

***Culex pipiens/restuans* oviposition  
study - determining nocturnal  
flight activity**

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# *Background*

- ❖ Reddy et. al paper 2007:
  - ❖ Study was conducted in Cambridge and Somerville, Massachusetts
  - ❖ Host-seeking and oviposition activity of *Culex spp.*
    - ❖ What time do they occur and are these behaviors simultaneous?

# *Background*

- ❖ Reddy et. al article:
  - ❖ Used caged birds to record host-seeking activity
  - ❖ Recorded oviposition activity using a camera

# *Background*

## ❖ Conclusions:

- ❖ Results showed that peak host-seeking and ovipositioning time of *Culex* mosquitoes occurred **two hours** after sunset
- ❖ Suggested that ULV treatment be conducted two hours after sunset for best results

# *Introduction*

- ❖ Are we treating at the correct time?
- ❖ If not, when should we treat?
- ❖ Study: observe flying activity and ovipositioning time of *Culex* mosquitoes

# 2007 Experimental Design

## ❖ Collections

- ❖ Established trapping sites
- ❖ High *Culex* populations
- ❖ Bioquip Gravid Trap- collection chamber replaced
- ❖ Hay infusion
- ❖ June-September

## ❖ Collect hourly (12 hour period)

- ❖ June-August: 2000-0800
- ❖ September 1900-0700

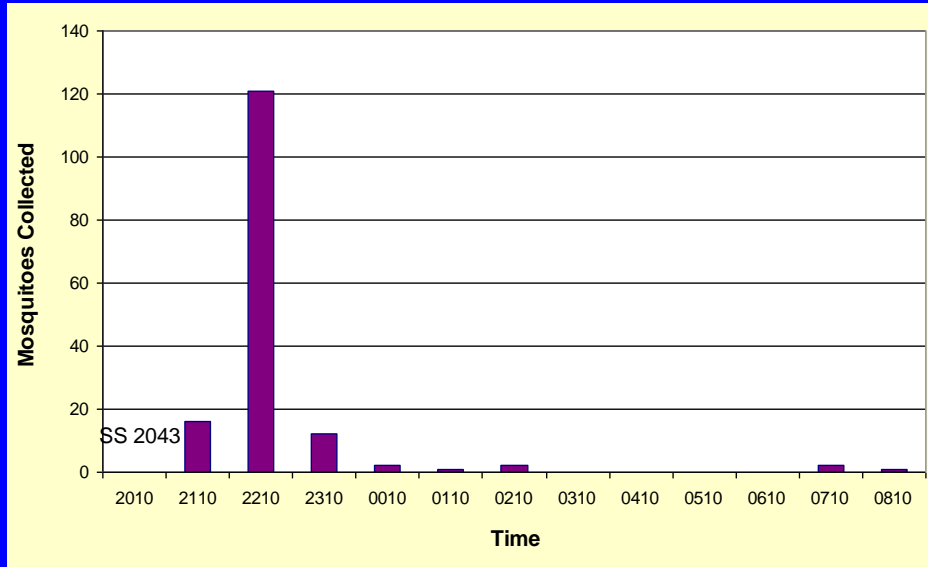
