

OPERATIONAL NOTE

YEAR-ROUND OBSERVATIONS OF ADULT *CULEX* MOSQUITOES IN STORM SEWER PIPES IN THE NORTHWESTERN CHICAGO SUBURBS

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ABSTRACT. Over the course of three years, 200 ft to 0.75 mi (60 m to 1.2 km) sections of 3 larger (>6 ft [1.8 m] diam) belowground storm sewer conveyance pipes in the northwestern Chicago suburbs were inspected for the presence of adult mosquitoes. *Culex* mosquitoes were by far the most common (555 of 556 [99.8%] total mosquitoes) collected within pipes during all four meteorological seasons (i.e. during months of October, January, May, August). These observations support prior work elsewhere, suggesting storm sewer pipes are consistent sites of refuge for adult *Culex* mosquitoes.

KEY WORDS *Culex*, hibernacula, mosquito, refugia, storm sewer

The built environment has long been associated with providing winter refuge for adult *Culex* mosquitoes (Nasci et al. 2001, Bugbee and Forte 2004, Farajollahi et al. 2005, Arsenault-Benoit et al. 2021, Ciota et al. 2011). Because of the buffered temperatures created in belowground and covered environments, networks of storm sewer conveyance pipes can serve as refuge for these mosquitoes. For example, from October 1994 to March 1995, McClellan (2000) found *Cx. pipiens* L. in central Illinois in a storm drain. Similarly, Siperstein et al. (2023) found *Culex* spp. in stormwater culverts in central Ohio from September to May during 2019 to 2022.

The Chicago metropolitan area holds an expansive underground storm sewer infrastructure that may harbor mosquitoes beyond the many storm sewer catch basins that are routinely treated with larvicides by local mosquito abatement districts (MADs). Within the jurisdiction of the Northwest MAD, one of four abatement districts within the Chicago metropolitan area, it is estimated that there exists at least 2,200 miles (3,540 km) of belowground storm sewer pipe at a rate of about 14.6 miles of belowground pipe per 1 sq mile (23.5 km per 1 2.6 sq km) of the area that district serves. It was thus hypothesized that Chicago area storm sewer pipes may provide reliable refuge for adult *Culex* spp. From 2019 to 2022, 9 total excursions were made among 3 larger (>6 ft [1.8 m] diam) belowground stormwater conveyance pipes located within the Northwest suburbs of Chicago, IL. These pipes were chosen for their large diameter that allowed inspectors to easily walk through

unimpeded and search for adult mosquitoes along the pipe walls (Fig. 1a). To safely enter and search within pipes, two confined space safety personnel escorted 4 to 6 mosquito inspectors during inspections. A third safety expert remained aboveground in case rescue measures were needed. Permits allowing for entry into pipes were also arranged by the safety team (Amerisafe Group, Greensburg, PA). Each inspection lasted for 30 to 45 minutes by walking approximately 200 ft to 0.75 mi (60 m to 1.2 km) from the pipe outfall into the pipe.

Dates of inspections were determined based on the availability of inspectors and safety personnel with an effort to sample at least once during each of the 4 meteorological seasons. Two pipes were sampled 4 times each, while the 3rd was sampled only once. The latter pipe was the largest and the diameter of some sections exceeded 10 ft [3 m]. This height was beyond the reach of inspectors and made observations and collections of mosquitoes more difficult. Mosquitoes were captured using Nature Bound™ Bug Catcher Toys, Thin Air Brands, LLC (Colorado Springs, CO) (Fig. 1b).

Mosquitoes were found during all 9 inspections and during months of all 4 meteorological seasons (Table 1). Those mosquitoes collected during 2 inspections were identified to species (Darsie and Ward 2005; Ferreira-de-Freitas et al. 2020): December 10, 2020, 200 *Cx. pipiens*, 3 *Cx. restuans* Theobald, and 8 *Culex* spp.; June 7, 2022, 2 *Cx. pipiens*, 8 *Cx. restuans*, and 1 *Aedes trivittatus* Coquillett. In the remaining inspections all other mosquitoes were identified to genus as *Culex* spp. Of the 556 total mosquitoes collected, 105 (18.9%) were males. A small number of bloodfed females were observed and collected during the August 10, 2021, inspections (5 in the Melas pipe and 3 in the Sunset Meadows pipe) and 1 during the June 7, 2022, inspection. The results of these efforts provide further evidence that *Culex* spp. may routinely use belowground conveyance pipes as sites for refuge, diapause, and estivation.

