Colorado Department
of Public Health
and Environment

# 2005 Mosquito Surveillance Plan

3/23/05

## A. Introduction:

Mosquito trapping and testing data provide both qualitative and quantitative information on arbovirus activity and potential human risk in an area. Advances in testing mosquito pools and calculation of minimum infection rates allow an integrated system based on mosquito surveillance to comprise a large part of the arbovirus surveillance strategy. Testing will focus on Culex species of mosquitoes, as these are the primary human vectors.

## B. Plan Description:

Mosquito testing this season will remain essentially unchanged from 2004. It will again have a three-tiered approach utilizing, once again, *sentinel*, *floater*, and *permanent* mosquito trap sites. *Sentinel* sites (see attached *Mosquito Sentinel Site Guidelines*) will act as a longitudinal system to replace chicken flocks, provide population data based on a consistent trapping protocol, and allow testing for the three arboviruses present in Colorado (Western equine, St Louis, and West Nile). *Permanent* traps are the long-term mosquito trap sites that local surveillance / control operations maintain at their own discretion, above and beyond the sentinel sites agreed to by CDPHE. *Floater* traps are those that are deployed based on current surveillance data such as positive birds and horses or human cases to provide local risk assessment, and to support local control and prevention decisions.

### Sentinel Traps

Unlike sentinel chicken flocks, whose sole purpose as a surveillance tool was to detect the presence of mosquito borne viruses, mosquito sentinel sites will also provide temporal mosquito population data, species make-up, and infection rate data. In addition, the long-term baseline data that will be collected, using a standardized trapping and testing protocol, can be used to accurately compare year-to-year changes in mosquito populations. It is hoped that this approach can be sustained and provide a long-term surveillance system for arbovirus activity into the future.

Mosquitoes will be collected at the sentinel sites weekly and all pools of *Culex* species will be tested for WNV using RT-PCR. A sample of submitted pools will also be tested for Western Equine Encephalitis (WEE) and St. Louis Encephalitis (SLE) viruses. This will permit accurate mosquito infection rates to be calculated. The number of sentinel mosquito trap sites will increase slightly (21 sites) from last season (15 sites) to upgrade the level of coverage across the state. As was the case last season, the selection of *sentinel* sites will

be determined by geographic location and the willingness of the local health agency, MAD, etc. to assume the responsibilities of maintaining a site during this and subsequent years.

**Floater Mosquito Traps**

"Floater" mosquito trap testing will integrate the qualitative virus data collected from dead birds, horse and human cases with the quantitative data mosquito trapping can provide. Local agencies will decide the need for trapping in their area, which should be driven by positive virus findings using other surveillance tools (positive dead birds or horses). These trap site locations are expected to change from year to year based on local surveillance needs.

**Permanent Mosquito Traps**

The third category of mosquito trapping includes *permanent* mosquito trap sites that local organizations and agencies operate and maintain, usually to monitor nuisance mosquito populations. The testing of Culex pools collected from these traps depends largely upon the conditions that exist at that site. Sampling and testing criteria will be discussed below (see C. 3. c. *Mosquito testing criteria*).

**Surveillance Dates to Remember**

Dead bird and mosquito surveillance activities will commence **May 1st**. Initial testing will focus on dead birds as they will be a more sensitive indicator of virus activity early in the season when mosquito populations and infection rates are low. Once virus is detected in an area, mosquito testing should be used to assess the level of risk for human transmission. Dead bird testing should be limited to no more than two or three WNV+ birds from the same area (i.e., approx. **5** $mi^2$ area or 1.25 mi. radius). Further bird testing does not provide additional information and expends limited lab resources. **Unlike last season however, corvid bird specimens meeting sampling criteria will be accepted beyond the July 1st deadline date for bird testing if no other WNV + birds or other surveillance tool indicates virus activity in that area.**

All Culex spp. mosquito pools from **sentinel** trap sites will be tested using RT-PCR at the CDPHE/LSD lab in Denver. However, mosquito pools from **sentinel** traps in Moffat, Mesa, and Delta counties will be sent to and tested at the regional laboratory in Grand Junction.

**Prior to July 1st**, Culex mosquito pools from *floater and permanent* traps should be tested at the CDPHE Laboratory Services Division (LSD) using RT-PCR because of its greater sensitivity.

**Zone Trapping:** During this early trapping period (May 1st to July 1st), in an effort to stretch diagnostic resources, surveillance participants are strongly encouraged to "*zone*" trap their **floater** and **permanent** trap captures. That is, co-mingle, by species, Culex mosquito captures from several floater or permanent traps in a general geographic area to increase the size of pools being tested. Because early season Culex numbers are not expected to be very high until later in the season, pooling captures from several traps will reduce the number of small mosquito pools that use the same test as would a pool of 50

mosquitoes. If a positive, co-mingled pool is detected, subsequent collections specific to a trap may be submitted in order to determine which trap the positive pool came from. **After July 1st**, when expanding Culex mosquito populations and increasing infection rates should offset the lower sensitivity of VecTest®, mosquitoes from these floater and permanent traps will be tested by VecTest® at the six regional laboratories. If WEE or SLE activity is observed, regional labs will be provided with multi-antigen VecTest® kits valid for all three viruses.

