

Mosquito Borne Disease & Mosquito Management in South Australia



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Overview

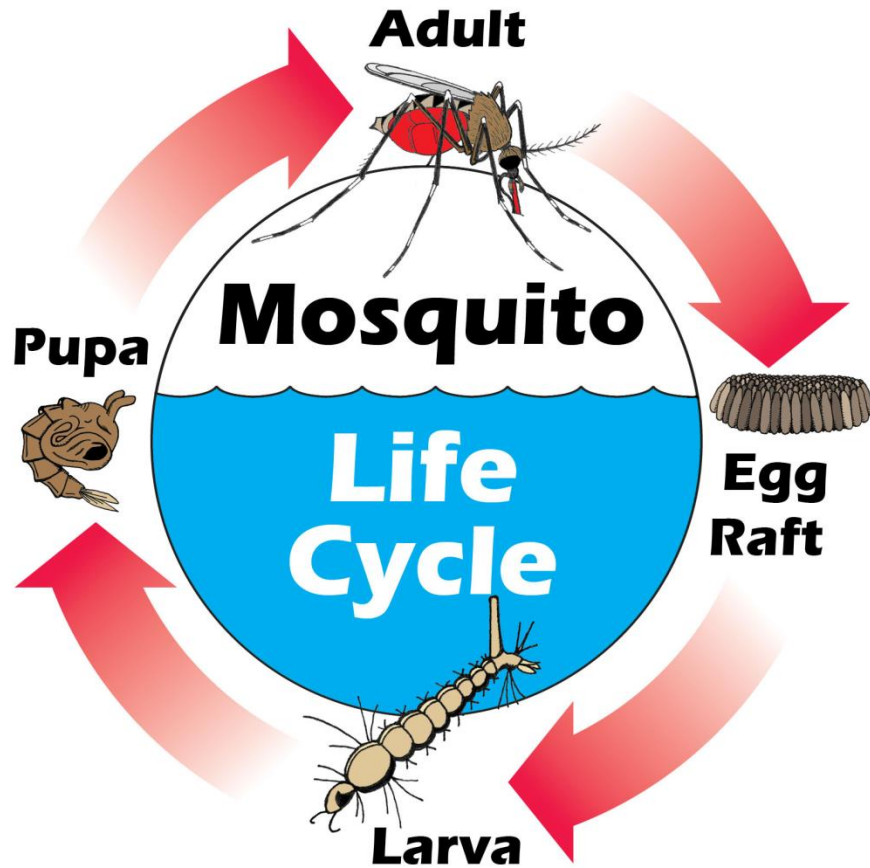
- > Mosquito ecology
- > Diseases
- > Monitoring Tools & Techniques
- > Integrated Mosquito Management
- > 2010/2011 Season Overview
- > Responses (Local councils)
- > Lessons / Future



Mosquito Ecology

- > Culicidae family
- > 300 species in Australia
- > Complex lifecycle – aquatic and terrestrial phases
- > Flight range / dispersal from 2m – 50km
- > Only adult female bites
- > Saliva + anticlotting agents > blood capillary of host (mode of infection)

Lifecycle



Diseases

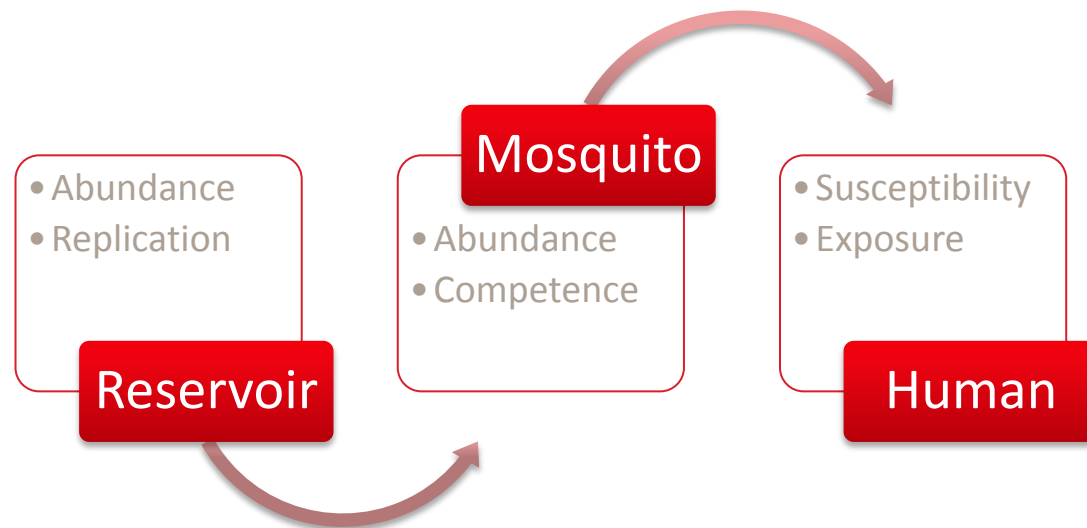


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Mosquito borne disease - transmission cycles

- > Animal > Mosquito > Animal
- > **Animal > Mosquito > Human**
- > Human > Mosquito > Human
- > Mosquito > Mosquito > Human





Mosquito borne diseases – a global perspective

> Malaria

- 200 million cases per yr
- 600,000 deaths (mostly women/children)

> Dengue

- 50 – 100 million cases per yr
- 20,000 deaths per yr

> Japanese Encephalitis

- 50,000 cases per yr
- 10,000 deaths per yr



Human disease risks - Australia

> Endemic

- Ross River virus
- Barmah Forest virus
- Murray Valley Encephalitis virus
- Kunjin

