# 2008 Arbovirus Surveillance Report

## Introduction

In 2007 surveillance was initiated using permanent trap sites for collecting large numbers of mosquitoes for arbovirus testing. During the 2007 collecting season over 24,000 mosquitoes were collected and tested for West Nile virus. Of the 420 pools tested, 36 pools were West Nile positive. With the success of the 2007 season, permanent trap sites were expanded in 2008 to include an additional county as well as some of the sites utilized in 2007.

## Methods

Trapping began on May 28, 2008, conducted by four student interns and the public health entomologist. Three of the sites in Jackson County utilized in 2007 were again used in 2008. These included the Jackson County fair grounds lagoon, the lagoon serving the large mobile home park in Cottageville and the small package plant also serving a mobile home park, also in Cottageville. In addition to these sites two additional sewage lagoons were located in Jackson County. These included a small sewage lagoon at the Greenhills Country Club **(Photo 1)**, located on the edge of the golf course. The other sewage lagoon was located outside of Ripley and served the Parchment Valley Conference Center **(Photo 2)**.

In addition to the five locations in Jackson County, several sites were chosen in Kanawha County. These sites included a package plant that served a housing development in the Big Bend area of Tornado **(Photo 3)**. The Tornado area is plagued by numerous failing septic systems and West Nile positive dead birds have been found the area in previous years. Several areas in the Lower Falls area were also chosen as trapping sites. Due to a roadside drainage pipe being crushed years ago, the Lower falls area suffers from poor drainage **(Photo 4)**. Many yards in the area remain flooded from May to August. A sewage lagoon located in the Lower Falls area was also used as a trapping location. Sites were also found on the grounds of the West Virginia Air National Guard (WVANG) and Capitol High School. The WVANG sites consisted of a natural drainage area that stayed consistently wet, and a man made drainage area that held water for long periods of time following a rainfall event. The Capitol High site was a drainage area that had become overgrown with a large stand of cattails (Typha ssp.). The Capitol High site was investigated following numerous complaints of biting mosquitoes during evening soccer games.

Additional sites were investigated following mosquito complaints that were received by state and county personnel. A home site in Belle, WV was investigated for several weeks after a home owner complained of mosquitoes coming from a business nearby, that was storing large tires. A drainage ditch near a railroad line in St. Albans (Kanawha Co.) that continually held water for weeks after rainfall was also investigated. Traps at this location were removed after four days, due to repeated vandalism. Traps were also located at an elementary school in Tornado (Kanawha Co.) but were also quickly removed due to vandalism.

Additionally Wetzel-Tyler Health Department submitted two pools of mosquitoes following a series of complaints.

**Trapping Methods**

In addition to the CDC gravid traps utilized in 2007, six Reiter-Cummings gravid traps **(Photo 5)** were utilized in 2008. The Reiter-Cummings Gravid Traps differ from the CDC gravid traps in that the trapping mechanisms are contained within a plastic box above a tray of mosquito brew. Unlike the CDC gravid traps this model has the intake fan disconnected to the collecting chamber. With mosquitoes not going through the fan to be collected, additional undamaged specimens were available for testing.

**Specimen Handling**

All mosquitoes collected daily were returned to the lab in the nets in which they were collected. All collecting nets were then placed in a minus 80 Celsius freezer to kill the mosquitoes. After all mosquitoes were dead, all samples from a single trapping area were placed in a large six inch Petri dish.

At the start of the season catches were sorted by trap type (CDC gravid or Reiter-Cummings gravid traps) to see if there were significant differences between trap catches. As the season progressed both trap types from a single location were combined. Mosquitoes were sorted into two groups: *Culex* and non-*Culex* mosquitoes. All non-*Culex* mosquitoes were discarded or saved as teaching specimens. All *Culex* mosquitoes (regardless of species) were pooled into groups of 100 mosquitoes (unless the catches were small then 25 to 50 mosquitoes were used. The pool groups of mosquitoes were placed in 2 ml Sarstedt micro tubes with two copper BBs. A buffer solution was added to the micro tubes and then the tubes were placed on a mixer mill for four minutes. With the addition of the buffer solution and the action of the copper BBs, the mosquitoes were ground into slurry on the mixer mill. The resulting material was centrifuged and extracted. Using RTPCR the sample was analyzed for WNV and Saint Louis encephalitis.

**Results and Discussion**

Between May 28 and October 9, a total of 66,039 *Culex* mosquitoes were collected at nine sites. The majority of mosquitoes collected were *Culex restuans* and *Culex pipiens*. Both species of mosquitoes prefer foul water sites for breeding. A total of 1,012 pools of mosquitoes were submitted for virus testing, of these 45 pools were positive for WNV. The highest numbers of mosquitoes were again collected in July **(Chart 1)**. Minimum infection rates (MIR) were calculated for each week when a positive pool was collected at a site. The minimum infection rate is calculated: ([number of positive pools / total specimens tested] x 1000). The MIR uses the assumption that a positive pool contains only one infected mosquito.