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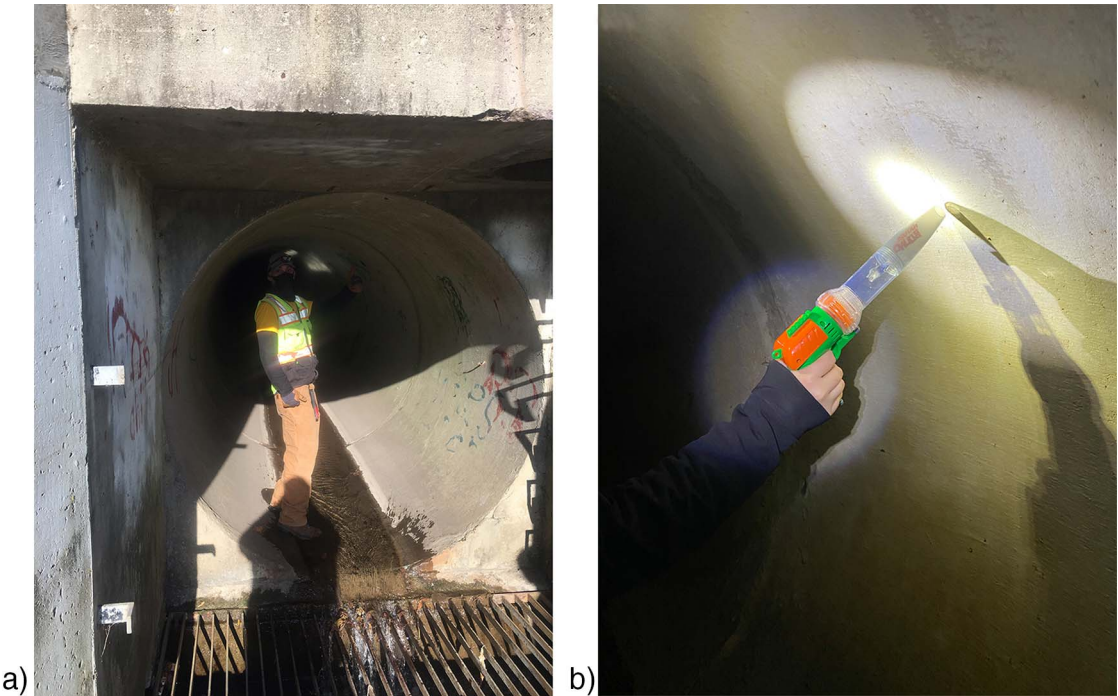


Fig. 1. (a) Inspector standing within the outfall of one of the examined belowground stormwater pipes; (b) inspector collecting adult *Culex* off a wall approximately 0.25 mi (400 m) into pipe.

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Table 1. Number of mosquitoes collected during inspections into larger (>1.8 m diam) belowground stormwater pipes from 2019 to 2022 in the Northwest suburbs of Chicago, IL.¹

Pipe name	Inspection date	# of adult mosquitoes collected
Des Plaines	October 23, 2019	78
Des Plaines	January 8, 2020	19
Des Plaines	November 5, 2020	51
Melas	December 10, 2020	211
Melas	January 13, 2021	74
Des Plaines	May 4, 2021	36
Sunset Meadows	August 10, 2021	23
Melas	August 10, 2021	55
Melas	June 7, 2022	9

¹ All mosquitoes were identified as *Culex* spp. except for those collected on December 10, 2020 (200 *Cx. pipiens*, 3 *Cx. restuans*, and 8 *Culex* spp), and on June 7, 2022 (2 *Cx. pipiens*, 8 *Cx. restuans*, 1 *Aedes trivittatus*).

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