> Exotic

- Malaria
- Dengue
- Yellow Fever
- JE
- Chikungunya
- West Nile virus
- Zika

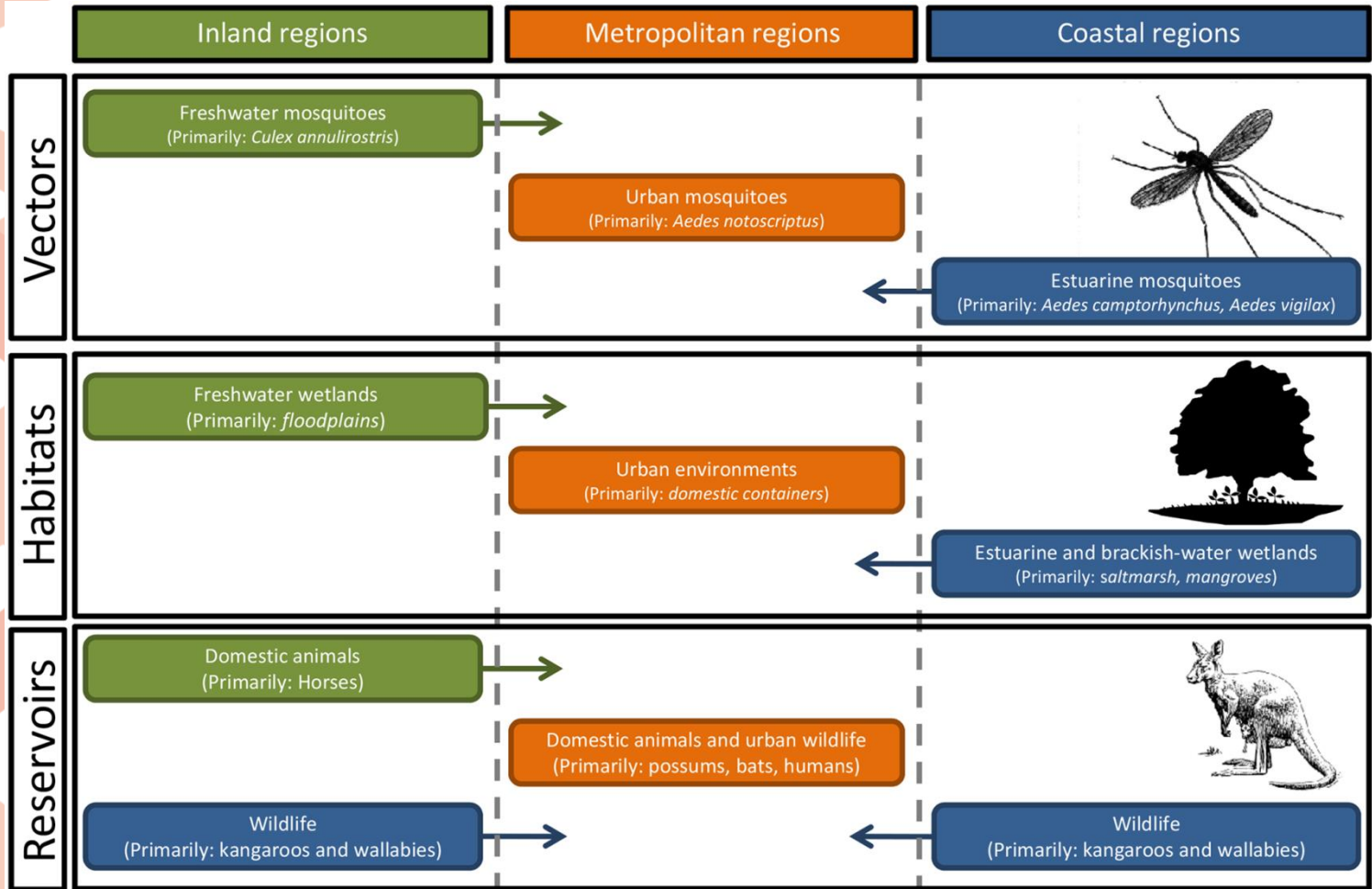


Alphavirus

>Alphavirus

- Ross River Virus and Barmah Forest Virus
- Incubation – usually 1-2 weeks
- Symptoms
 - Fever
 - arthralgia
 - Rash
 - Self limiting (majority @6wks)
- No specific treatment (treat symptoms)
- High risk areas in SA are predominantly along the Murray River

Ross river virus





Flavivirus

> Flavivirus

- Murray Valley Encephalitis Virus and Kunjin (West Nile) Virus
- Incubation – 7 -28 days
- Symptoms
 - Predominantly asymptomatic
 - Mild illness – fever, headache, nausea
 - 1/1000 – encephalitis/meningitis
 - 20% mortality, 40% permanent neurological damage
- No specific treatment (treat symptoms)
- Infection confers immunity (MVE)
- High risk areas thought to be confined to riverine areas along the Murray River

La Niña events over time

As La Niña events recur on a two to seven-year cycle, there have been many over the last century, varying in strength and impacts. The SOI and sea surface temperatures can be used to compare the intensity of La Niña events. (See graph below for more details.)

Atmospheric and oceanic intensity of La Niña events since 1900. Intensity ranked by SOI values for atmosphere, while oceanic intensity is ranked by sea surface temperature indicators (only available reliably since mid-century). Some multi-year events have two or three La Niña peaks.



