Landward from the frontline defensive ecological systems of the coastal beach and dune are less fragile communities, that benefit greatly from the continual cycles of tides and storms. Salt marshes and mangrove forests line most of the coastal areas where wave energies are not too strong and where tidal influence is sufficient to keep the environment saline. The organic matter produced by these communities represents the single greatest food source for estuarine food chains.

The most important sources of energy to the estuarine environment are the tides that flush nutrients, organic matter, and larvae in and out again, and the inflow of waters laden with nutrients and organic matter from the terrestrial environment. Their physical energies shape the contours of bay bottoms, scouring tidal channels, and depositing sand bars, develop tidal creeks shaped to insure flushing even at their farthest reaches, and open and close ocean inlets as the yearly cycles of wet seasons and spring tides trade influence. Carried by these two intertwining waters are the chemical energies of nutrients that are required by vegetation for growth, and the seeds, larvae, and juvenile fish that insure the estuary remains a diverse, resilient, and productive soup.

Driving Energies of the Upland Landscape

Of the main renewable driving energies of the upland landscape rain is the dominant force. Given in figure 3 is a diagram of the hydrologic cycle showing the relative percentages of rainfall that are evaporated, transpired by vegetation, recharged, and that portion that is runoff. The amount of rainfall, its cycle through the landscape, and the periodicity of the wet and dry seasons control many of the processes of Florida's landscape mosaic and coastal estuarine resources. Nearly 70% of total rainfall returns to the atmosphere either as evaporation or as transpiration from vegetation. Of the remaining rainfall, about 10% recharges ground waters, and 20% runs off the landscape.

Because of their importance, the contributions of fresh water from rainfall, runoff and sewage are compared in table 1. Rainfall and runoff contribute a total of 592 billion gallons (2.2 billion cubic meters) of fresh water per year to the Indian River. Historically, runoff was probably less than 1/2 of its current value, since the water basin boundries have changed through construction of drainage canals. By comparison, if it is assumed that the sewage from all the populations of Brevard, Indian River and St. Lucie counties were discharged to the Indian River, the total additional fresh water would amount to only 26 billion gallons (98 million cubic meters) per year, or about 4.4% of the total freshwater input to the estuary.

The final columns in table 1 show nutrient contribution to the Indian River based on average concentrations of total phosphorus in rain, surface water runoff, and treated sewage effluent. A different picture emerges when relative contributions of nutrient sources are compared. The contribution of sewage is greater than rainfall and runoff combined (bear in mind that sewage estimates are based on estimated population serviced by sewage plants that discharge to the estuary; the actual sewage flows may be somewhat different).