Mosquitoes and their Management

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Director of Mosquito Research
Rutgers University

Introduce Myself

- **Emeritus Professor in Dept. Entomology at Rutgers**
  - **Medical Entomologist by Training**
  - **Specialize in Mosquito Biology & Epidemiology of Mosquito-borne Disease**

- **Director of the Mosquito Research Program**
  - **Oversee Rutgers' Mosquito Control Mandates**
  - **Serve as Advisor to Executive Dean of Cook College**
  - **Review County Mosquito Plans & Estimates**
  - **Direct NJ's Encephalitis Surveillance Program**
  - **Secretary for NJ's PESP Program**
    (Pesticide Environmental Stewardship Program)

Federal Initiative to Reduce Pesticide Usage

My Objectives

- Give you an Overview of Mosquito Biology
- Review how Mosquito-borne Diseases Cycle in Suffolk County
- Use that Information to explain the Rationale behind Vector Control Decisions
- Show you that a model IPM Component has been Incorporated into your Long-Term Plan

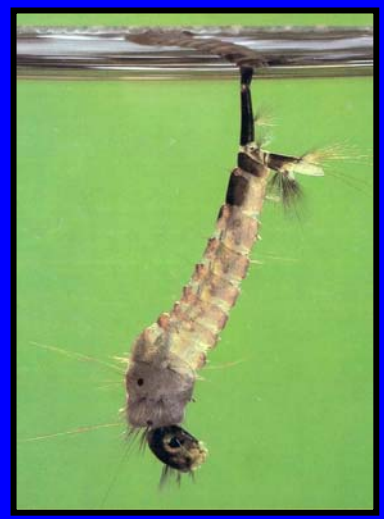
Mosquito Life Cycle

(10 Genera and 42 Species in Suffolk Co.)

Terrestrial Adult

Egg Stage

Aquatic Pupa



Aquatic Larva

Mosquito Eggs Come in 2 Designs

Allows for 2 Very Different Life Cycle Strategies

Eggs that must remain Moist

Laid on Standing Water

Shrivel up if they dry out

Eggs designed to Dry Down

Laid in Areas that Flood

Remain dry for long periods

Mosquito Life Cycle Types

Floodwater Life Cycle

Eggs Laid on Ground in Low Lying Areas

Spend long periods in Dormancy
Wait for a Flooding Event
Race to Emerge before the Habitat dries

Adults Appear in Broods

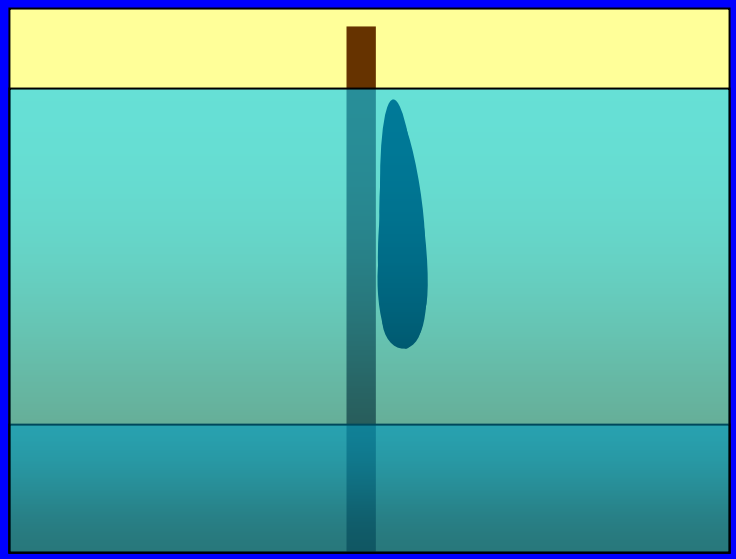
Permanent Water Life Cycle

Eggs Laid on Standing Water

Hatch within days of Oviposition
Overlapping Generations all Summer
Populations Build Slowly

