

## **Influence of Freshwater Discharge and Ammonia Loading on Inshore Benthic Community Structure in Biscayne Bay.**

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Biscayne National Park is located adjacent to a very large population and agricultural center. Over the past 100 years of land development, Biscayne Bay's circulation patterns have been highly altered, freshwater sheet flow discharge eliminated, and freshwater discharge by canals has increased. In addition, the timing of freshwater discharge is highly altered and inshore water quality has declined. Much of the estuarine zone of Biscayne Bay has been eliminated by the loss of a "natural" volume and timing of freshwater sheetflow along the western shore of Biscayne Bay. Also, the nearshore aquatic environment is highly impacted by nutrient loading, which has increased productivity and filamentous algae.

The quality of both canal and groundwater inputs has declined as urbanization and agriculture have dominated the landscape. Numerous landfill and other contaminated sites influence groundwater that enters Biscayne Bay. Initial nutrient loading figures from the Mowry Canal and groundwater to Biscayne Bay are very high compared to our typically low regional levels (oligotrophic conditions). Groundwater nutrient levels obtained 50m from shore along Biscayne Bay from the Dinner Key to Mowry Canal have ammonia concentrations 30 or more times greater than those of overlying surface waters. In addition, the highest groundwater concentrations were found at Black Point and decreased by nearly half both northwards and southwards. The location of the highest concentrations off Black Point was no surprise because the site is located close to the old and present Dade County landfills. Our groundwater nutrient loading values suggest that Biscayne Bay may be undergoing considerably more nutrient loading than previously thought. This poses not only an environmental degradation problem, but also potentially one of ammonia toxicity.

Coastal mangroves are highly productive systems that are known to export ammonia because of anaerobic decomposition processes. Ammonia production in the coastal mangrove system is limited to a fraction of the biomass turnover on an annual basis and is therefore fixed within rather narrow bounds at any site. In addition, most mangrove swamps along the western shore of Biscayne Bay overlie a carbonate marl soil about 1 m thick, which overlies the bedrock (and groundwater). The mud layer is impermeable and serves to separate the surficial interstitial soil and tidal water from the freshwater groundwater of terrestrial origin. This is an important point because mangrove-derived ammonia is separate from anthropogenic-derived ammonia in groundwater until they are discharged into the Bay. An exception to this may be the thin fringing mangrove zone along the water's edge, which frequently is not underlain by the marl soil horizon. This is the zone of highest productivity, greatest physical export of detritus, greatest below ground biomass production (actually accretion), and soils with the best gas exchange.

Only limited data on Biscayne Bay ammonia concentrations is available for inshore areas.

The need to understand the distribution of ammonia in Biscayne National Park was necessary to establish pollution load reduction goals based upon actual spatial and temporal distributions and their impacts to Bay ecology. To this end we conducted a survey of total ammonia concentrations (soil, sediment, surface water, and groundwater) in the coastal mangroves and adjacent Bay waters along the western shore of Biscayne National Park. Benthic community characteristics (species composition, structure, cover, biomass) and physical parameters were measured at each sampling site. Data from this survey are presented to: 1) determine ammonia distribution in the Park, 2) correlate benthic community characteristics with freshwater sources and ammonia concentration, and 3) locate "hot spots" where ammonia levels are above background levels and may pose an environmental degradation or toxicity problem.

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