La Niña and MVEv

> SA cases 1951, 1974 and 2011

Table 1: Outbreaks of MVE, Australia¹⁵

Year	Number of cases (proven and presumed)					
	South Australia	Victoria	New South Wales	Queensland	Northern Territory	Western Australia
1917			70	44		
1918		13	49	5		
1922				75		
1925			10	11		
1951	1	34	10			
1956		3*				
1974	10	27	5	10	5	1

*combined Victoria and NSW cases

Monitoring



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People

- > Arboviruses are notifiable diseases under the South Australia Public Health Act 2011
- > GPs and laboratories required to notify
- > Cases matched against geographic data and reported to Local Government
- > Enhanced surveillance by Communicable Disease Control Branch under certain circumstances

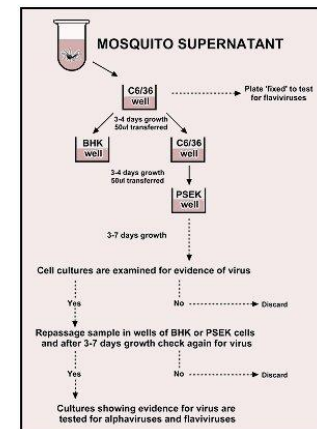


Environment

- > Rainfall
- > Temperature
- > Tidal movements
- > Weather patterns
- > Natural hosts
 - Species
 - Abundance
 - Migratory birds

Mosquitoes

- > Abundance
- > Species
- > Viral Carriage



Monitoring – viral carriage

> Sentinel Flock Testing

- Focus on flavivirus
- 5 flocks in 5 locations
- Bled monthly from October – April



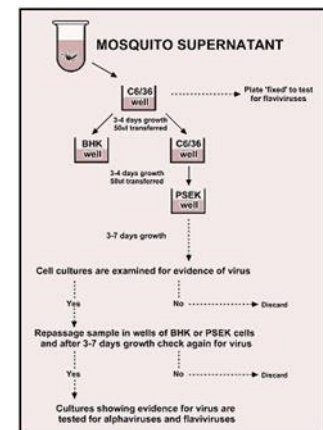
Monitoring – viral carriage

> FTA cards



Viral Identification – Fixed-cell ELISA using MOSAVEX

- > Collected mosquitoes are identified, sorted and and then ground using MOZAVEX
- > Supernatant is added to mosquito cells which are cultured and then tested for virus



2010/2011 Mosquito Borne Disease Outbreak



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2010-2011 Season

> Media Coverage

Mozzie disease warning

Mozzie warning for Riverland residents

Council acting to control mozzies

Region flooded with mosquitoes

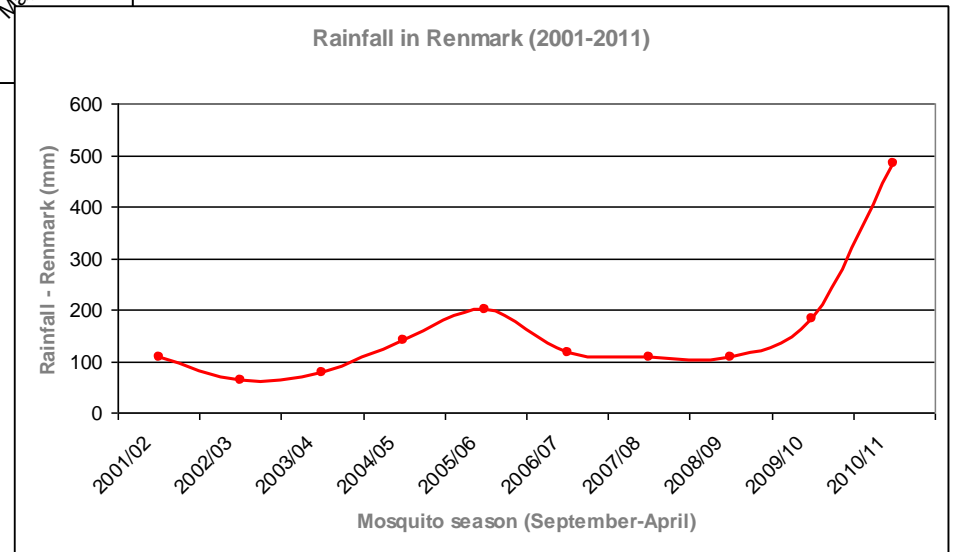
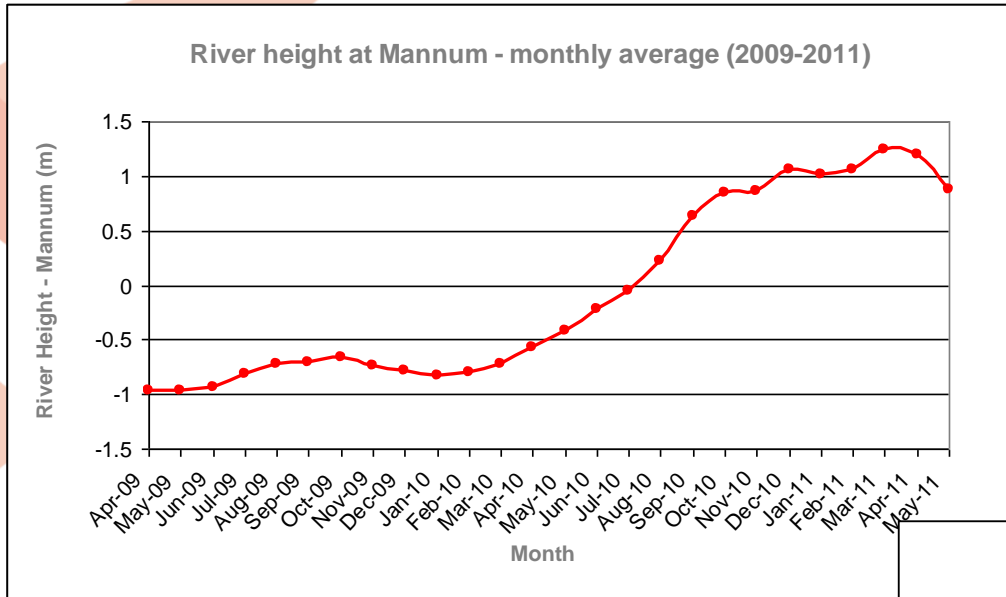
Second case of potentially fatal mozzie bite disease encephalitis confirmed in SA

A RARE disease, not seen in humans in South Australia for more than 35 years, has been detected in birds in the state's lower Murray region.

