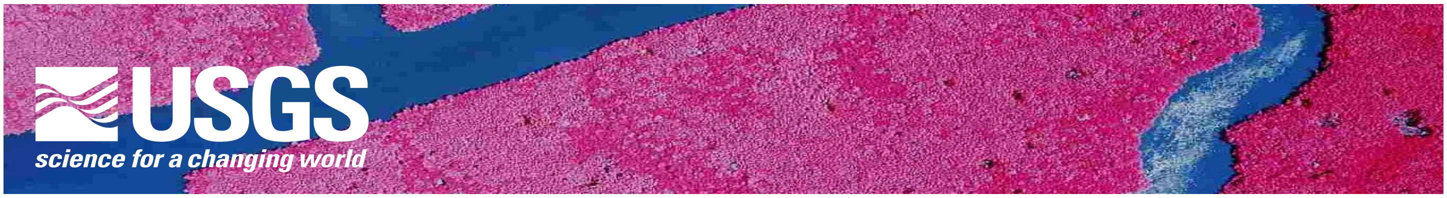

Lightning Gaps in the Mangrove Forest of Everglades National Park

With an average of 9,900 cloud-to-ground lightning strikes occurring annually in Florida (Figure 1), lightning-created canopy gaps are a common and important component of the mangrove ecosystem (Figure 2).

Figure 1. A picture of a typical lightning strike (photo by Michael Fewings).

These gaps produce a mosaic of different successional stages that may be vital as a living seed bank in the mangrove ecosystem. Species dynamics in the mangrove ecosystem of Everglades National Park are affected by the Everglades' hydrological restoration, sea-level rise, hurricanes, and lightning gaps. Clearly, to understand the dynamics of future mangrove ecosystems, determining how these ecosystems respond to small- and large-scale disturbances will be crucial. Here we characterize the role of lightning gaps within south Florida mangrove ecosystems. By using a serial sampling of recent and closing gaps, we will be able to determine the way these small-scale disturbances affect current and future forest structure in the larger context.

Our study area is the mangrove forest of the Shark River region of Everglades National Park (Figure 3). This forest is approximately 15 km wide. From the coast upstream toward the freshwater marshes, canopy height declines from an average of 10.1 m to 5.4 m. The forest consists of stands of mixed mangroves with *Rhizophora mangle L.* (red mangrove), *Laguncularia racemosa (L.) Gaertn* (white mangrove) and A*vicennia germinans (L.) Stearn* (black mangrove). Historically, catastrophic hurricanes occur approximately every 30 years in south Florida. Our study sites have not been substantially disturbed by a hurricane since Hurricane Donna in 1960.

Figure 2. Aerial vew of a recently created lightning gap in the Shark River area

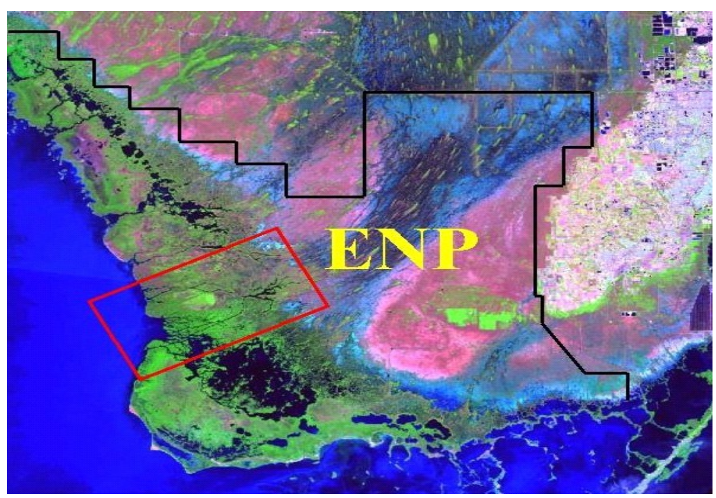

Figure 3. A color infrared aerial photo of the southern Florida peninsula. The border of the Everglades National Park (ENP) is outlined in black. Our study region is outline in red.

