ECOSUMMARY

A Report by the Surface Water Assessment and Monitoring Program (SWAMP)

#97-005

Biological Reconnaissance of Baker/Pemberton Watershed: Possible Effects of Aerial Spraying During the Medfly Eradication Program July 9 and 13, 1997

Purpose

Biorecons were performed at Baker and Pemberton Creeks in order to assess possible effects on the aquatic macroinvertebrate community from the aerial application of malathion by USDA's Medfly Eradication Program.

The USDA Medfly Eradication Program began malathion spraying on June 5, 1997, in the Baker Creek watershed, and on June 17 in Pemberton Creek watershed. Aerial spraying will continue on a weekly basis indefinately, until the medflies are eradicated. The entire watershed of Baker/Pemberton Creek is contained within the spray zone, which involves repeated flights north and south, crossing the Creeks each time. It is suspected that the stream biota would be effected by malathion entering the water either directly or through stormwater runoff, which has occurred nearly daily during the spray period thus far.

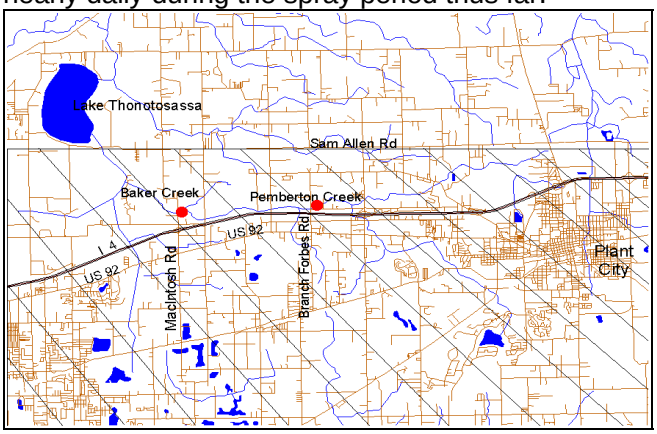

Fig. 1. Site locations. Spray zone is in hatchmarks.

Basin Characteristics

Pemberton/Baker Creek, in eastern Hillsborough County, is part of the Hillsborough River watershed, within the Tampa Bay EMA. Pemberton Creek flows west from Plant City, into Baker Creek, which then flows into Lake Thonotosassa (Fig. 1). The stream drains urban development, rangeland, and citrus groves. The Pemberton site was located upstream of the bridge on Branch Forbes Rd., in Plant City. Citrus trees are planted on both sides of the stream, and exotic plants line the banks. The stream affords a plentiful habitat available for colonization by invertebrates. The bottom consists mainly of rocks and rubble. Submerged roots are also fairly plentiful, and some submerged vegetation is present. The Baker Creek site was located upstream of the bridge at MacIntosh road in western Plant City (Fig. 2). Here, the riparian zone is about 15 m wide, and a mix of exotic and native plants cover the banks, indicating past disturbance. The bottom substrate consists mainly of sand, with about 25 % rocks. There is no submerged aquatic vegetation because the canopy shades the stream.

Fig. 2. Baker Creek at MacIntosh Rd.

Results

Biorecons are based on three measurements of the aquatic invertebrates present in a stream: the total number of different species (Total Taxa), the number of good water quality ("Florida index") indicator species, and the total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) species present ("EPT"). A stream scoring above the threshold value for two or more of these measurements is considered healthy. If less than two threshold values are reached, an impacted condition is suspected.

Results of the Biorecons indicate severe impairment to the streams:

<u>July 9, 1997, one day after spraying:</u>

	Pemberton	Baker	Threshold
Total Taxa	5	6	18
Fl Index	0	1	10
EPT	0	1	4
DO (mg/l)	7.13	6.36	
pH (SU)	7.49	6.96	
Conductivity (umhos.cm)	401	323	
Temp. (^{O}C)	26.91	25.11	
Habitat Score	100	110	

July 13, 1997, 6 days after spraying:

	Pemberton
Total Taxa	11
FL Index	0
EPT	0
DO (mg/l)	7.85
pH (SU)	7.69
Conductivity (umhos/cm)	320
Temp. (^{0}C)	26.79

All three invertebrate community measures were well below the threshold values on both days. Physicochemical readings were within normal ranges. The habitat assessment yielded a low-optimal score (110) for Baker Creek and a sub-optimal score (100) for Pemberton Creek. The difference was largely due to the poor riparian zone at Pemberton Creek.

In comparison, biological assessments performed last summer, in 1996, yielded the following for the same parameters:

	Pemberton	Baker
Total Taxa	23	25
FL Index	14	15
EPT	7	10

Water collected for malathion analysis on July 13 revealed a level of 0.81 ug/l at the Baker Creek site and 0.41 ug/l at the Pemberton Creek location. Both concentrations are in excess of State standards.

Significance

Malathion, and its by-product malaoxon, are extremely toxic to aquatic invertebrates. EC_{50}s (concentration in which 50% of the test animals are adversely effected in chronic toxicity bioassays) for various invertebrates range from 1 ug/l to 1mg/l (Extension Toxicology Network[3]). The State standard for malathion is 1 ug/l. The results of the water chemistry and Biorecon indicate that Pemberton/Baker Creek is receiving elevated levels of malathion that appears to have had a toxic effect on the stream macroinvertebrate community. Although it is logical that the aerial spraying is the source of the malathion, there is no background chemistry data for comparison. However, comparison to the background biological data indicates a severe perterbation.

The repeated spraying in the Plant City area increases the potential for toxic effects on aquatic invertebrates, and possibly fish, in Pemberton/Baker Creeks and Lake Thonotosassa. Long-term weekly application of malathion may result in disruption of invertebrate life cycles and dispersal, and decrease recolonization in the stream. The food web would be impaired, and the stream would not meet its designated use.

Suggestions

FDEP recommended that a buffer zone for spraying be observed for Pemberton/Baker Creeks in order to prevent aquatic toxicity and violation of State Surface Water Standards. However, the Medfly Eradication Program (USDA) deemed this technically impossible for a stream of such small size. In addition, the Creeks are located near to recently found medflies, thus avoiding the stream would not be treating possible infestations. In future infestation situations, flight plans should be developed to decrease direct spraying of small streams.

Continued monitoring of this watershed is recommended in order to determine the source of the elevated malathion levels and if the invertebrate community is able to recolonize in full, and if so, how long it takes.

References:

[1] SWAMP #96 - 002. Ecosummary: Pemberton Creek, Hillsborough County. August 6, 1996.

[2] SWAMP #96 - 003. Ecosummary. Baker Creek, Hillsborough County. August 31, 1996.

[3]Extension Toxiology Network. Pesticide Information Profile: Malathion. Pg. 3

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