## ❖ Record egg rafts every hour

## ❖ Weather

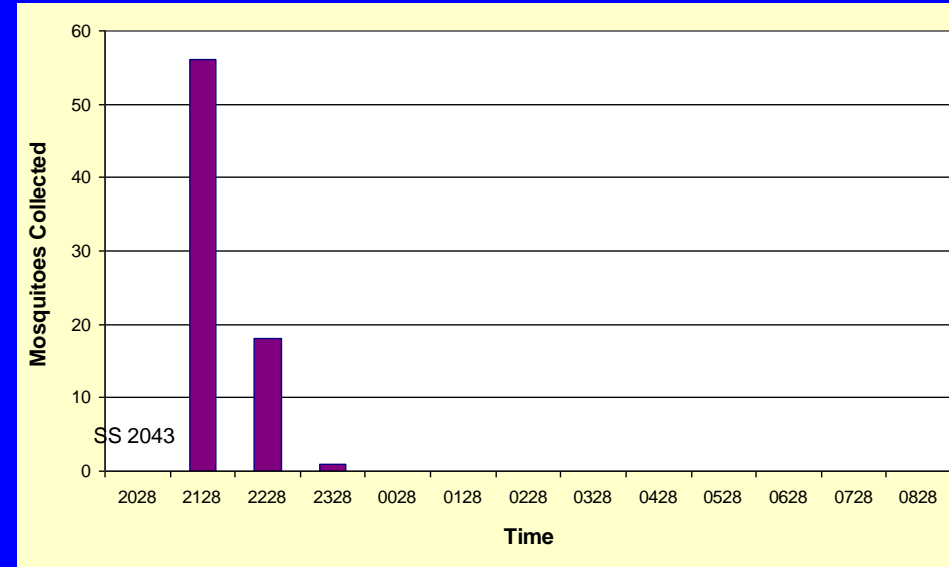
- ❖ Temperature
- ❖ Humidity
- ❖ Wind

# June Results

## Juniata County- Zooks Dam

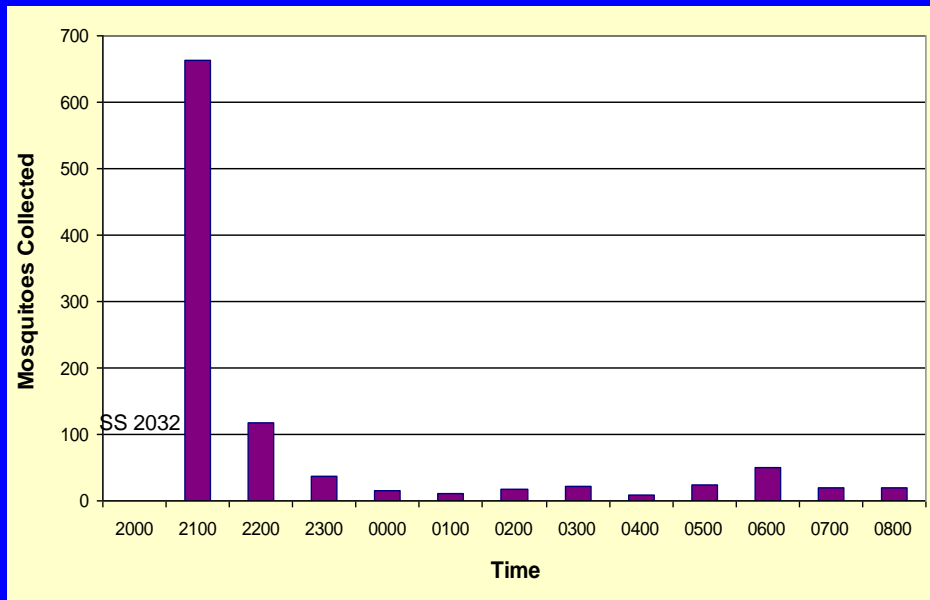


## Juniata County- Port Royal STP

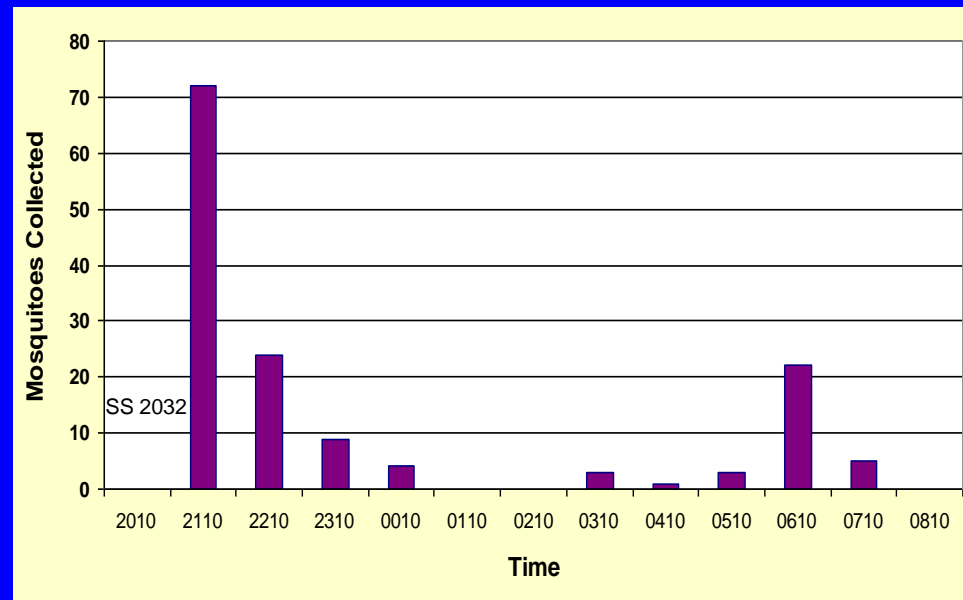


# July Results

## Perry County- Newport Plaza

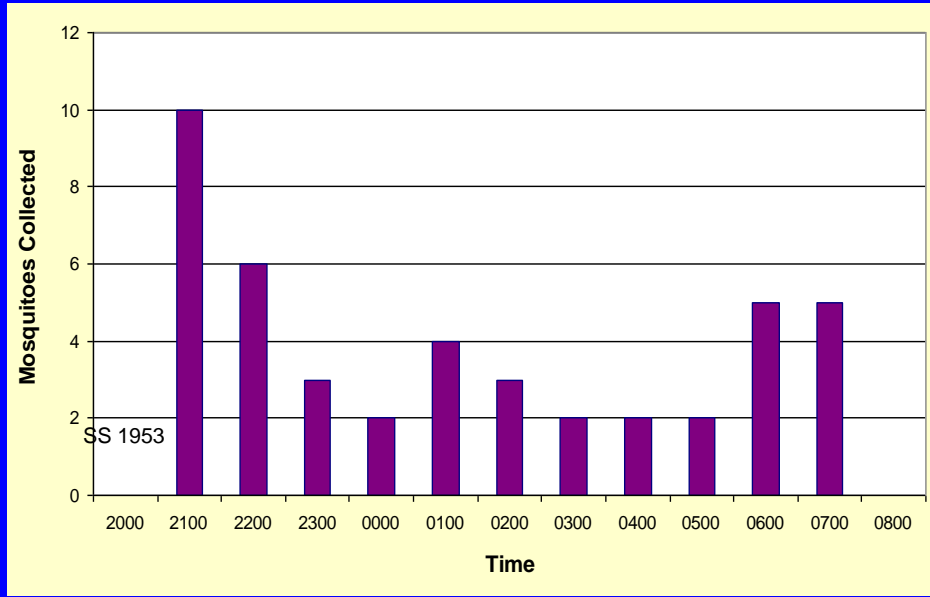


## Perry County- Newport STP

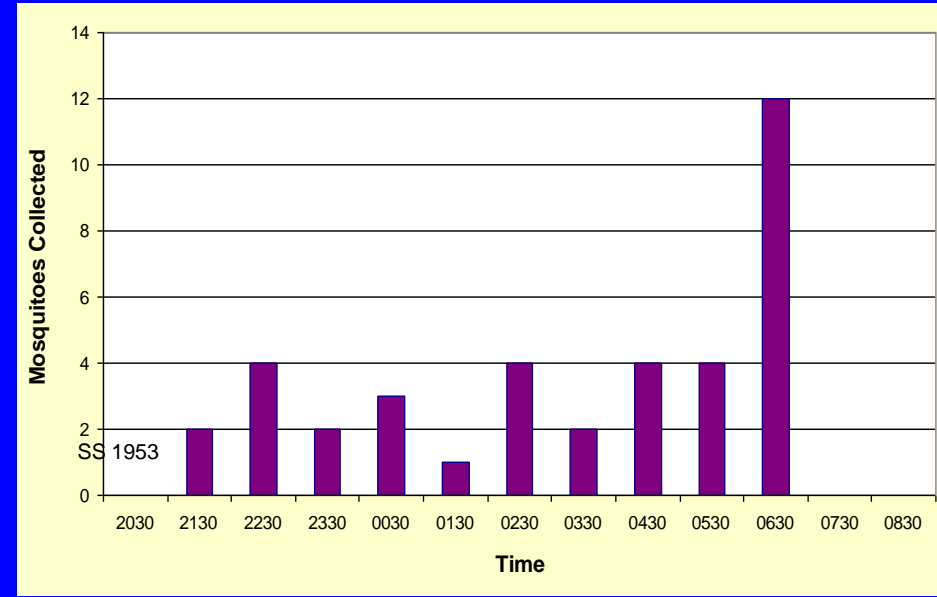


# August Results

York County- Strine HAC

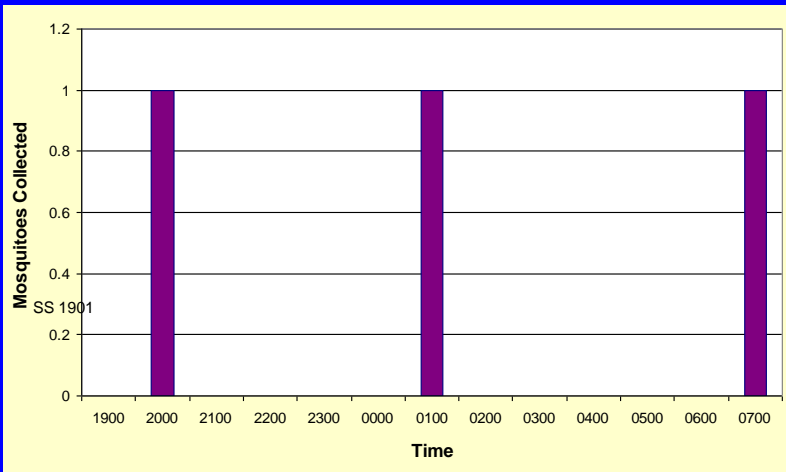


York County- Stonewood Park

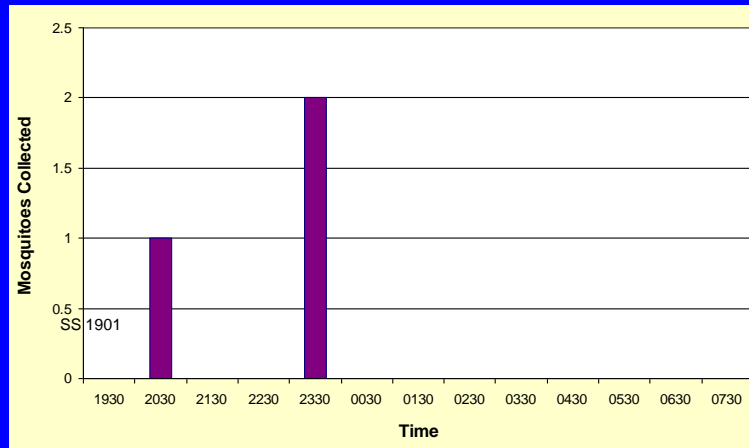
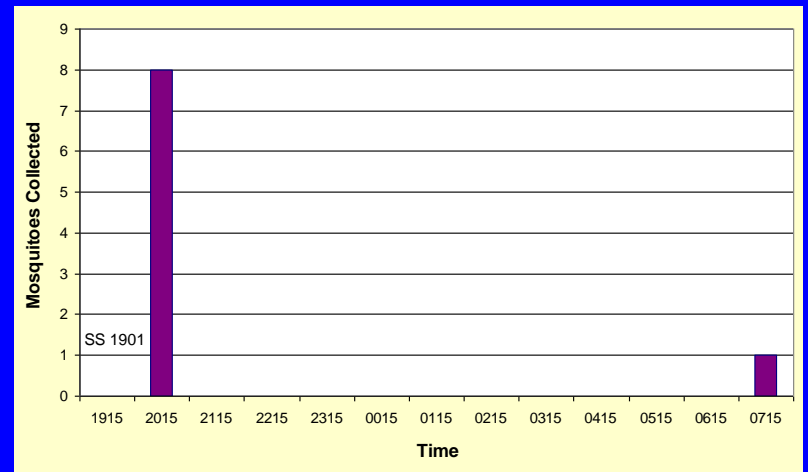