MIRs are used to determine when control practices should be put in place to prevent cases of human or animal disease. The cut-off for MIR is 4.5 to 4.9; anything above these values, then control practices should be put in place.

Collections from Jackson County **(Chart3)** produced 35,553 mosquitoes for the season **(Chart 2)**.

At the Jackson County fair location three traps were placed around the sewage lagoon, two CDC gravid traps and one Reiter-Cummings gravid trap. A total of 9,332 mosquitoes were collected over the season. One hundred and thirty two pools were submitted for virus testing, yielding seven WNV positive pools. The first positive pool for this site was identified on 12 June 2008; in 2007 the first positive pool was identified on 20 July. MIRs ranged from 1.51 to 3.22 throughout the season.

At the mobile home park lagoon in Cottageville (Jackson Co.) three CDC gravid traps were placed around the perimeter of the lagoon. A total 8,306 mosquitoes were collected for the season, yielding 102 pools to be tested **(Chart 4)**. A total of six pools were positive for WNV. The first positive pool for this location was identified on 15 July 2008; while all pools collected in 2007 for collected on 3 August. The MIRs for this site ranged from 1.7 to 5.2

At the mobile home package plant 4,535 mosquitoes were collected from the single CDC gravid trap placed at the site **(Chart 5)**. Sixty four pools submitted virus testing yielded two WNV positive pools. The first positive pool was collected on 3 September 2008. The site was pumped out on 30 September and the second positive pool was collected on 1 October, with no additional pools collected for the season. The first positive pool collected for this location was 3 September 2008; in 2007 the first pool was collected on 10 August. The MIR following the pumping of the facility was 4.9, possibly resulting from displaced females seeking an oviposition site.

Three CDC gravid traps were located around the Greenhills Country Club sewage lagoon located in Silverton (Jackson Co.). Over the season these traps produced 9,558 testable mosquitoes **(Chart 6)**. A total of 102 pools of mosquitoes were submitted for virus testing, yielding five WNV positive pools. The first positive mosquito pool was collected on 15 July 2008. The local health department was informed that the lagoon had been larvacided, but the product was never identified. The MIRs for this site ranged from 0.5 to 9.52 throughout the season. During mid-August the MIR dropped to 1.5, during a period when night temperatures dropped to the mid -50's.

Two CDC gravid traps were placed around the large sewage lagoon at Parchment Valley Conference Center in Evans (Jackson Co.). The lagoon is surrounded by fencing and is largely inaccessible for trapping. The two traps produced 3,822 mosquitoes over the collecting season. A total 60 pools of mosquitoes were submitted for virus testing, yielding 3 WNV positive pools. The first positive pool was collected on 7 August 2008.

The collections for the Kanawha County sites produced 30,486 mosquitoes over the season **(Chart 7)**. The Lower Falls area of St. Albans which floods due to poor drainage covers an area of several blocks. To adequately survey the area, seven traps were scattered throughout the neighborhood. Three Reiter-Cummings gravid trap and four CDC gravid traps were used, with some traps being removed over the season as the high water levels dried down. The Lower Falls traps produced 17,811 mosquitoes over the collecting season **(Chart 8)**. Three hundred and thirteen pools of mosquitoes were submitted for virus testing, yielding 13 WNV positive pools. The first positive pool was

collected on 26 June 2008. The drainage ditch along the roadside was re-graded the first week of August. After the ditch was re-graded the MIR ranged from .09 to 4.4. This was possibly due to females being concentrated around a decreasing water source as the lawns continued to dry down.

A sewage lagoon was also located in the Lower Falls area of Kanawha County. The lagoon produced only a small number of testable mosquitoes over the season with a total of 982. The traps continually were filled with large swarms of male mosquitoes. Only one CDC gravid trap was used and it was placed over the effluent pipe. Twenty seven pools of mosquitoes were tested, but no positives were identified.

Two traps, a CDC gravid trap and a Reiter-Cummings gravid trap were placed near a package plant serving a housing development in Tornado area of Kanawha County. The traps were only in place approximately eight weeks, before they were removed due to vandalism. During the time they were in place the traps produced 5,979 testable mosquitoes. A total of 23 pools tested yielded three WNV positive pools. The first positive pool was collected on 11 June 2008.

Two CDC gravid traps were also placed at an elementary school package plant near the Big Bend Site, but were removed after only one week due to vandalism. The traps yielded 230 testable mosquitoes. A total of seven pools were submitted for virus testing, with no positive pools being identified.

WVDHHR was asked by the West Virginia Air National Guard (WVANG) to assist with arbovirus surveillance on the Charleston military base. Originally three traps were set, two Reiter-Cummings gravid traps and one CDC gravid trap. One of the Reiter-Cummings gravid traps set near the flight line was removed, as the wet area where it was placed dried up completely. The additional Reiter-Cummings gravid trap was placed near a wet area which never dried up over the collecting season. The CDC gravid trap was placed near a man-made drainage area that held standing water for weeks following a major rain event. The WVANG sites yielded a total of 4,542 mosquitoes over the season **(Chart9)**. A total of 91pools were submitted for virus testing, producing 5 WNV positive pools. The drainage area was fixed in August. A MIR was not calculated for the first positive pool of mosquitoes, due to the fact that only four mosquitoes were collected that week. MIRs throughout the season ranged from 4.38 to 11.9.

