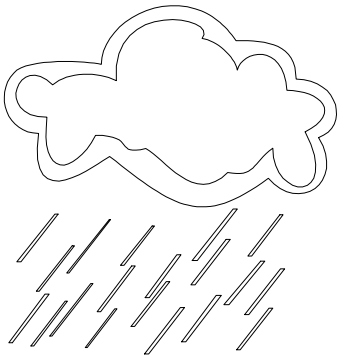
Mosquitoes and Stormwater Management



Water Quality and Supply

Extensive drainage and flood control systems have eliminated many wetland areas that provided suitable aquatic habitats for a variety of mosquito species. However, the diversion of stormwater to coastal marine systems via canals has dumped pollutants into our estuarine systems, and it has also greatly diminished the amount of storm water that enters recharge areas for replenishing the aquifer.

To alleviate these water quality and supply problems, various types of stormwater detention/retention areas are being incorporated into all new commercial and residential developments. Some established developments have also been retrofitted with stormwater retention or detention systems. The widespread use of these stormwater systems may lead to increased mosquito production, unless adequate precautions are taken.

Stormwater Detention/Retention Systems

Most stormwater detention ponds are semi-permanent aquatic systems that dry out only under drought conditions. Often during the rainy season, the water levels in these ponds remain at or near the outflow structures. Under these conditions, stormwater entering a detention area displaces an equivalent amount of water that usually overflows to an adjacent man-made or natural drainage system. The detention pond acts as a sink or trap where pollutants picked up by the initial surge of stormwater settle out before leaving the detention pond. These ponds are usually referred to as wet-detention systems.

By contrast, retention areas are designed to hold stormwater until the effects of percolation and evapotranspiration return the area to its normal dry state. Regulations concerning the design and construction of retention areas stipulate that stormwater inflow must dissipate within 72 hours so that a new volume can be

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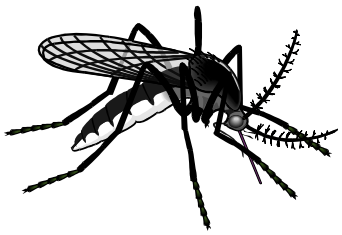
accommodated. Since these stormwater areas are designed to dry out rapidly, they are usually called dry-retention systems.

Mosquito Production



Detention ponds for holding stormwater runoffs usually do not produce mosquitoes in sufficient numbers to cause a problem. Exceptions may occur when ponds becomes nearly dry due to a lack of rainfall. Under these conditions, wastewater *Culex* may invade the system. A similar type of invasion can occur in detention ponds that receive both storm and wastewater.

Wide fluctuations in water levels, especially when they are frequent events, may make the detention system a suitable habitat for flood-water mosquitoes such as *Aedes vexans* and *Psorophora columbiae*. Floating and rooted aquatic plants may foster the growth of populations of *Mansonia dyari, M. titillans* and *Coquillettidia perturbans*.

Although stormwater entering retention systems is supposed to percolate into the ground within 72 hours, retention areas often remain wet for longer periods. Floodwater mosquitoes are normally the first to appear in retention areas. Later in the rainy season, it is not uncommon to find *Culex*, especially if grass cuttings have been accumulating in these areas.

Mosquito Control Considerations

Local mosquito control programs should be actively involved in the planning and approval stages for all new stormwater management schemes. Try to avoid the placement of retention systems in areas where they are likely to remain wet for a period long enough for mosquito development. If retention areas must be placed at these sites, then a dual retention/detention system might be the best approach for both stormwater management and mosquito abatement. With proper design and construction, excess water in the retention part of the system can be sent to the detention pond, thus lessening the chances for mosquito production.

Detention ponds should receive only stormwater. Treated wastewater from package plants should be placed in separate holding ponds. Banks on detention ponds should be steep, but not too steep to hinder mowing and other maintenance activities. Deeper ponds are preferable to shallow ones. Inlets and outlets

should be constructed with erosion protectors. Adequate vegetation should be maintained on the banks to prevent erosion.

Growth of aquatic vegetation should be restricted to the periphery of detention ponds. Property owners should be responsible for weed control in their ponds. City or county governments should have ordinances that require owners of detention ponds to follow proper maintenance procedures. The presence of a mechanical aerator, such as a fountain in the middle of the pond, often makes the site more attractive, deters the growth of unwanted vegetation, and makes the habitat more suitable for fish.

The bottoms of retention areas should be free of depressions where water might accumulate and remain for periods sufficient to allow mosquito production. Mowing and other maintenance operations should be done without producing ruts. Grass cuttings and other types of debris should be removed from retention areas. Long-term responsibilities for proper maintenance of retention areas should be clearly stipulated in city or county ordinances.

Once a retention system has been installed at an inappropriate location (e.g., on a site where the water table is too close to the surface), not much can be done to change the situation without eliminating the system. Under these conditions, mosquitoes must be controlled with larvicides. For a larvicide operation to be effective, it must be supported with a quality inspection program. The widespread occurrence of potential mosquito breeding sites in retention areas greatly increases the costs and manpower needs of the program. The widespread occurrences of potential mosquito breeding sites in retention areas greatly increases the costs and manpower needs of inspection programs. Perhaps through educational programs directed at the general public, we could generate more service requests for the control of mosquito larvae and fewer for adult mosquito control.