Adults are Active all Season

Habitats used by Floodwater Mosquitoes



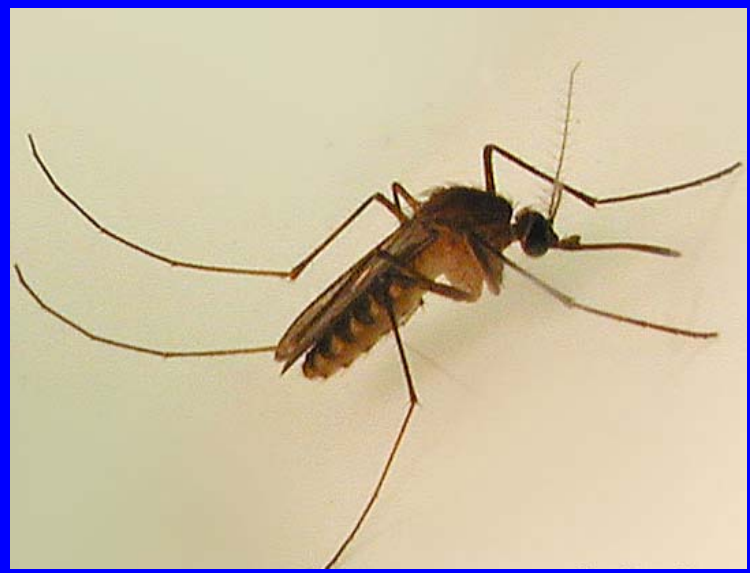
Habitats used by Permanent Water Mosquitoes

Role in Disease Transmission Differs Significantly in Suffolk Co.

Transfer the Pathogens to Humans
"Bridge Vectors"

Flood Water Mosquitoes
Primarily Mammal Biters

Amplify Encephalitis in Birds
"Amplification Vectors"