Traps were located in Belle as the result of a complaint about mosquitoes emanating from large tires at a business near a homeowner's backyard. A single Reiter-Cummings gravid trap was placed in the homeowner's backyard. Over a four week period the trap only produced 342 mosquitoes. Fourteen pools of mosquitoes were submitted for testing, with no positive pools identified. The trap was pulled from the location after 4 weeks of small catches.

Traps were located at Capitol high School in Charleston after a complaint about mosquitoes biting during soccer games. Originally four Reiter-Cummings gravid traps were set around the perimeter of the field; however due to low catch numbers three traps

were removed after three days. The remaining trap located in the drainage area with cattails was left in place. The trap(s) from this location produced 296 mosquitoes total. Fourteen pools were submitted for virus testing, with only one WNV positive pool identified.

Traps were also located at a drainage ditch along a railroad in St. Albans due to complaints. Three Reiter-Cummings gravid traps were set in the area, but were removed after several days due to repeated vandalism. While in place the traps collected 283 mosquitoes. Eleven pools were submitted for virus testing, and no positive pools were identified.

Wetzel-Tyler Health department also submitted adult mosquitoes for virus testing in 2008. Following numerous complaints of biting mosquitoes, in an area prone to flooding the local health department (LHD) requested assistance from WVDHHR. WVDHHR supplied the LHD with CO2 light traps to assist with surveillance. A total of 21 mosquitoes were submitted for identification and testing. Two pools were submitted for virus testing, with no positive pools identified.

**Conclusion**

Utilizing permanent trap sites continues to work well as a surveillance strategy in West Virginia, allowing the ability to sample large numbers of mosquitoes near population centers. However the system is not without its shortfalls. If traps are located more than an hour and a half from Charleston, specimens cannot be retrieved and processed in same day. This shortfall could be overcome if LHDs or other organizations did their own trapping and sent samples to WVDHHR for processing. Wetzel-Tyler Health Department showed that this method will work. Another limitation continues to be that the summer interns leave in mid-August to return to classes. This leaves only the public health entomologist to conduct surveillance. At this point surveillance at each site becomes sporadic as the entomologist rotates between different sites. Communities in which the sites are located are encouraged actively seek treatments for controlling mosquitoes in these locations.