Participants in the surveillance program are encouraged to use limited mosquito testing resources responsibly. At this time there will be no testing quota assigned to each county. Depending on the intensity of virus activity that is detected, the risk of human exposure, planned control efforts, etc., diagnostic resources may be diverted to where they are needed most. Regional epidemiologists and CDPHE will be monitoring diagnostic resource usage, suggesting where testing is needed and curtailing usage when it's appropriate based on virus activity and the resources that are available for that region or county.

## C. Plan Criteria:

1. **Sentinel Mosquito Trap Sites**:
   a. Obligations:
      1) Trapping Schedule: weekly from early May through September. In 2005, it is recommended that a trapping frequency of one night per week be observed, adding additional nights if needed due to inclement weather.
      2) Each site will consist of 2 CDC $CO^2$ baited, light traps and one gravid trap.
      3) Traps shall be properly maintained and baited appropriately (i.e., dry ice for light traps and straw-manure infusion for gravid traps). See "Mosquito Trapping and Handling Protocol" dated 4/29/04.
      4) Accurate records maintained (date, # trap nights, # mosquitoes by species, Culex population density, weather conditions, etc.)
      5) **Weekly** submission of *Culex* mosquito pools and data to LSD in Denver or if the pools are from Mesa, Delta, and Moffat counties, pools should be sent to the regional lab in Grand Junction.
      6) Calculation of Infection Rates
   b. Site considerations:
      1) Care should be used in selecting a sentinel trap site so they do not have to be moved to insure continuity of data. Site should be stable and easily accessible.
      2) Site has a history of significant *Culex* mosquito activity and close proximity to appropriate *Culex* breeding habitat
      3) Close proximity to human populations
      4) Availability of resting sites and protection from wind (e.g., culverts, fences, shrubbery, trees, sheds, etc.)
      5) Away from competing sources of light (light traps) or oviposition sites (gravid traps).
      6) Avoid areas where heavy, regular adult mosquito and/or insect control areperformed.
      7) History of past arbovirus activity.
      Note: "*Sentinel*" trap sites should remain at the same site each season; however, traps can be moved within a general area (< 0.5 mile) of similar habitat in order

to improve trap performance and are not required to hang from the same tree week after week.

c. Mosquito pooling suggestions:
   1) Sorted Culex mosquitoes of the same species from the two light traps can be co-mingled into common pools.
   2) Sorted mosquitoes from the gravid traps **cannot** be co-mingled with the same species from light traps. They must remain segregated in separate pools. Note: to calculate mosquito population density, take the total number of captured mosquitoes, by species, and divide by the number of trap nights.

2. **Floater Mosquito Traps**
   a. Location preferences: same as above, except that a confirmed, infected dead bird, horse, and/or human case has been reported in the area.
   b. Deployment considerations:
      1) Surveillance data will be used to support mosquito control activitivies .
      2) Trap(s) deployed for a minimum of two (2) weeks.
      3) Trap(s) operated a minimum of one night per week, adjusted to allow for inclement weather.
      4) Traps properly maintained and baited appropriately.
      5) Mosquito captures sorted and pooled. Culex species submitted to the appropriate regional lab or LSD lab for testing.
   c. Obligations:
      1) Trap data (e.g., trap nights, species, #'s, dates, Culex population density, weather conditions, etc.) maintained.
      2) Calculation of Infection Rates
      3) "***Zone Trapping"*** see above.

3. **Permanent Mosquito Traps**
   a. Location preferences: same as those described for *sentinel* and *floater* traps.
   b. Deployment considerations: the selected location has a history of trapping at that site.
   c. Mosquito testing criteria:
      1) Many permanent traps have an established history and have collected an abundance of mosquito data over the years, but often have been deployed as a result of nuisance mosquito monitoring as opposed to arbovirus activity in which case, nuisance mosquito species will not be tested at this time
      2) Culex mosquitoes from permanent traps should be tested if the site is within 1.25 mi. of a WNV+ bird, horse or human case, a sustained increase in the Culex mosquito population is noted, and/or the site provides the only arbovirus surveillance data for that area.
   c. Obligations:
      1) Trap data (e.g., trap nights, spp. #'s, dates, Culex population density, weather conditions, etc.) maintained.
      2) Calculation of Infection Rates
      3) "***Zone Trapping"*** see above.