

Many MS4s in Colorado have raised concerns about disease vectors associated with structural stormwater BMPs. Specifically of interest is the mosquito, which is known to be a potential carrier of the West Nile Virus. Although this is a concern, federal and state water quality regulations still apply and are not anticipated to change. Specifically, MS4 permittees will still be required to develop and implement strategies, which include a combination of structural and nonstructural BMPs, to address stormwater runoff from new development and redevelopment, as per the Phase I and Phase II stormwater regulation's post-construction requirements. Also, entities are still required to obtain the appropriate federal and/or state permit coverage before altering wetlands or other Waters of the US.

Various studies have found, as would be expected, that some structural water quality BMPs can support mosquito production. However, the significance of these BMPs as a risk of West Nile Virus is debatable, and many municipalities may make the determination that further action is not required. However, if a municipality determines that further efforts to control mosquito production in structural BMPs are needed, certain measures can be taken while still maintaining compliance with the requirements of the State stormwater regulations.

In order for mosquitoes to breed, specific conditions must be present. A mosquito's life cycle consists of four stages (egg, larvae, pupa, and adult). Mosquitoes must lay their eggs in stagnant water, or on damp soil that will soon be flooded with water. It will take 24-48 hours for the eggs to 'hatch' into larvae. The larvae and pupa must have standing water in order to survive, and this stage will typically take 5 to 18 days before the production of an adult mosquito (Floore, 2002). To prevent production of mosquitoes, most sources indicate that water should not be allowed to remain stagnant for over 48 hours. This appears to be a conservative estimate.

Therefore, there are several steps that a municipal permittee may take to reduce the risk of mosquito production in structural BMPs, with the primary focus being on preventing standing water for prolonged periods. Proper design and maintenance of structural BMPs is key to meeting this goal.

When a new stormwater BMP is being installed, a design that does not rely on extended retention of stormwater without flushing (exceeding 48 hours) should be considered. The UDFCD Urban Drainage Criteria Manual Vol 3, and other similar manuals for designing stormwater BMPs, contain many options for structural BMPs that meet these criteria. Examples include, but are not limited to, grass swales, porous pavement, landscape detention, extended detention basins, sand filters, and reducing directly connected impervious areas. Proper design and maintenance are important to ensure the ponds continue to operate as intended to prevent stagnant water being available for mosquito production. Designing BMPs with the proper slope, using easily accessed forebays to allow for removal of accumulated materials, and adequately inspecting and maintaining basins are some key practices that should be considered.

For existing basins that include retention of stormwater sufficient to promote mosquito production, it may be possible to retrofit these designs to allow for complete drainage in a shorter period. However, it should first be determined if the BMP in its current state is actually allowing for mosquito production.

For wet detention basins or wetlands where retrofitting is not an option, stocking these BMPs with a population of minnows is recommended. A healthy population of minnows will feed on the mosquito larvae and prevent them from reaching the hatching stage. However, only a species of minnow native to the area should be used. Contact the appropriate Division of Wildlife biologist in the area for stocking and species information. For the east slope, contact Steve Puttmann, Senior Biologist – (970) 472-4321. For the west slope, contact Sherman Hebein, Senior Biologist – (970) 252-6022.

See the following resources for further information:

- CDPHE's West Nile Virus Information
  - <http://www.cdph.state.co.us/dc/zoonosis/wnv/wnvhom.html>
- The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs. *Stormwater* 3(2).
  - [http://www.forester.net/sw\\_0203\\_dark.html](http://www.forester.net/sw_0203_dark.html)
  - Good article covering what the issues are and some recommended solutions and referencing a study in California.
- Stormwater BMPs and Vectors. *Stormwater* 3(2)
  - [http://www.forester.net/sw\\_0203\\_stormwater.html](http://www.forester.net/sw_0203_stormwater.html)
  - Another article about solutions to mosquito problems with structural BMPs.
- Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manual (Vol. 3)
  - UDFCD manual for stormwater management. Updated Sept. 1, 1999. This is a stormwater BMP manual developed for the Denver metro area. Includes regional, residential, industrial, commercial, and construction BMPs.
  - Available from:
    - Urban Drainage and Flood Control District
    - 2480 W. 26th Ave., Ste. 156-B
    - Denver, CO 80211
    - Phone: (303) 455-6277
    - [http://www.udfcd.org/usdcm\\_orders.htm](http://www.udfcd.org/usdcm_orders.htm)

If you have any questions, please contact Matt Czahor of the Water Quality Control Division, Stormwater Program, at (303) 692-3575.