**Photo 1:** Sewage lagoon located Greenhills Country Club in Silverton

**Photo 2:** Sewage lagoon at Parchment Valley Conference Center near Ripley

**Photo 3:** Sewage treatment package plant in the Big Bend area of Tornado (Kanawha Co.)

**Photo 4:** Yard flooding in the Lower Falls area of St. Albans (Kanawha Co.)

**Photo 5:** Reiter-Cummings gravid trap

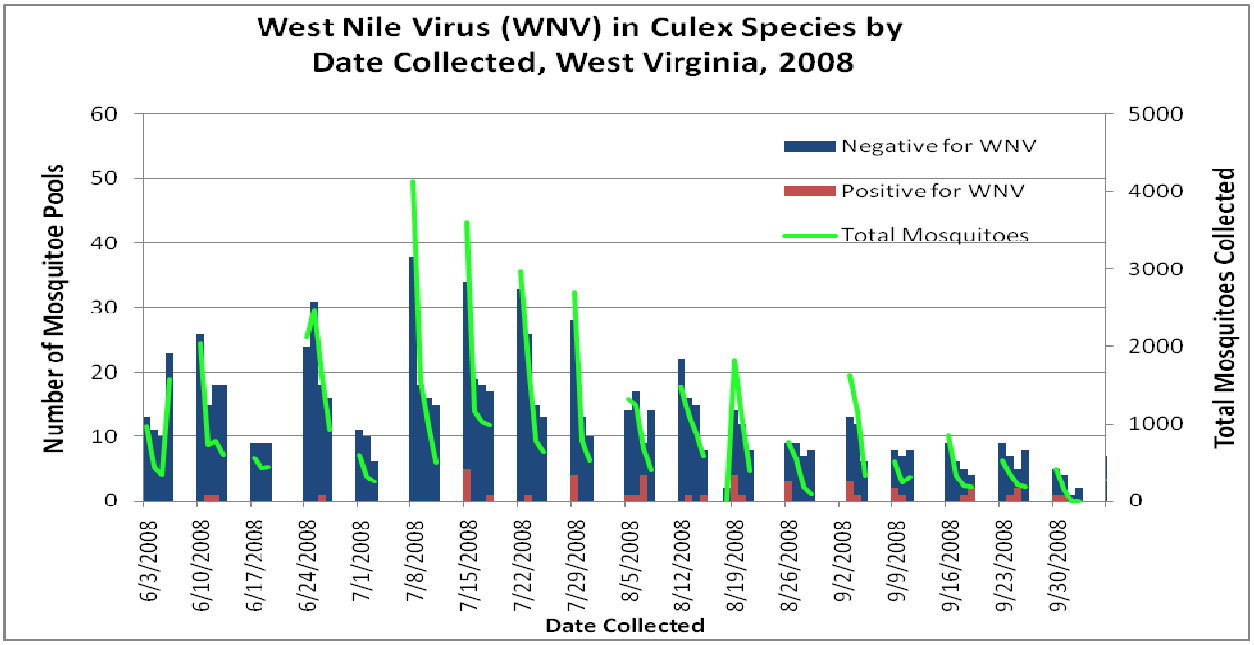


**Chart 1:** Total *Culex* Mosquito Collection for West Virginia in 2008

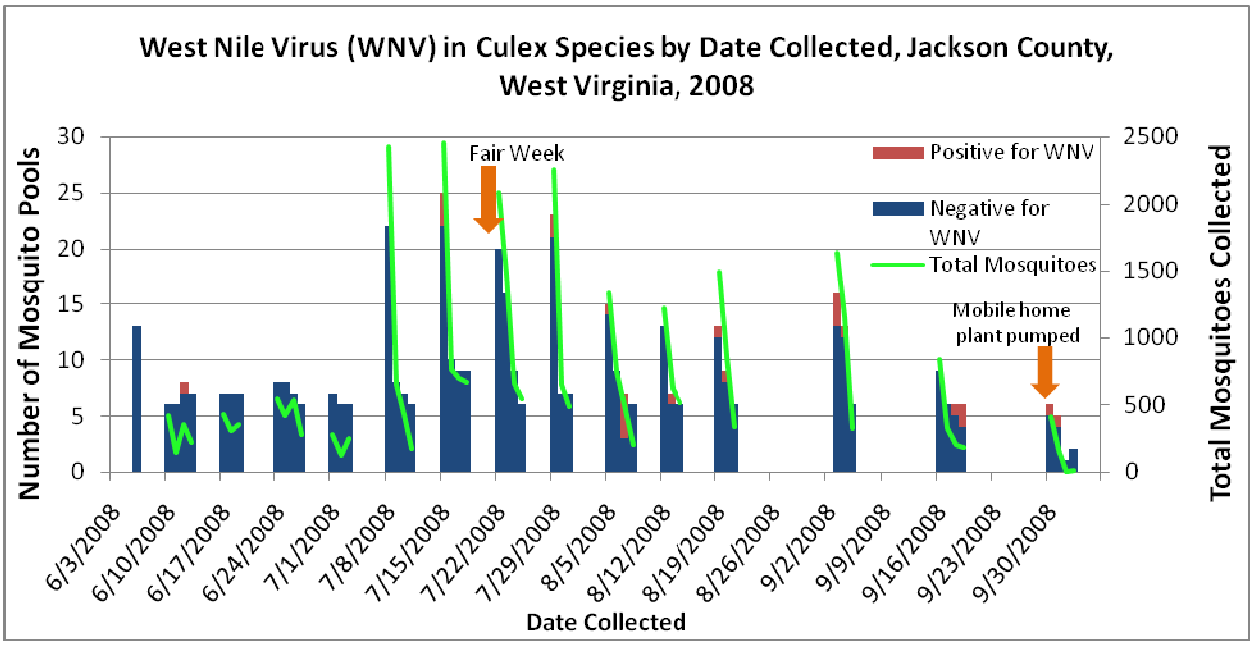


**Chart 2:** Total *Culex* Mosquito Collections from Jackson County in 2008

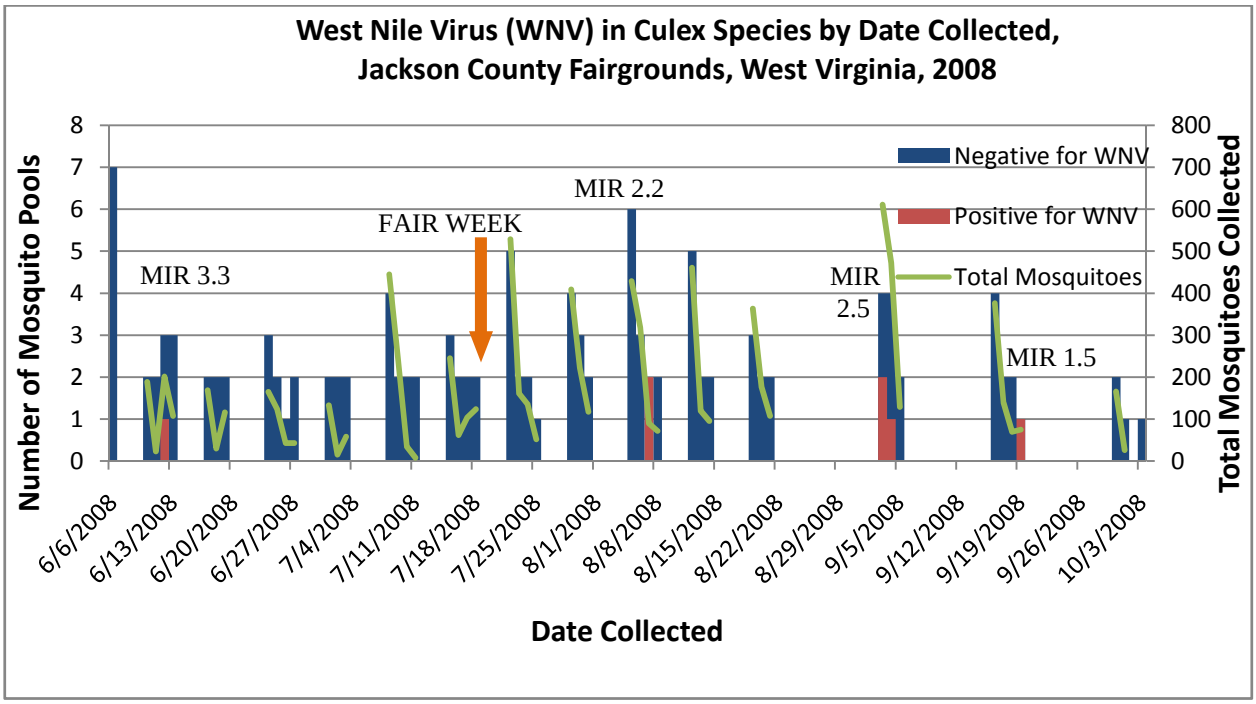