# September Results

Dauphin County- DEP SCRO



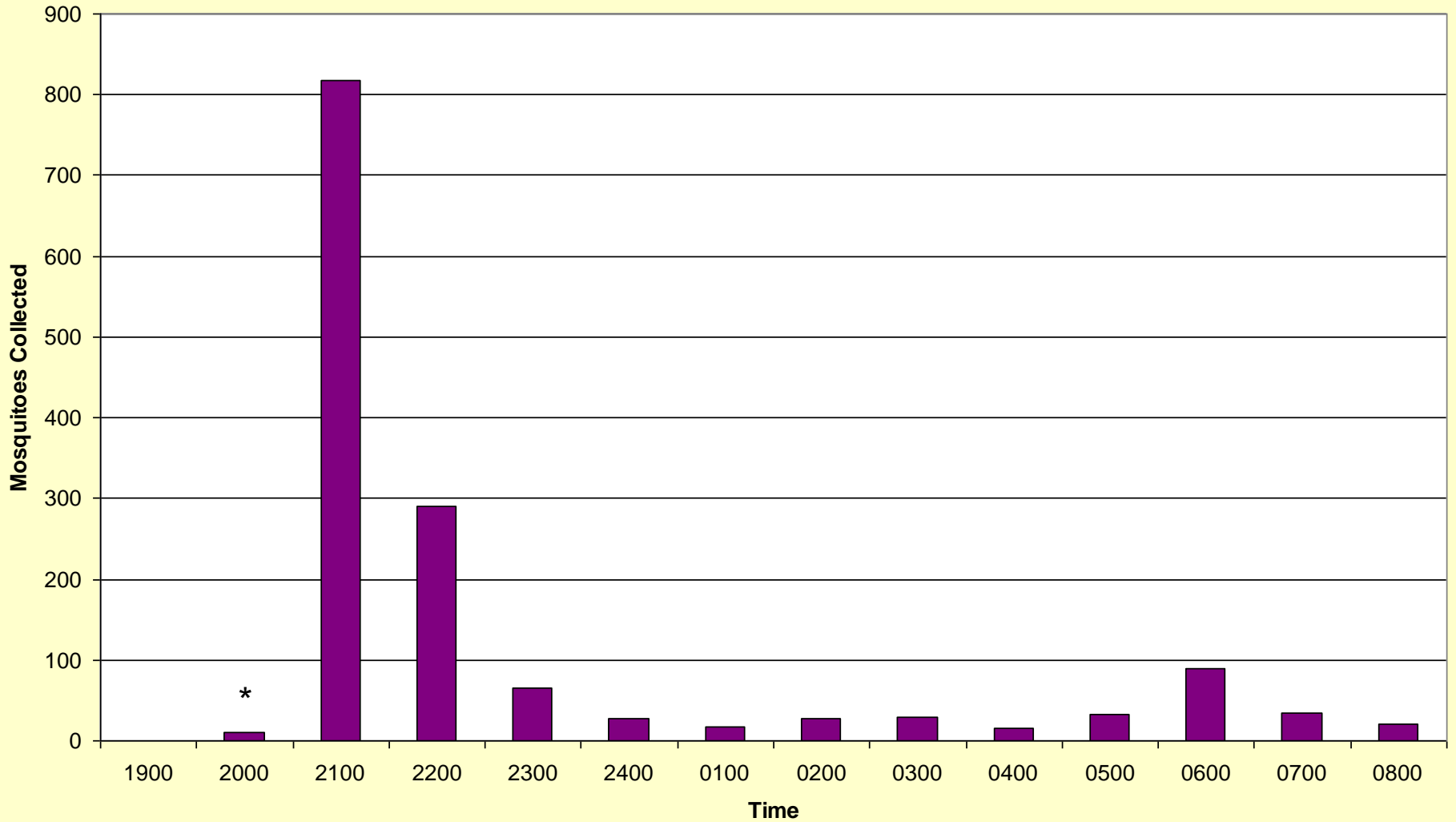
Dauphin County- BOL 1



Dauphin County-  
DEP- BOL 2

# Summary Results

Oviposition Study 2007



\* Specimens Collected in September

# 2007 Discussion

- ❖ According to our observations, we are treating around the correct time (9-11pm)
- ❖ Starting treatment two hours after sunset would miss flying times
- ❖ Temperature, humidity, wind
  - ❖ Not sure if correlation exists from data sets
- ❖ Did not record species per hour
- ❖ More data necessary

# 2008 Experimental Design

## ❖ Collections

- ❖ Established trapping sites
- ❖ High *Culex* populations
- ❖ Bioquip Gravid Trap- collection chamber replaced
- ❖ Hay infusion
- ❖ June-September

## ❖ Collect hourly (12 hour period)

- ❖ June-September: Time varied

## ❖ Record egg rafts every hour

## ❖ Species

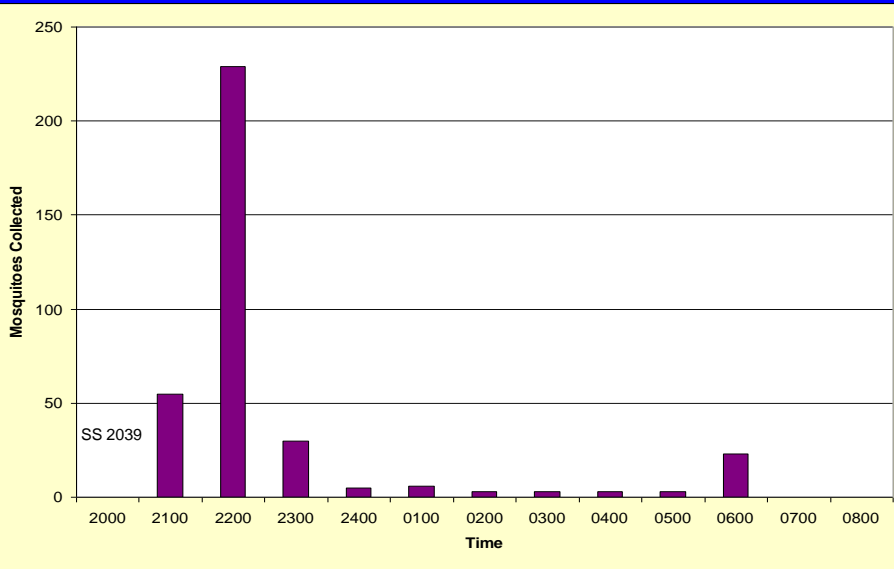
- ❖ Kept track of what species were collected hourly (not recorded in '07)