Permanent Water Mosquitoes
Mainly Bird Feeders

Sets the Stage for How Viruses Cycle in Nature

Encephalitis Cycles in Suffolk County

EEE & WNV

Bird Biting Amplification Vectors

Remember that Flo dwater Mosquitoes appear a Broods

Flood Water Bridge Vectors

Both Diseases Have a Seasonal Pattern

Summer

Virus Levels Build

Amplified in HY Birds

Restricted to Bird Feeders

Spring

Virus at Low Levels in Adult Birds

Requires Juveniles for Amplification

Fall

Virus at Highest Levels

Access to Bridge Vectors

Transfer to Mammal Hosts takes Place

Winter

Virus Undetectable

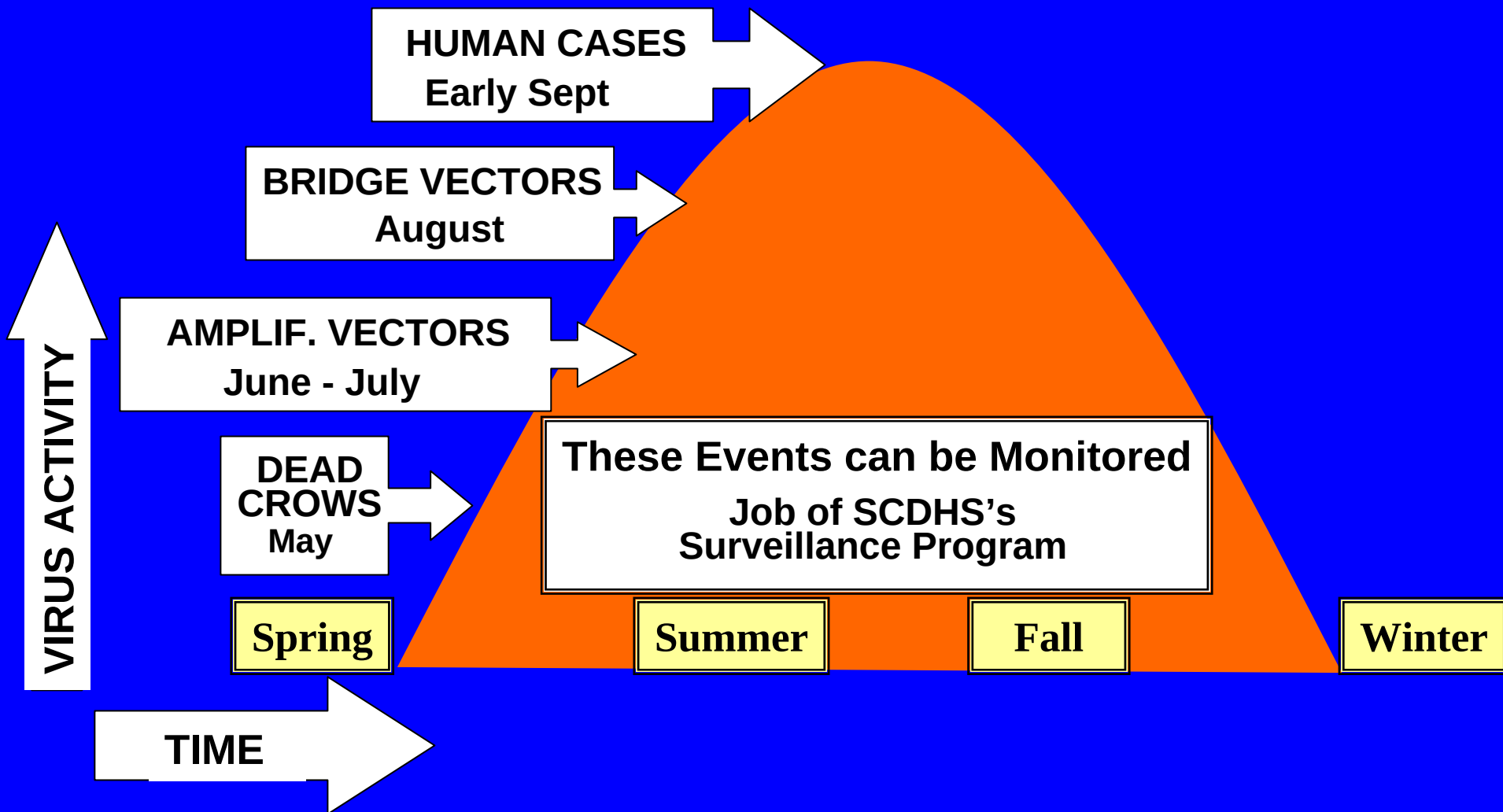
Mosquitoes ?

Birds ?

Unknown Host ?

Events that Lead to Human Cases

(Use WNV as an Example)



Disease Surveillance Efforts

CO_2 Trap
Bridge Vectors

Monitor
Dead Birds

Gravid Trap
Amplification Vectors

Test Specimens
for Virus

Health Passes that info on
to Vector Control

SCVC Mosquito Surveillance Efforts

(Begin Long before there is any evidence of Disease)

Monitor Larval Populations
(ID to Species)