**Chart 3:** Total *Culex* Mosquito Collections from Jackson County Fair Grounds in 2008

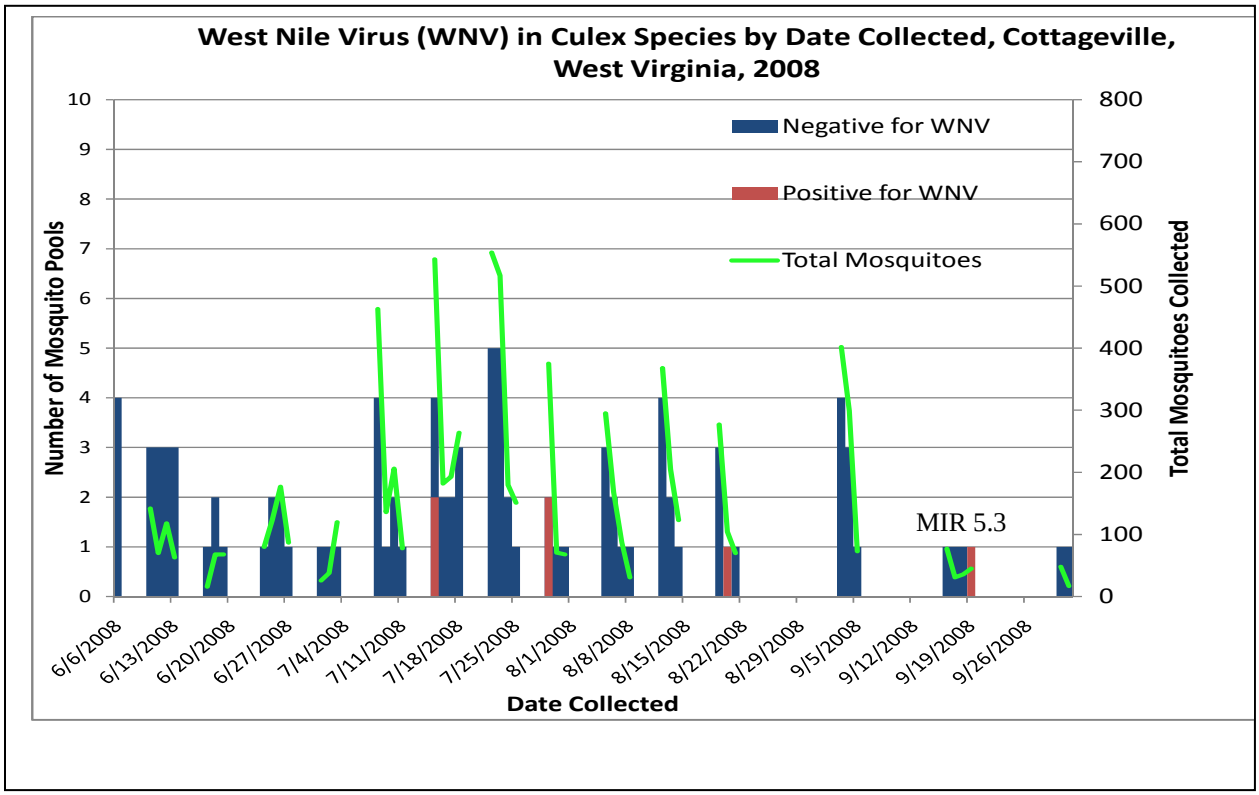


**Chart 4:** Total *Culex* Mosquito Collections from Cottageville Lagoon (Jackson County) in 2008

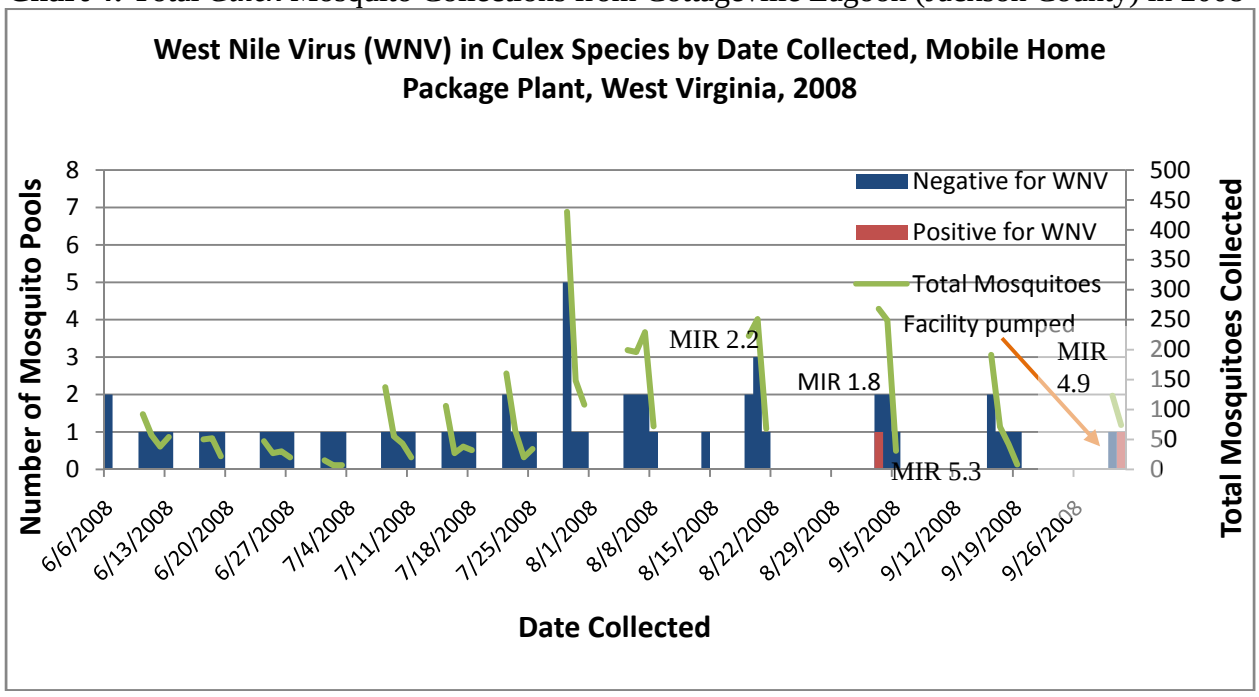