## ❖ Weather

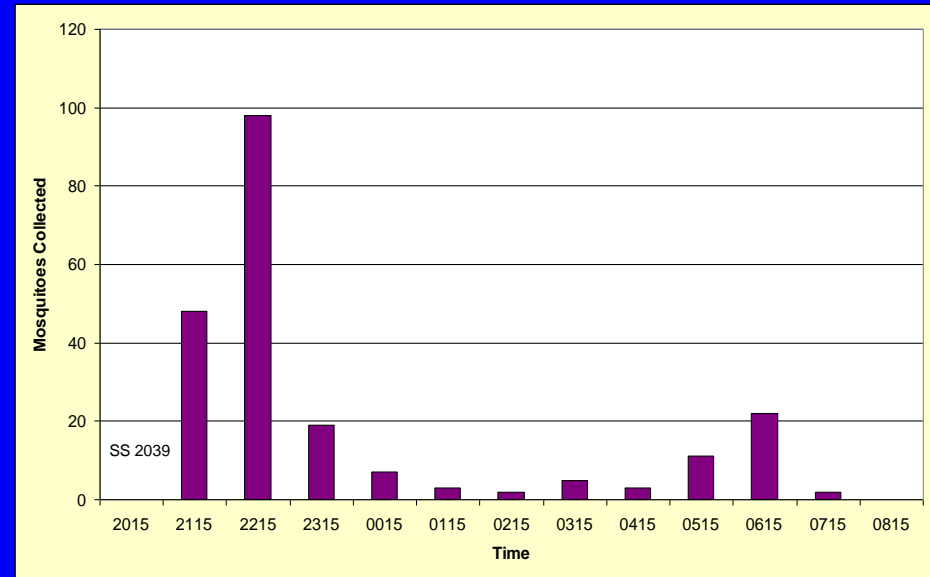
- ❖ Temperature
- ❖ Humidity
- ❖ Wind

# June Results

## York County- Shiloh Nursery

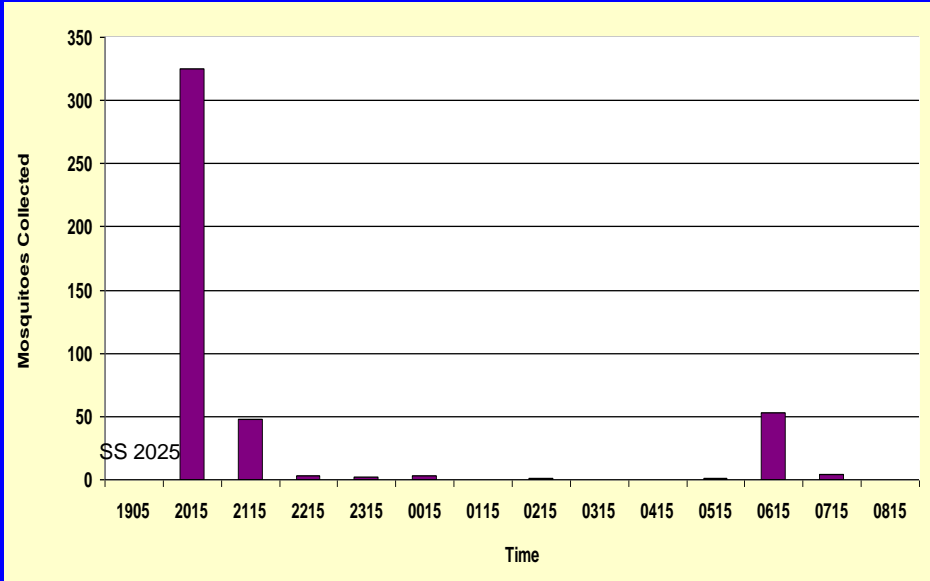


## York County- AM Appliances

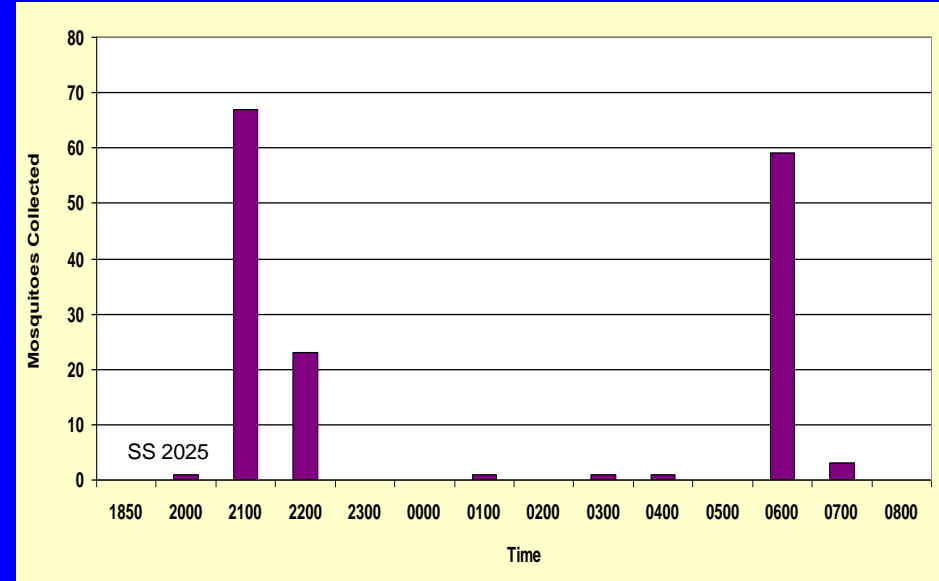


# July Results

## Adams County- Lutheran Home

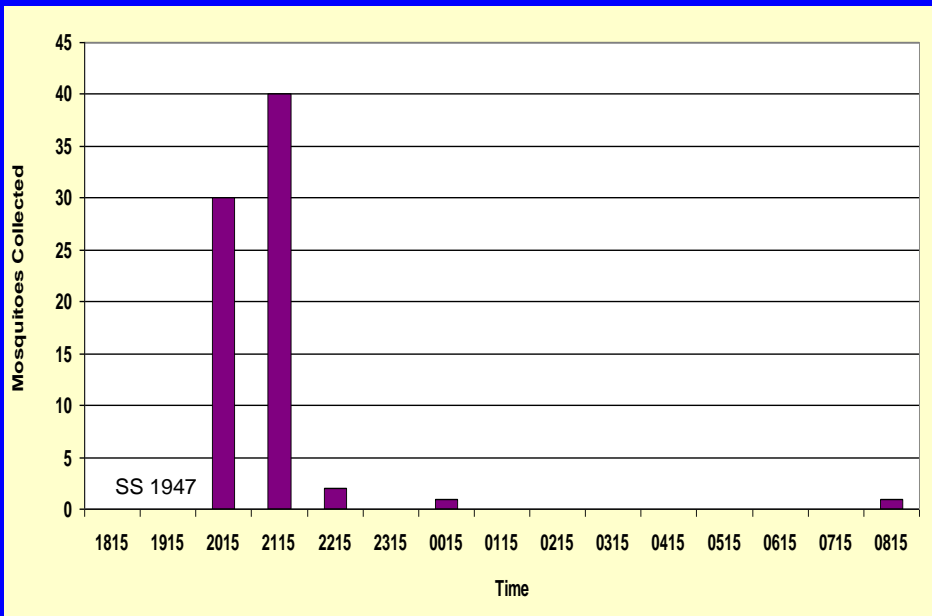


