

THE MICROBIAL BIOCHEMICAL POTENTIAL OF TWO  
DETENTION-RETENTION MARSHES IN THE  
KISSIMMEE RIVER VALLEY WATERSHED

BY

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THESIS

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## ABSTRACT

### The Microbial Biochemical Potential of Two Detention-Retention Marshes in the Kissimmee River Valley Watershed

One of the major programs to abate the deterioration of water quality in the Lake Okeechobee watershed was the addition of detention-retention facilities.

The microbial biochemical potential of two different detention-retention marshes in the Kissimmee River Valley were examined to determine their effectiveness to improve water quality. The kinetics of decomposition and nutrient mineralization and assimilation, as mediated by microorganisms, and the enumeration of microorganisms capable of utilizing various substrates were studied. Various communities within each marsh were studied during a 2-year period. The decomposition rates of 3 plant substrates were determined. Chitin was used as a standard for organic decomposition. Chitin had significantly higher ( $p < 0.05$ ) rates of decomposition than the plant material in all sites at both marshes. Chitin decomposition rates were significantly different ( $p < 0.05$ ) between sites. Significant differences ( $p < 0.05$ ) in rates of decomposition were also found between the 3 plant substrates. The difference in decomposition rates for the 3 plant substrates existed within sites, as well as between sites. The number of microorganisms and the mineralization and assimilation rates were sig-

nificantly different ( $p < 0.05$ ) between the detention-retention marshes. Significant differences ( $p < 0.05$ ) in numbers of microorganisms and rates were also found between sites within each marsh.

The variation in detrital processing demonstrated that site-specific dynamics occurred in the detention-retention marshes. Higher decomposition rates were associated with sediment sites containing organic matter with either a continuous, shallow flow of water or alternate wet/dry periods. Decomposition rates were lowest at sites containing sandy sediments, and dry soil sites without a flow of water. Higher aerobic and anaerobic bacterial activity was also associated with sediment sites containing organic matter with either a continuous, shallow flow of water or alternate wet/dry periods. Higher fungal activity was associated with dry soil sites. High fungal activity was also associated with alternate wet/dry sediment sites, but only during dry periods. Microbial activity was lowest at sites containing sandy sediments and in water columns.



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At first men try with magic charms  
To fertilize the earth,  
To keep their flocks and herds from harm  
And bring new young to birth.

Then to capricious gods they turn  
To save from fire or flood;  
Their smoking sacrifices burn  
On altars red with blood.

Next bold philosopher and sage  
A settled plan decree  
And prove by thought or sacred page  
What Nature ought to be.

But Nature smiles—a Sphinx-like smile  
Watching their little day  
She waits in patience for a while—  
Their plans dissolve away.

Then come those humbler men of heart  
With no completed scheme,  
Content to play a modest part,  
To test, observe, and dream.

Till out of chaos come in sight  
Clear fragments of a Whole;  
Man, learning Nature's ways aright  
Obeying, can control.

William C. Dampier

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