Map Breeding Sites

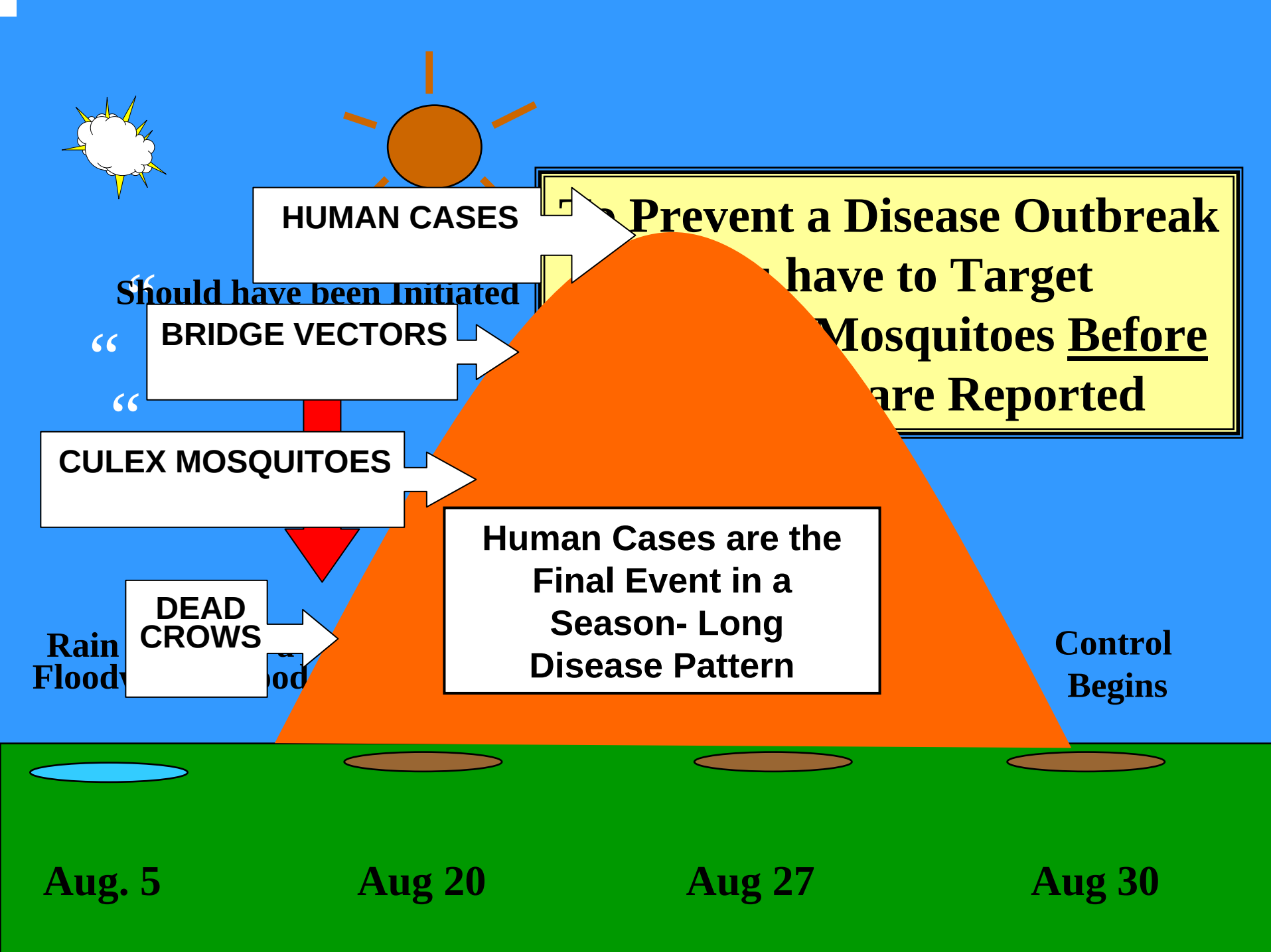
Combine the Info with Disease Surveillance Data to make Responsible Vector Control Decisions

Measure Adult Populations
(ID to Species)

Many Propose Controlling Mosquitoes only after Human Cases Appear

Floodwater Mosquitoes are the Primary Vectors to Humans in Suffolk Co.

The Transient Nature of the Floodwater Life Cycle makes the Argument Unacceptable


HUMAN CASES
Should have been Initiated
BRIDGE VECTORS
CULEX MOSQUITOES
DEAD CROWS
Prevent a Disease Outbreak
have to Target
Mosquitoes Before
are Reported
Human Cases are the Final Event in a Season- Long Disease Pattern
Rain
Control Begins
Aug. 5
Aug 20
Aug 27
Aug 30

Responsible Mosquito Control is Based on Science

Your Long-Term Plan provides a Blueprint to Achieve that End

Public Education

Surveillance

Source Reduction

Larval Control

Adult Control

Each step is Essential for a Well Balanced Program

Referred to as “Integrated Pest Management” or IPM

The Long-Term Plan

(An IPM Approach to Mosquito Control)