## Adams County- Walnut Grove STP

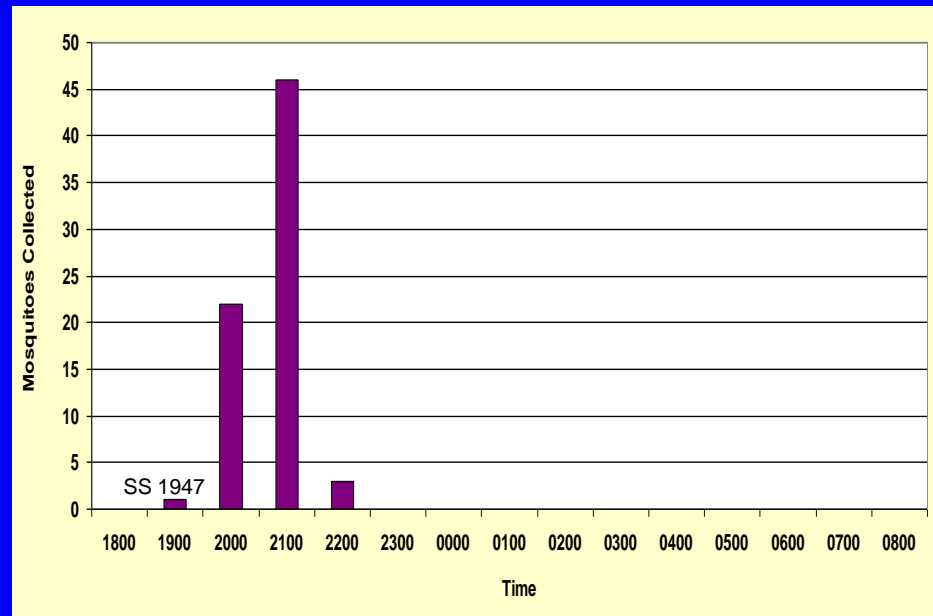


# August Results

## Lancaster County- LGH Health Camp

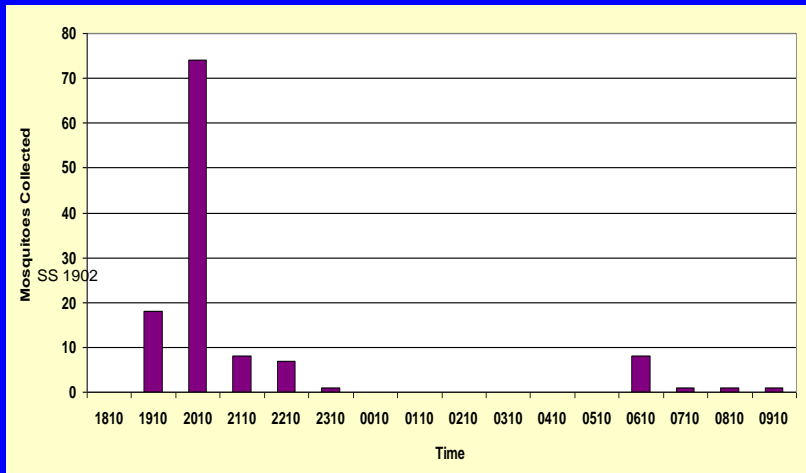


## Lancaster County- Springton Way

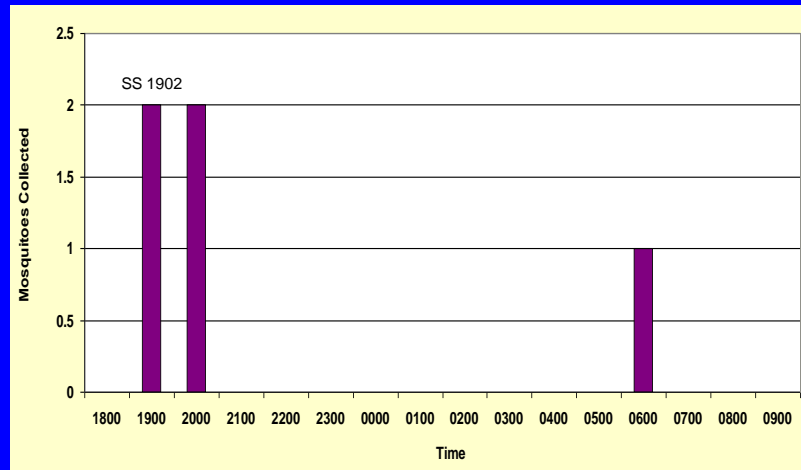
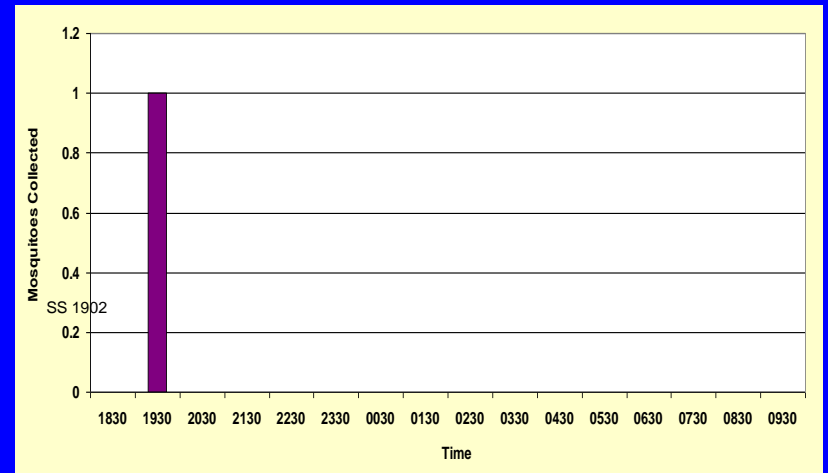