**Chart 5:** Total *Culex* Mosquito Collections from Mobile Home Package Plant (Jackson County) in 2008

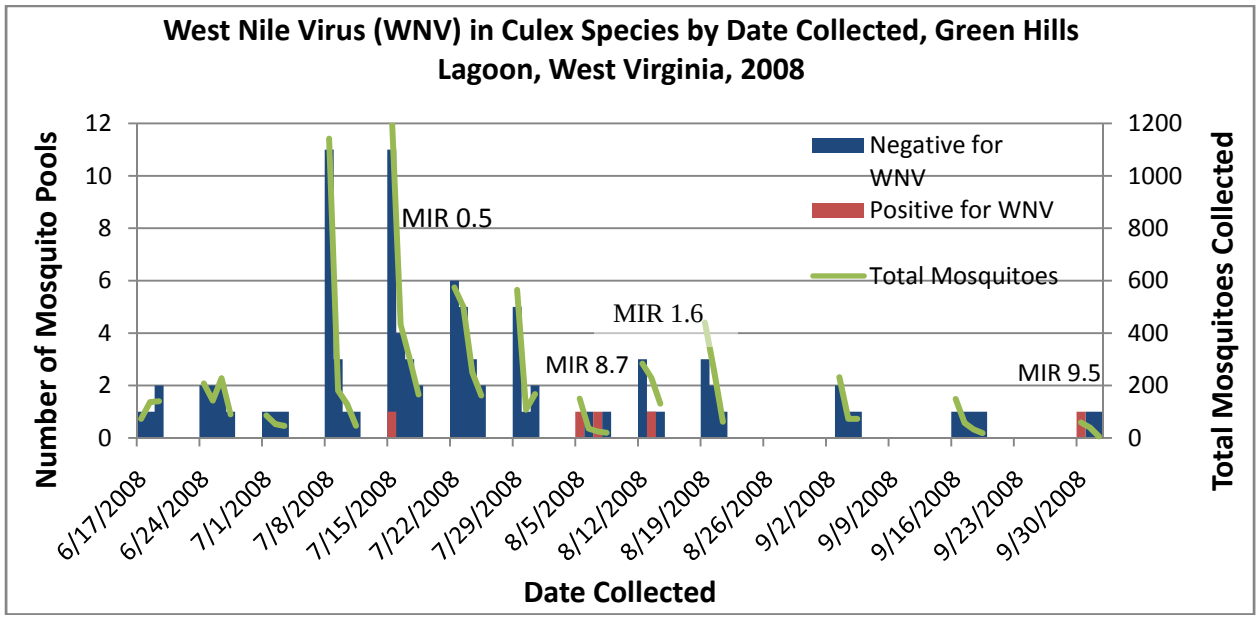


**Chart 6:** Total *Culex* Mosquito Collections from Lagoon at Green Hills Country Club (Jackson Co.) in 2008

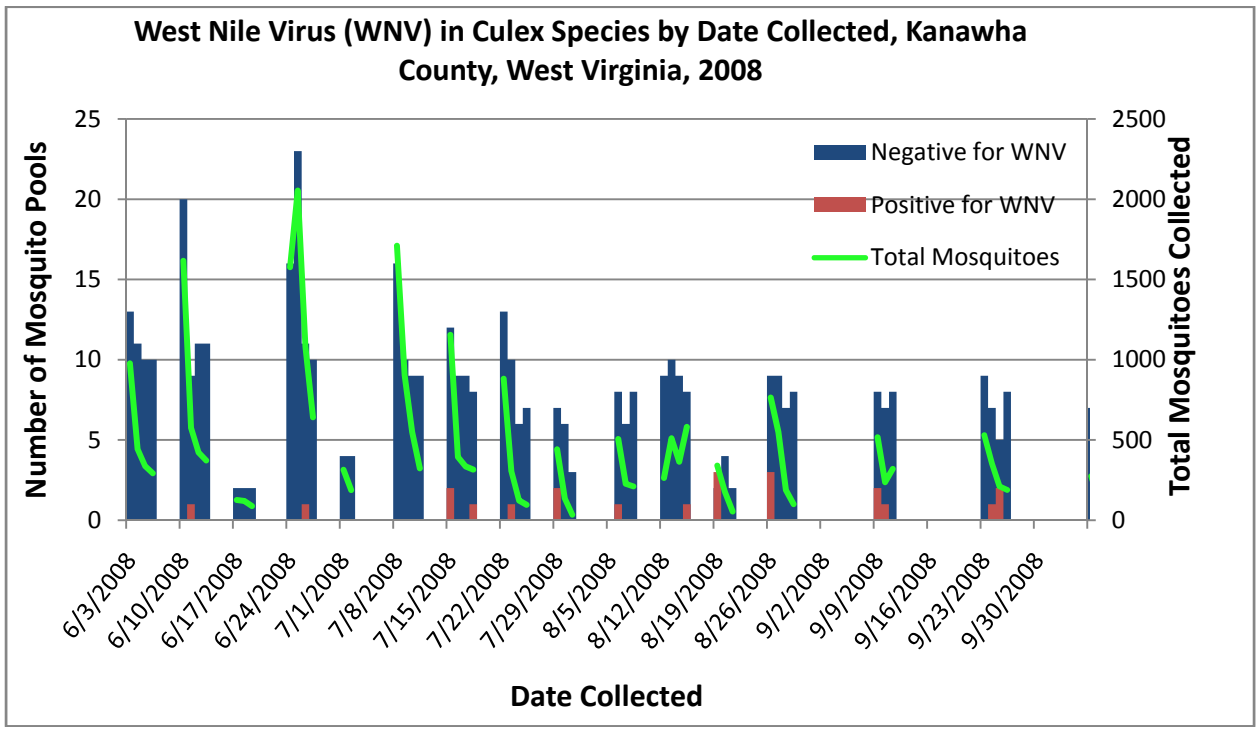