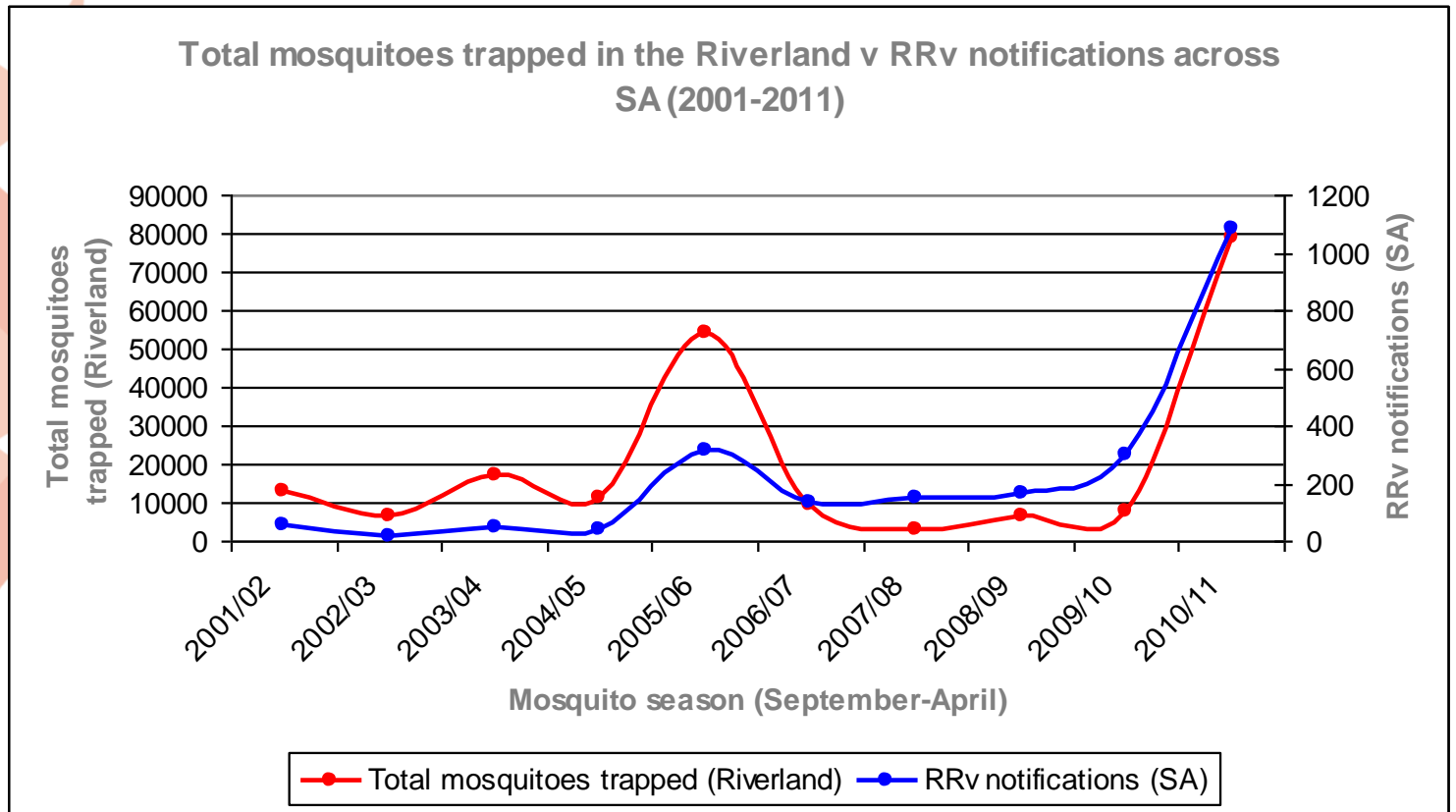
SA man dies from mosquito-borne disease

Mozzies back to normal

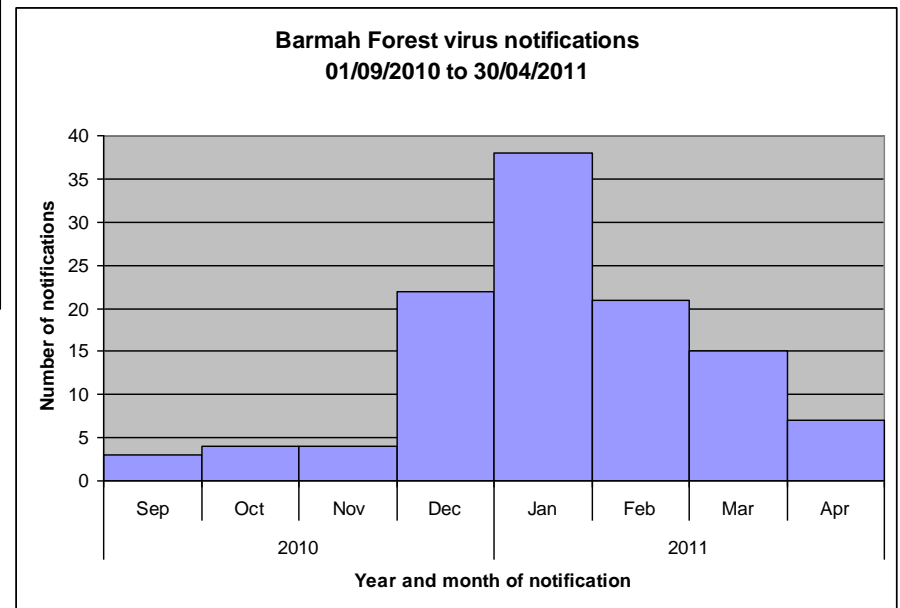
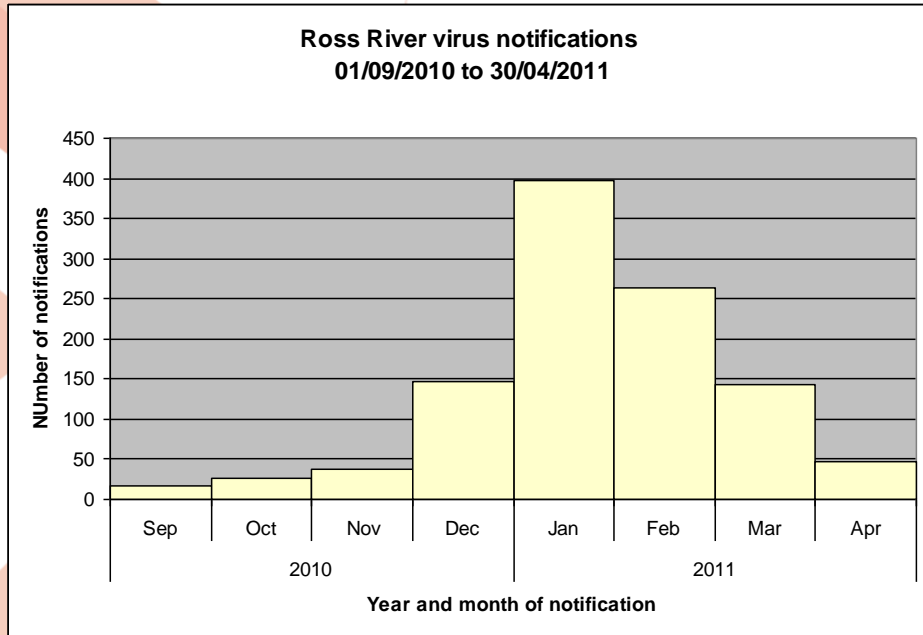
