



Mosquitos in Constructed Wetlands: A Management Bugaboo?

Urban planners considering constructed wetlands for stormwater treatment might be concerned that mosquitos could become a major nuisance. Some observations in the field indicate that mosquitos are not a problem in constructed wetlands (Adams, 1983; Bennett, 1983). In general, functioning stormwater wetlands are less likely to produce mosquitos than are nutrient-laden secondary sewage and agricultural wastewater ponds or ponds that do not have frequent turnover. Even so, strong preconceptions exist, and building a wetland without first gauging public opinion could result in a major public relations headache. Those involved in the decision to build a wetland and the wetland designer can familiarize themselves with the breeding requirements of prevalent mosquito species to determine whether they feed on humans or carry disease and the likelihood that a wetland will be a high producer of mosquitos. Public opinion surveys and good information dispersal are important to avoid setbacks or negative impressions of wetlands and stormwater practices. Preventive measures can be incorporated in the site selection and design. In general, the basic design and maintenance of a good stormwater pond deters mosquito production (Table 1). If, indeed, mosquitos emerge, various biological controls can be used to subdue larval and adult populations.

An anti-mosquito strategy is as follows:

1. Assess the probable mosquito nuisance level of the area. Inform the public of the differences between stormwater and wastewater treatment.
2. After obvious high-risk sites have been ruled out (the local riding stable!) and there is still a moderate risk, modify the wetland design (e.g., maintenance of base flow, choice of vegetation) to deter mosquito breeding.
3. Choose and implement appropriate controls (Table 2) and monitor production levels.

Consult Biologists Familiar With the Locality at Each Stage

Some form of public involvement could be incorporated into the technical process. It cannot be assumed that residents will accept different designs equally. It might be worth considering inviting interested residents to participate in the planning well

before designs are finalized and resources committed to the project.

Mosquito Risk

Where and when are mosquitos a concern? Wherever there is standing water, there may be mosquitos. Depending on the species, eggs are laid directly in standing water or in dry cavities (ground depressions, old tires) that later receive water. The larvae feed on algae and organic particles and take in oxygen by floating at the surface. Larvae develop into pupae, which emerge from the water as winged adults. The females of most species feed on the blood of animals although not all feed on humans. Many species of *Culex* do indeed feed on humans and these are the major nuisance species of North America. Some species of *Culex* carry encephalitis. Only species of *Anopheles* may potentially carry malaria and while there are such mosquitos in North America, the disease itself has not recently occurred here.

Mosquito production is sensitive to water level fluctuations. For the majority of species, production

Table 1: How Well-Designed Stormwater Wetlands Deter Mosquito Production

Mosquito breeding requirements	Stormwater pond design
<ul style="list-style-type: none">■ Shallow, stagnant water; anaerobic condition■ Egg rafts of permanent-pool species float on the water	<ul style="list-style-type: none">■ In a well-constructed and maintained stormwater pond the water is kept moving; residence time is only a few days.
<ul style="list-style-type: none">■ Adult females choose environments of high nutrition (anaerobic, high nutrients and bacteria) in which to lay their eggs.	<ul style="list-style-type: none">■ Urban stormwater ponds are in non-agricultural settings and do not have high nutrient loads or animal waste.
<ul style="list-style-type: none">■ Temporary-pool species require periodic drying (as in containers, puddles, tidal marshes)	<ul style="list-style-type: none">■ Well-designed on-line systems are not expected to dry out.