**Chart 7:** Total *Culex* Mosquito Collections from Kanawha County in 2008

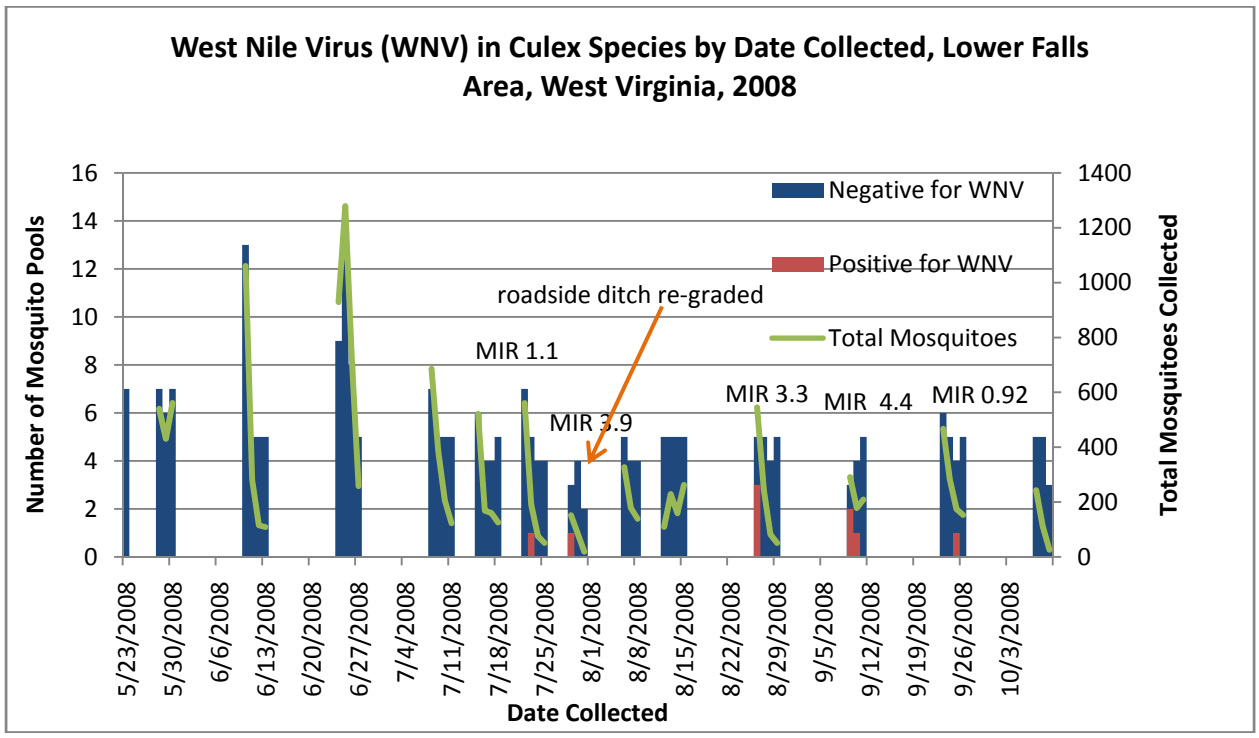


**Chart 8:** Total *Culex* Mosquito Collections from Lower Falls area (Kanawha County) in 2008

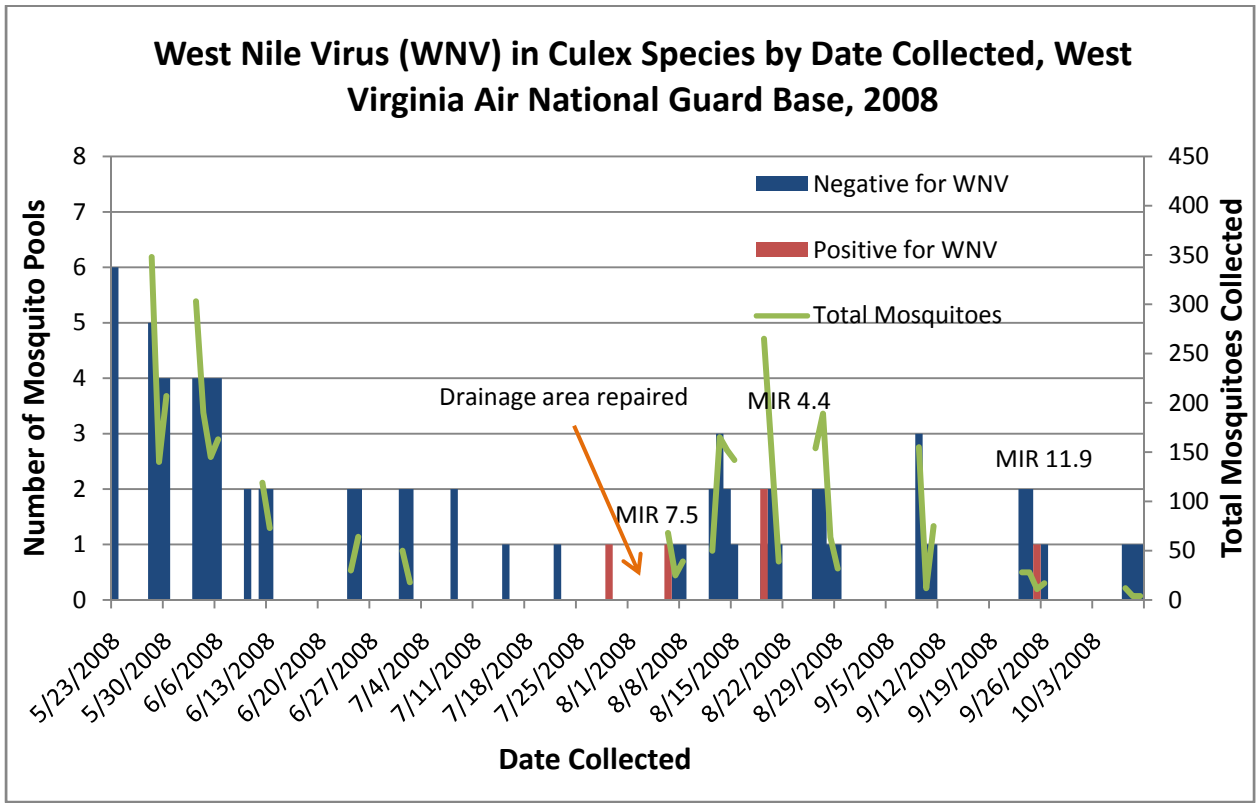

**Chart 9:** Total *Culex* Mosquito Collections from WVANG Base (Kanawha County) in 2008