2010-2011 Season



2010-2011 Season

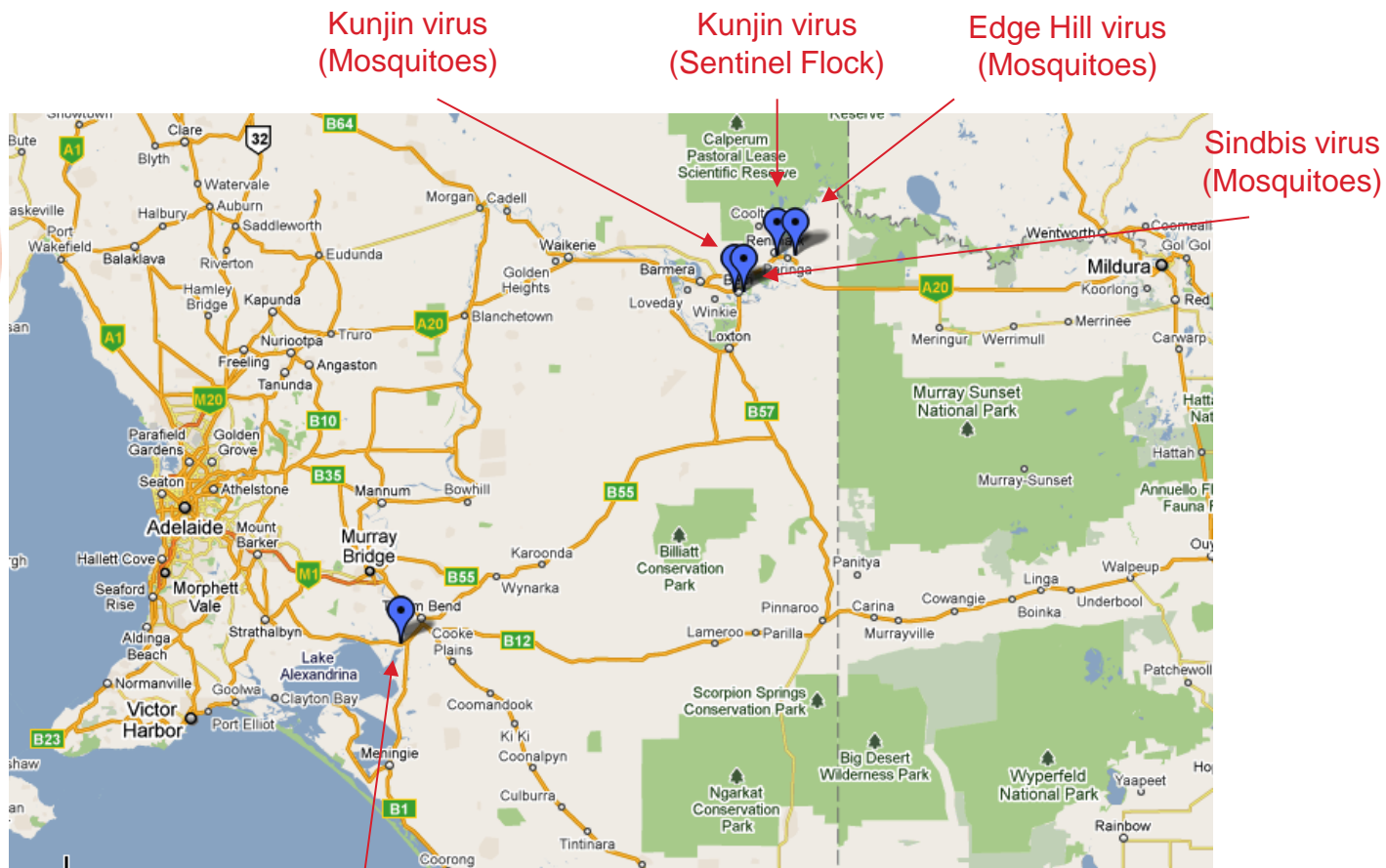


2010-2011 Season



2010-2011 Surveillance Results

> Arbovirus detections



MVEv
(Ducks)