# September Results

## Cumberland County- CH Recycling

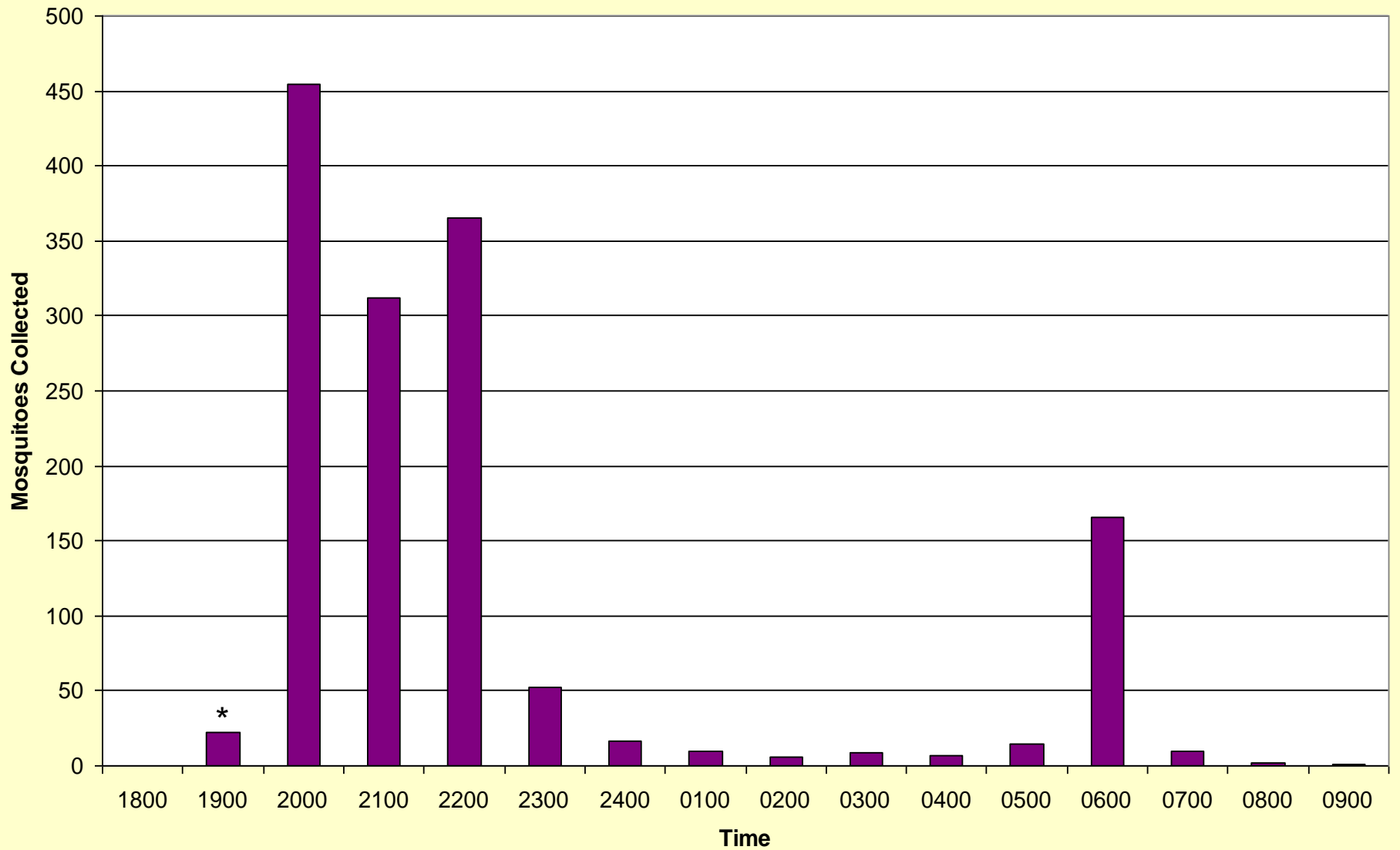


## Cumberland County- Seibert Park



## Cumberland County- CH Church

# Summary Results



\* Specimens Collected in September

# *2008 Discussion*

- ❖ Most activity between 8-11pm
- ❖ Recorded species per hour
- ❖ Can we narrow down when peak activity occurs?

# 2009 Experiment

- Questions?
  - How small is the window?
  - Was there too much disturbance?
  - Was the initial setting of the trap drawing in mosquitoes?
  - Base starting time on sunset?
  - Shorten length of study?
- Suggestions
  - Shorten collection intervals
  - Possible
    - Spend least amount of time possible near trap
  - Possible
    - Set traps before collections begin
  - Previous year's data
    - Yes
  - Previous year's data
    - Yes

# 2009 Experiment

## ❖ Collection Protocol:

- ❖ Trap set 1.5 hours before actual sunset

  - ❖ Exact time variable depending on location

- ❖ Collections started 1 hour before sunset

  - ❖ Collections every 15 minutes for 3 hours (total of 4 hours)

- ❖ Collection Interval

  - ❖ Shortened- Collected every 15 minutes

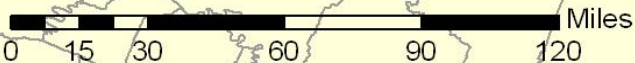
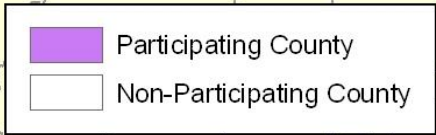
- ❖ Entire gravid trap changed

