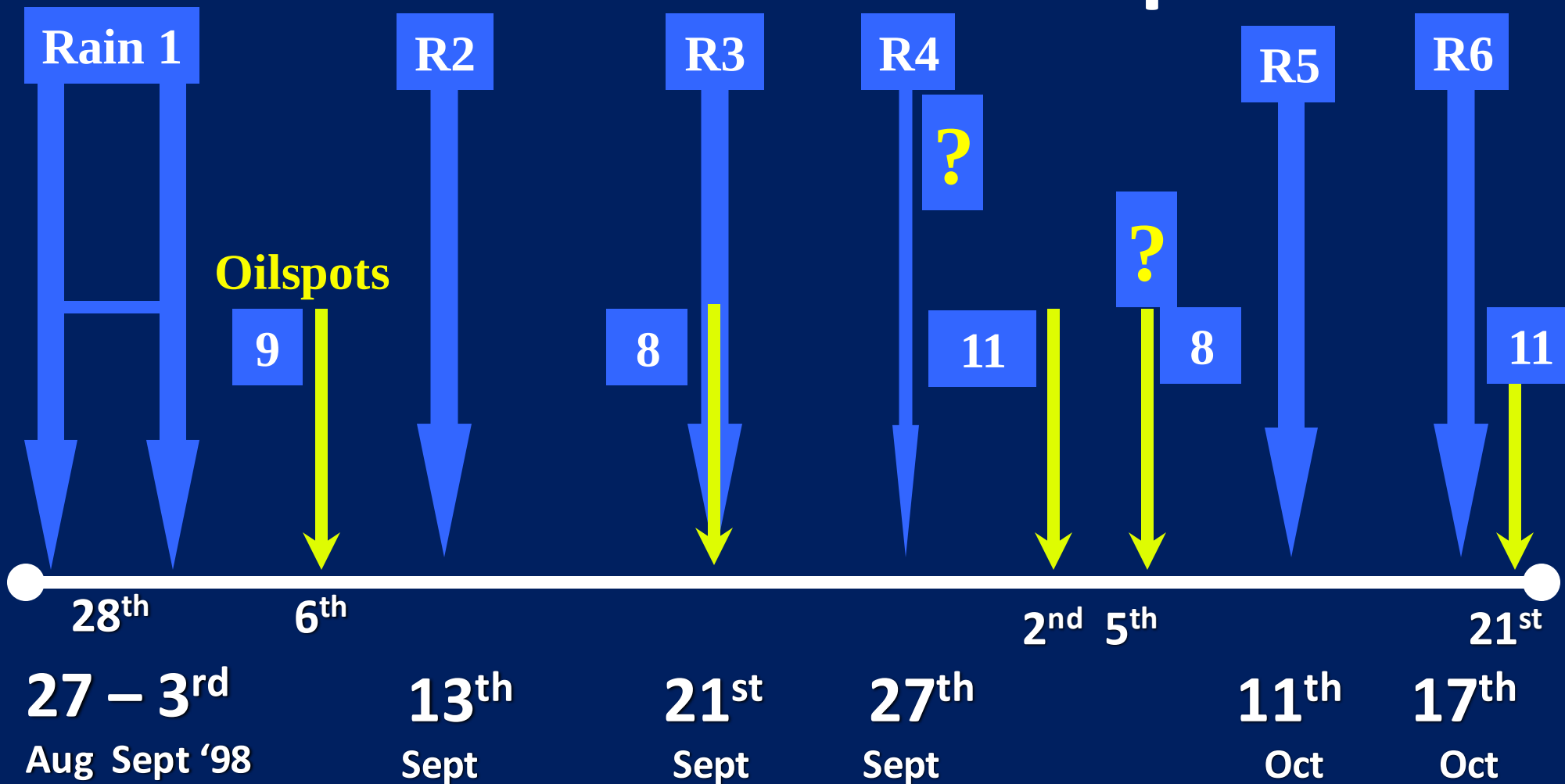


Infection on old leaves will be yellow-brown and remain small, confined by the finest veins (tapestry pattern)

→ LOOKS LIKE



Weather events – An example



The Downy Rap - Disease Cycle

Primary Infection

When 10:10:24 has come,
downy mildew's just begun.

Ten degrees and rainfall showers.

Ten millimetres in 24 hours.