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Murray Valley Encephalitis

- > Two cases
- > First locally acquired cases since 2000
- > One fatal
- > One discharged

Outbreak Response



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Clinicians

- > GP Alerts (based on monitoring)

**- Please immediately bring to the attention of all doctors -**

Date: 29 March 2011

Contact telephone number: 1300 232 272 (24 hours/7 days)

PUBLIC HEALTH ALERT***Murray Valley Encephalitis Virus detected in birds in SA***

- Murray Valley Encephalitis Virus (MVEV) has been detected in birds in the lower Murray region.
- MVEV infection is a rare disease. No human cases of MVEV infection have been detected in South Australia for over 30 years.
- Symptoms of mild disease include fever, headache, nausea and vomiting but about one in 1000 people develops meningitis or encephalitis.
- Infection is spread from infected animals to humans by mosquito bites.
- Avoidance of mosquito bites is the most effective protection.

Murray Valley Encephalitis Virus (MVEV) infection has been detected in birds in the lower Murray region.

No human cases of MVEV infection have been notified in South Australia since the mid 1970s. MVEV is endemic in birds in northern Australia but illness in humans is rare.

Many people infected with MVEV are asymptomatic or have mild symptoms such as fever, headache, nausea and vomiting. About one in 1000 people develops meningitis or encephalitis and symptoms may include: increasing confusion, headaches, neck stiffness, tremors, drowsiness and seizures. In infants and young children meningitis or encephalitis may present as irritability or floppiness. About 20% of persons who develop severe MVEV infection will die. Approximately 40% of those who survive will have permanent neurological damage. Others still may take several months to recover.

Testing for MVEV infection should only be considered where there is history of exposure to mosquitoes, high clinical suspicion and compatible neurological symptoms and signs. Diagnosis is made by serology on blood or molecular detection of MVEV in CSF. Tests are done in interstate laboratories so results may take some time to come back.

Significantly increased numbers of human cases of other mosquito-borne viruses (Ross River Virus and Barmah Forest Virus) have been notified in South Australia since January. Recent viral screening of mosquitoes trapped in the Riverland has identified Kunjin Virus, Edgell Virus and Sindbis Virus.

Infection is spread by mosquito bites. There is no person to person spread. There is no specific treatment for MVEV infection and no vaccine to prevent infection. Avoidance of mosquito bites is the most effective protection through measures such as:

- Avoiding exposure outdoors when mosquitoes are active.
- Covering up with long, loose fitting clothing of sufficient thickness to prevent mosquitoes biting through the fabric.
- Using an insect repellent containing DEET or Picaradin on exposed skin (but avoid use in babies and toddlers).
- Using mosquito nets, mosquito-proof tents and screened houses.

Dr Ann Koehler - Director, Communicable Disease Control Branch



Clinicians

- > Knowledge building
- > Consideration in diagnosis
- > Requests for testing
- > Better understanding of prevalence
- > Travel medicine



Control Measures

- > SA Health
 - Advice
 - Media/Promotion
 - Control in areas out of local government control

- > Local Government
 - Surveillance
 - Identification and treatment of breeding sites

- > Measures
 - Larviciding
 - Adulticide
 - Engineering



Globe Derby Park Mosquito Management Program



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Globe Derby Park Mosquito Management Program