  - ❖ Ensure condition both traps and batteries

# 2009 Experimental Design

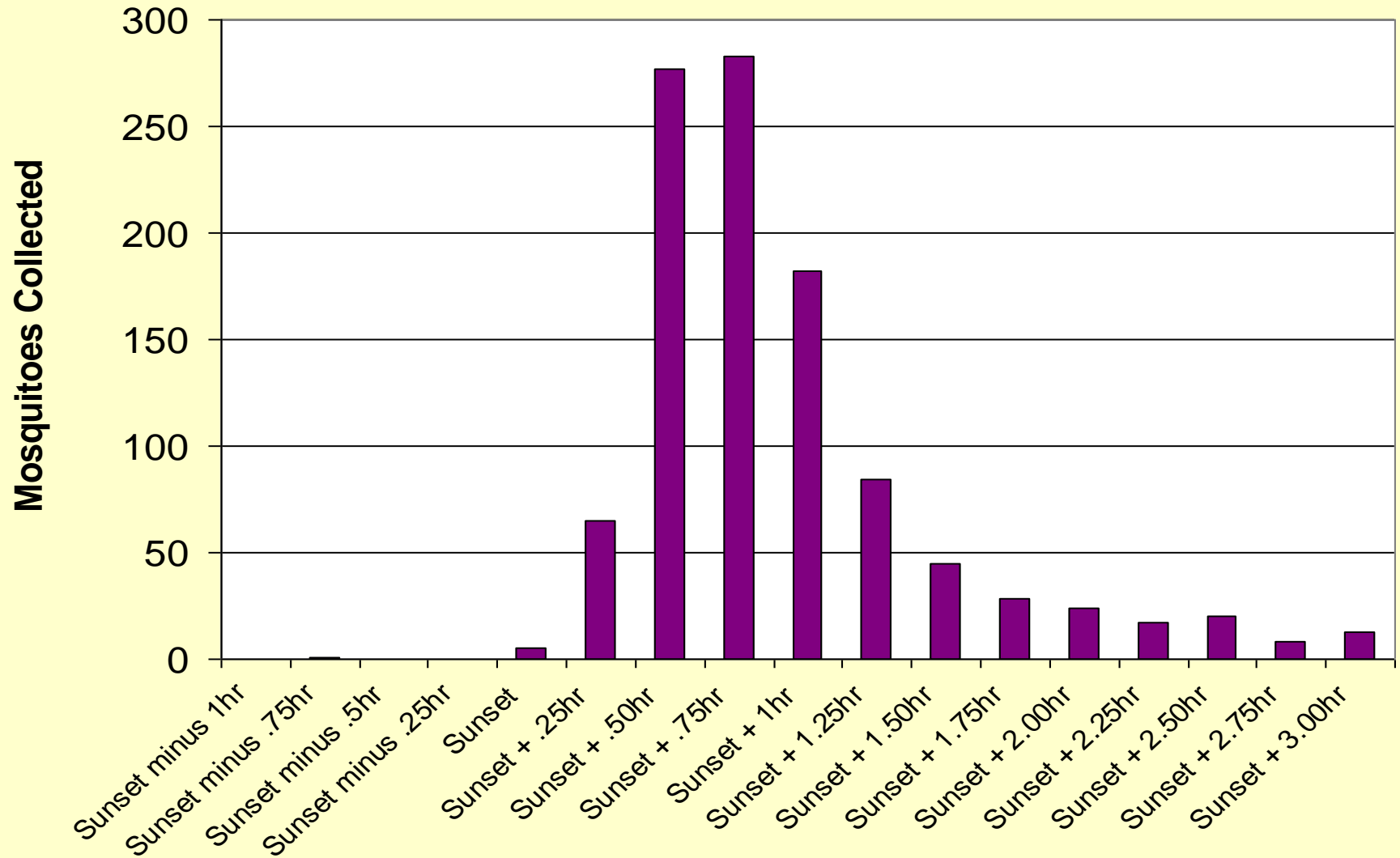
- ❖ Statewide Participation
- ❖ Established trapping sites
  - ❖ 100 *Culex spp.* collection in past two weeks
- ❖ Weather Recorded
  - ❖ Temperature
  - ❖ Humidity
  - ❖ Wind Speed
- ❖ Study conducted weeks of July 27<sup>th</sup> and August 24<sup>th</sup>
  - ❖ Exact day weather dependent
  - ❖ September- Budget Constraints

# The Pennsylvania West Nile Virus Control Program County Participation in 2009 Culex Oviposition Study



# Summary Results

## Oviposition Study 2009



# 2009 Results

## ❖ Numbers breakdown

❖ 77% collected within 1 hour after sunset

❖ 85% collected within 1.25 hours after sunset

❖ 94% collected within 2 hours after sunset

(data compiled by Mike Hutchinson)

<u>Sunset</u>		<u>Sunset + 1hr</u>		<u>Sunset + 2.00hr</u>	
<i>Culex restuans</i>	4	<i>Culex restuans</i>	122	<i>Culex restuans</i>	20
<i>Culex salinarius</i>	1	<i>Culex pipiens</i>	57	<i>Culex pipiens</i>	3
		<i>Culex salinarius</i>	3	<i>Anopheles quadrimaculatus</i>	1
<u>Sunset + .25hr</u>					
<i>Culex restuans</i>	7	<u>Sunset + 1.25hr</u>		<u>Sunset + 2.25hr</u>	
<i>Culex pipiens</i>	56	<i>Culex restuans</i>	69	<i>Culex restuans</i>	12
<i>Anopheles punctipennis</i>	1	<i>Culex pipiens</i>	14	<i>Culex pipiens</i>	2
<i>Culex territans</i>	1	<i>Culex salinarius</i>	1	<i>Culex salinarius</i>	2
				<i>Anopheles punctipennis</i>	1
<u>Sunset + .50hr</u>		<u>Sunset + 1.50hr</u>			
<i>Culex restuans</i>	100	<i>Culex restuans</i>	30	<u>Sunset + 2.50hr</u>	
<i>Culex pipiens</i>	171	<i>Culex pipiens</i>	14	<i>Culex restuans</i>	15
<i>Anopheles punctipennis</i>	4	<i>Culex territans</i>	1	<i>Culex pipiens</i>	4
<i>Ochlerotatus japonicus</i>	2			<i>Aedes vexans</i>	1
<u>Sunset + .75hr</u>		<u>Sunset + 1.75hr</u>		<u>Sunset + 2.75hr</u>	
<i>Culex restuans</i>	168	<i>Culex restuans</i>	23	<i>Culex restuans</i>	5
<i>Culex pipiens</i>	105	<i>Culex pipiens</i>	4	<i>Culex pipiens</i>	3
<i>Anopheles punctipennis</i>	3	<i>Culex salinarius</i>	1		
<i>Ochlerotatus japonicus</i>	3			<u>Sunset + 3.00hr</u>	
<i>Culex salinarius</i>	2			<i>Culex restuans</i>	7
<i>Aedes vexans</i>	1			<i>Culex pipiens</i>	5
<i>Ochlerotatus trivitattus</i>	1			<i>Ochlerotatus trivitattus</i>	1

# 2009 Results

## ❖ Species Breakdown

- ❖ *Culex restuans* - 582
- ❖ *Culex pipiens* – 438
- ❖ *Culex salinarius*- 10
- ❖ *Anopheles punctipennis*- 9
- ❖ *Ochlerotatus japonicus*- 5
- ❖ *Ochlerotatus triseriatus*- 2
- ❖ *Aedes vexans*- 2
- ❖ *Culex territans*- 2
- ❖ *Anopheles quadrimaculatus*- 1
- ❖ *Ochlerotatus trivittatus*- 1

❖ Total 1,052 specimens- 98% *Culex*

# 2009 Conclusions

- ❖ Window is smaller than first anticipated
  - ❖ Activity limited at 2 hours after sunset
- ❖ Appears that sunset correlates strongly with flight/oviposition activity
  - ❖ Start treating at sunset
  - ❖ Treat less sites per night
- ❖ Need to statistically analyze the data

2010

## ❖ Questions

❖ September?

❖ Window earlier and/or shorter- Temperature

❖ *Culex pipiens/ restuans* analysis

❖ Location?

❖ Season?

❖ Biology?

❖ Budget?



# *Acknowledgements and Questions?*

- ❖ DEP Regional Biologists
- ❖ Vector Management Staff
- ❖ County Staff