Surveillance

Drives the Control Efforts

Takes the Guesswork out of Mosquito Control

Absolutely Essential to make Responsible Control Decisions

The Long-Term Plan

(An IPM Approach to Mosquito Control)

Surveillance

Source Reduction

Eliminates Breeding Habitats

The Single Most Effective Form of Mosquito Control

You wouldn't have any Mosquitoes if you removed all of their Breeding Habitat

The Long-Term Plan

(An IPM Approach to Mosquito Control)

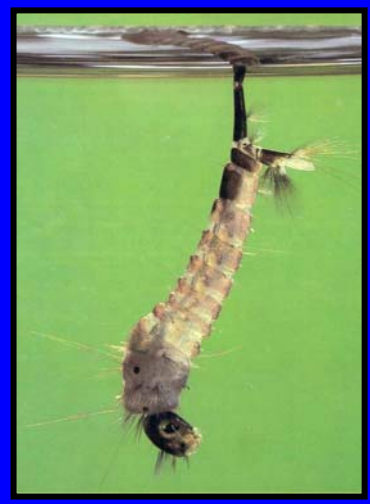
Surveillance

Source Reduction

Larval Control

Targets Mosquitoes before they Disperse

Needed where Source Reduction has not yet been Accomplished



Incorporates Biological Agents

Relies primarily on Biorational Pesticides

The Long-Term Plan

(An IPM Approach to Mosquito Control)

Surveillance

Source Reduction

Larval Control

Adult Control

Used as a Last Resort in an IPM Program

Targets the Mosquitoes after they have Dispersed

The Least Efficient form of Mosquito Control

Aerial Applications

Ground Applications

The Long-Term Plan

(An IPM Approach to Mosquito Control)

Public Education

Surveillance

Source Reduction

Larval Control

Adult Control

How does SCVC Compare with Other Programs ?

Public Education ✓

Surveillance

Source Reduction

Larval Control

Adult Control

Clearly Outlined in your Long Term Plan

Comparable to the Better Programs We Review

Enhanced since WNV

How does SCVC Compare with Existing Programs ?

Public Education

Surveillance ✓

Source Reduction

Larval Control

Adult Control

Unique Cooperation re: Health & Vector Control

Ranks among the Best in the Nation

Something you should be very Proud of

How does SCVC Compare with Existing Programs ?

High Marks in both Areas

Public Education

Surveillance

Source Reduction

Larval Control √

Adult Control √

Reflects the Quality of your Surveillance Program

Impressive List of Decisions used in Long-term Plan

How does SCVC Compare with Existing Programs ?

Public Education

Surveillance

Source Reduction

Larval Control

Adult Control

Goes Against Everything IPM Stands For

How does SCVC Compare with Existing Programs ?

Public Education

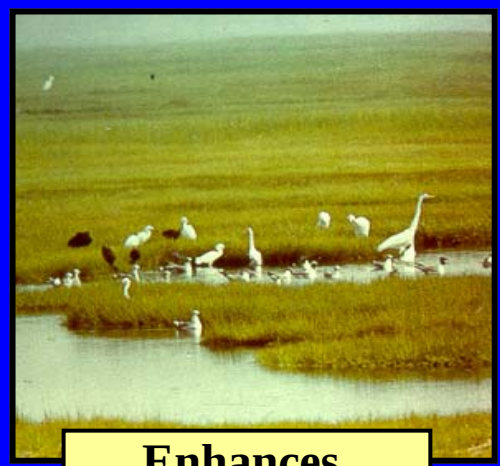
Surveillance

Source Reduction

Larval Control

Adult Control

Significantly Reduces Pesticide Usage



Your Plan is an IPM Model on a National Scale

Mosquitoes and their Management

Wayne J. Crans
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Rutgers University

Overwintering Mechanisms Differ

Winter Severity does not Seriously Impact Either Type

Flood Water Mosquitoes
Overwinter as Eggs

Permanent Water Mosquitoes
Hibernate as Mated Females