Globe Derby Park Mosquito Management Program



Globe Derby Park Mosquito Management Program

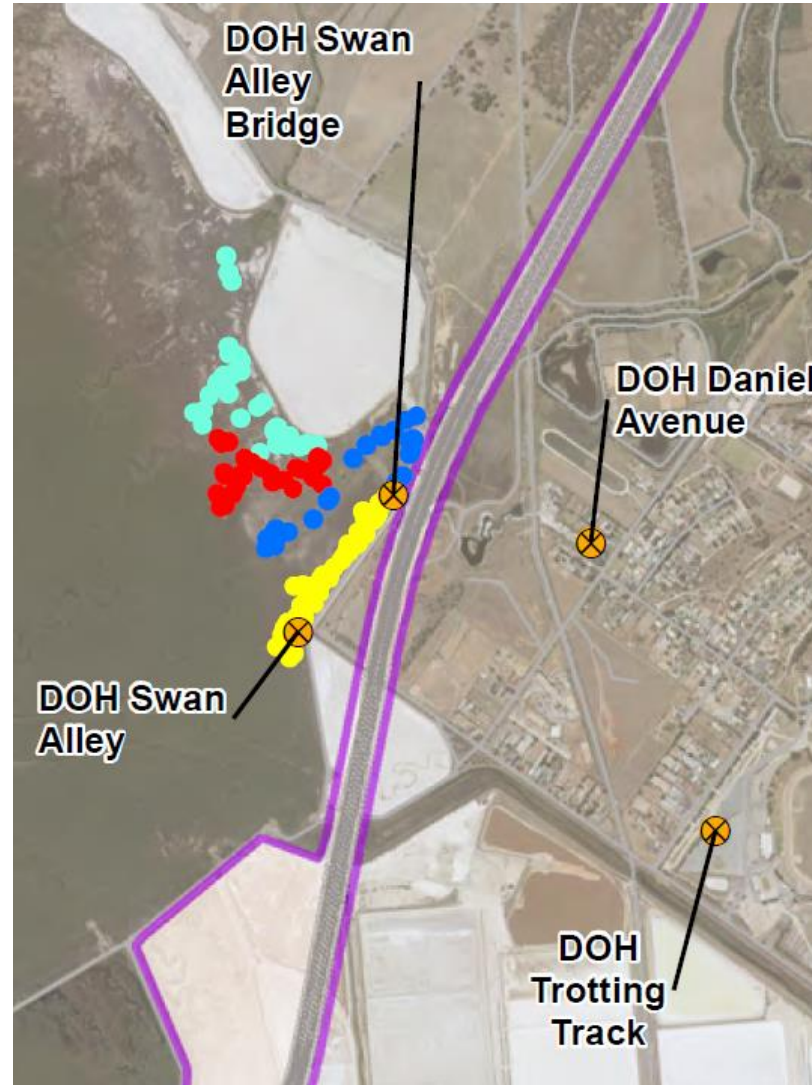




19.10.2009



SA Health's Globe Derby Park Mosquito Control Program Treatment Area





Aerial treatment proposal

45.61 hectares



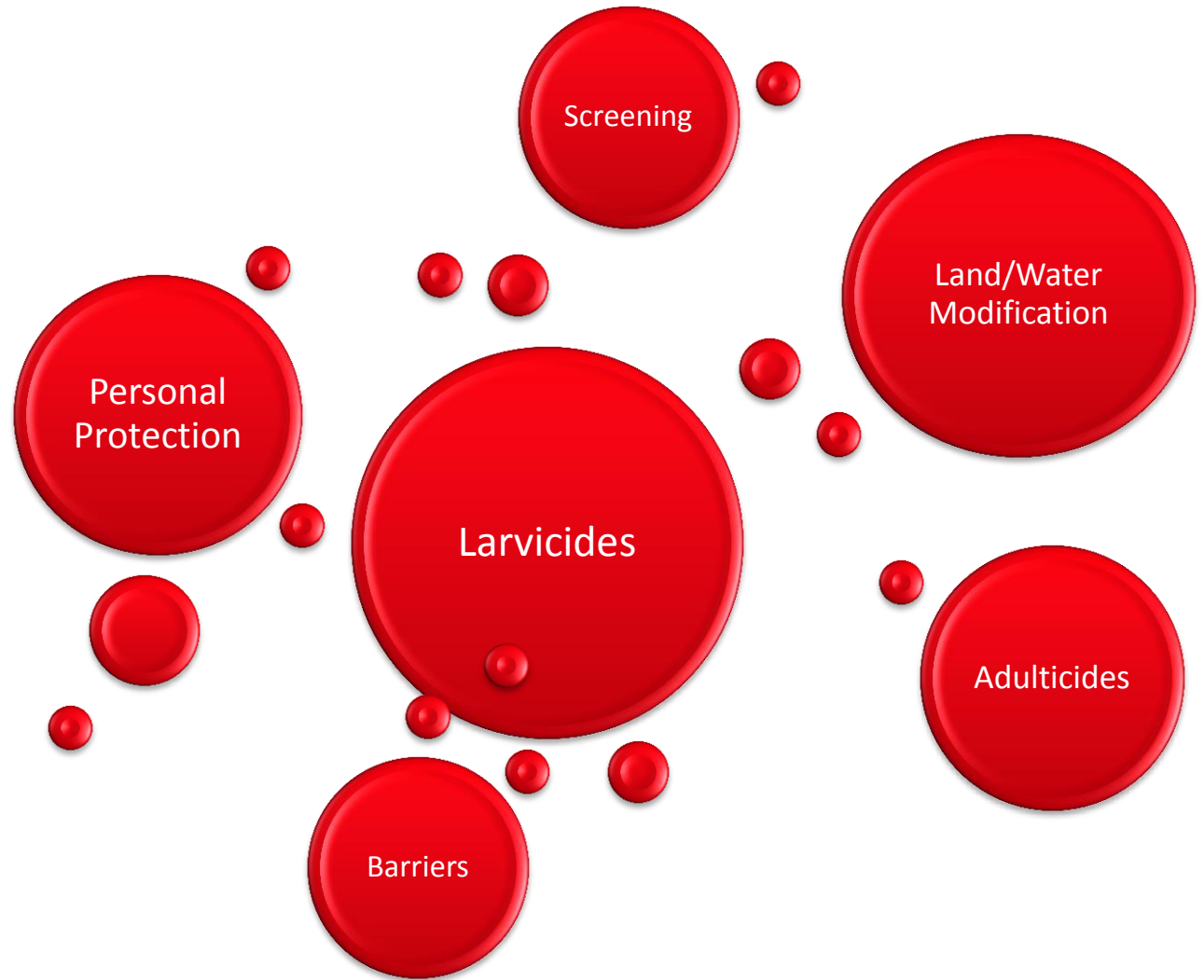
Integrated Mosquito Management



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Integrated Pest Management



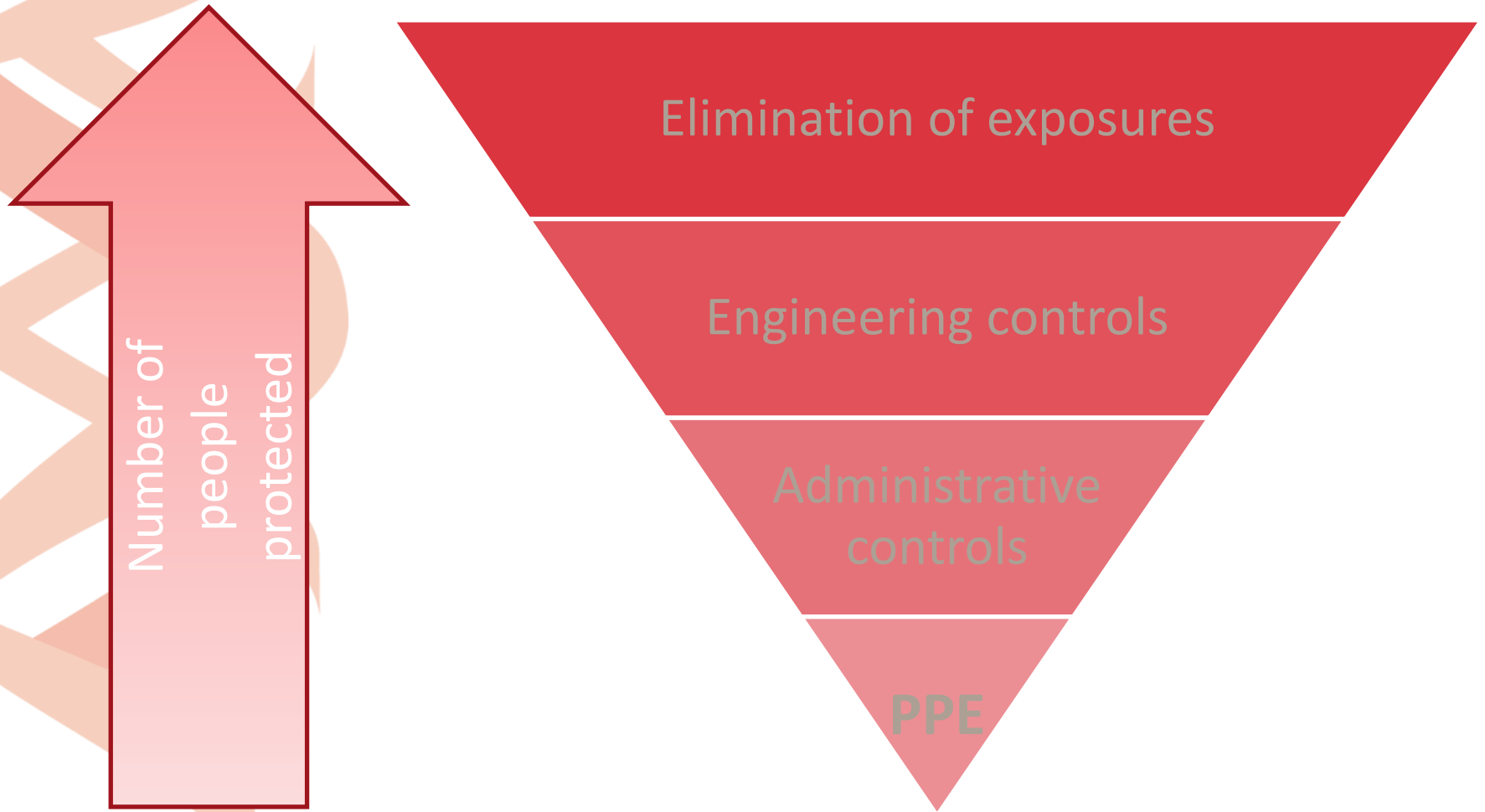
Surveillance - Mosquito Larvae



Surveillance - Trapped Adult Mosquitoes



Hierarchy of control measures



Integrated Mosquito Management

Physical Controls

- Land modification
- Water modification
- Barriers

Chemical Controls

- Larvicides
- Adulticides
- Repellents

Biological Controls

- Predatory fish species



Larvicides V Adulticides

> Larvicides

- Bacillus thuringienensis israelensis
- S-Methoprene
- Pyriproxfyen
- Liquids/Pellets/Briquettes

> Adulticides

- Aqua K-Othrine
- Thermal Foggers or ULV Aerosol Generators

Application of Bti Larvicide



S Methoprene Larvicide Station



Aerial Application

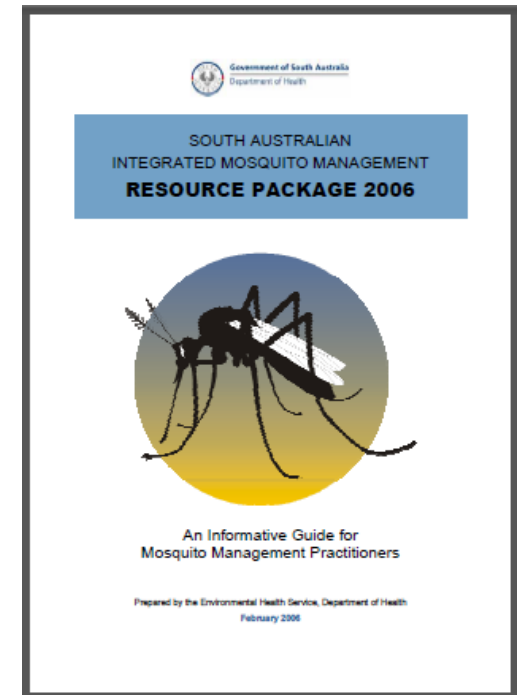




Runnelling site in southeast Queensland, showing mangrove swamp habitat

Local Government

- > Mosquito Control Subsidy
- > Training and support
- > South Australian Integrated Mosquito Management Resource Pack
 - Surveillance techniques
 - Control measures
 - Integrated mosquito management



Community Education





Government of South Australia
Department of Health

SOUTH AUSTRALIAN
INTEGRATED MOSQUITO MANAGEMENT
RESOURCE PACKAGE 2006



An Informative Guide for
Mosquito Management Practitioners

Prepared by the Environmental Health Service, Department of Health
February 2006

Important Points & Future Directions



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Important Points

- > Proactive, coordinated surveillance and management
 - Importance of robust monitoring (viral carriage and sentinel surveillance systems)
 - Importance of entire health system coordination and response
- > Future
 - Impact of climate change
 - Mutation
 - Development in mosquito prone areas
 - Exotic vector incursions (*Ae aegypti* / *albopictus*)



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