We examined 54 gaps that were randomly located by boat and helicopter. The average gap size is 332 ± 193 m^2. In general the gaps were elliptical in shape. The gaps varied in age from newly created to extensively recovered (< 1 month to > 10 years).

Within a subset of the gaps, we surveyed tree species, saplings, seedlings, crab burrow density, and we assessed the light environment, soil physical structure, and amount of coarse woody debris. Preliminary results indicate a general trend for red mangroves to dominate recovery in the short term (Figure 4). We found differences in the relative abundance of crab burrows depending on gap status.

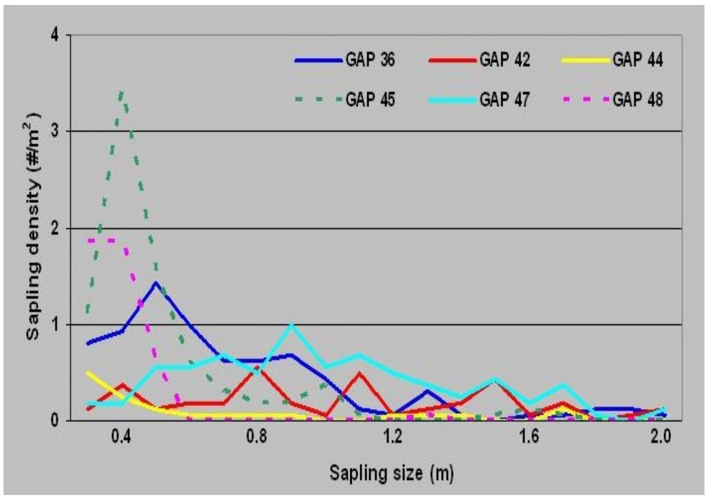

Figure 4. Density of *Rhizophora* saplings (number per m^2), by size class (height in m), for relatively old gaps (solid) versus younger gaps (dashed).

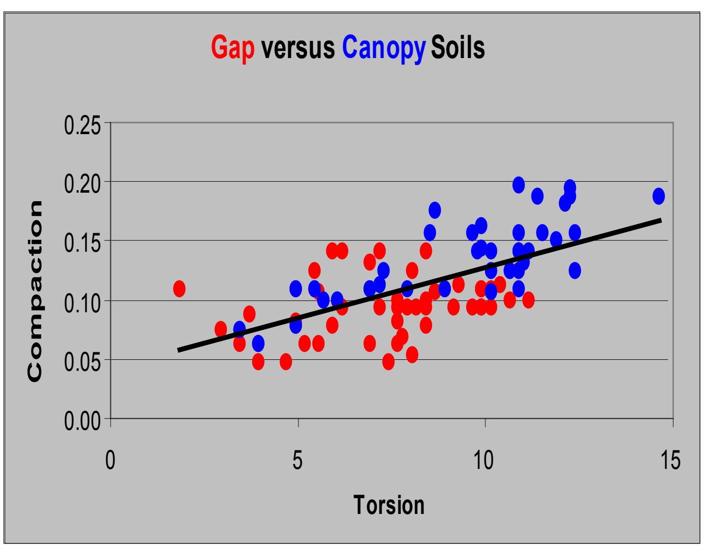

Figure 5. Soil compaction versus soil shear strength (both in kg per m^2) for gaps (red) and forest canopy (blue) locations.

The mean number of crab burrows is 99.57 per m^2 with the values ranging from 48.25 to 158.75. Soil shear strength and compaction are lower in gaps than in the surrounding forest (Figure 5). There is higher transmittance of photosynthetically active radiation (PAR) in new gaps than in the recovering gaps and closed canopy forest.The results of this study will be incorporated into current modeling efforts that are attempting to predict mangrove forest structure in response to Everglades restoration efforts. These models include the Across Trophic Level System Simulation package (ATLSS) and the Everglades Landscape Model (ELM).

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