

relevant literature is given at the conclusion of this paper). While there is still much research needed, the general conclusion of research to date is that wetland systems are well adapted to the role as long as discharge rates do not exceed capacity of wetland to "treat" wastewaters. Some researchers have likened the role of wetlands in sewage treatment to "low energy tertiary treatment facilities".

Much of the controversy over the effectiveness of wetland treatment systems results from the vast quantities of sewage that are now released from regional treatment plants. Sizes of treatment plants have risen dramatically in recent years, so that it is nothing to see 20 -30 MGD facilities. It is difficult to locate wetland systems capable of assimilating such large flows. The trend for ever larger treatment facilities is probably not compatible with wetland recycle of sewage wastes in many developed regions where large wetland systems are scarce. Much research is needed to develop smaller scale technology for waste treatment that has the same treatment efficiencies as the large regional plants, but at a scale that is more appropriate to the scale of the environment.

Simulation models like that given in Figure 2 are useful in determining assimilative capacity of wetland systems, and the quantity and quality of effluent from the wetland. The model is simulated on micro computer with resulting output like the graphs given in Figure 2 that show the concentrations of various species of nitrogen and total phosphorus. Necessary input variables include the quantity and quality of monthly rainfall, runoff into the wetland, and sewage effluent, as well as the type and size of wetland. The first graph shows the normal concentrations of nitrogen and phosphorus in a cypress wetland in central Florida with no sewage discharge. The second graph shows the concentrations through the year with a discharge rate of 2" per week.

Simulation models of the nutrient dynamics within wetland systems can be utilized by governmental agencies and utilities for planning purposes to determine options available for the disposal of wastewaters within the context of anticipated growth and the needs for additional treatment capacity.