Variation in the nutrient content of sediments down core in the Basin and Fringe Mangrove Forests of Jobos Bay, Puerto Rico – 100 years of change

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Research Questions

Does the nutrient content of sediments vary down core between basin and fringe mangrove forests in *JBNERR*?

If so, is this a reflection of changes in land use patterns in watershed over the last 100 years? In both of the mangrove forest types? What does this variation mean for accretion rates and productivity in this ecosystem?

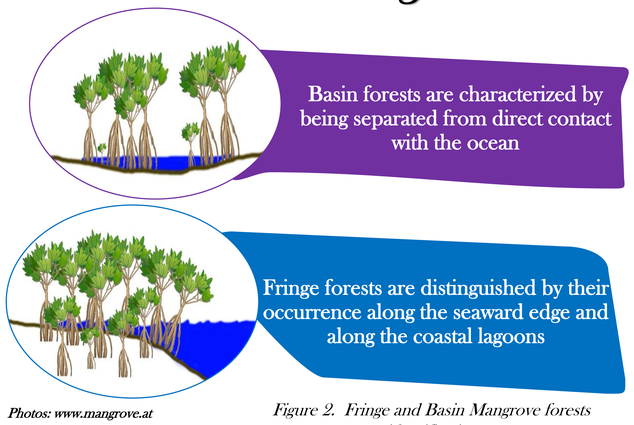
Why Mangroves are Important

They're responsible for a net import of nutrients, freshwater, and sediments, and a constant outflow of organic matter and water from terrestrial environments to marine or estuarine waters

Figure 1. Black mangroves (Avicennia g.) at JBNERR

They contribute to estuarine and marine food chains, to water quality, and to the maintenance of coastal geomorphology (Cintrón *et al.,* 1985)
World's richest carbon stores (Donato *et al 2011)*

Difference between the Fringe and Basin Mangrove Forest



Photos: www.mangrove.at

Figure 2. Fringe and Basin Mangrove forests identification

Jobos Bay National Estuarine Research Reserve

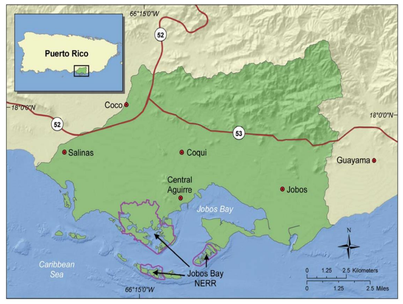


Figure 3. JBNERR Location and boundaries (Photo:NOAA/NOS/NCCOS/Center of Monitoring Assessment around Jobos Bay, Puerto Rico)

JBNERR was established in 1981, with an acreage of 2,883
Contains a variety of habitats that include: mangroves, wetlands, extensive seagrass beds, upland dry forests, and lagoons. *(JBNERR, 2015)*
Mean annual Temperature: 26°C(78.0°F) *(NCDC,2010)*
Mean annual rainfall: 106-114 cm

Irrigation canals brought water (200 M gal/day, pers. comm. Angel Dieppa) from other watersheds for agriculture from 1914 until 1995 for sugarcane and fruit and vegetable cultivation

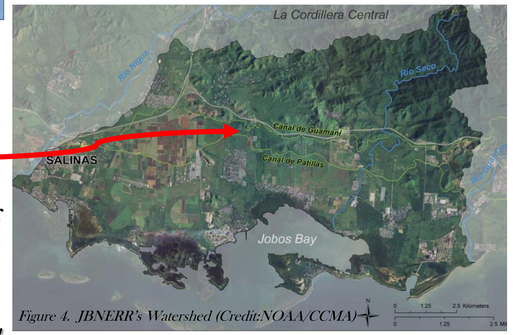


Figure 4. JBNERR's Watershed (Credit:NOAA/CCMA)

Coring Site Locations

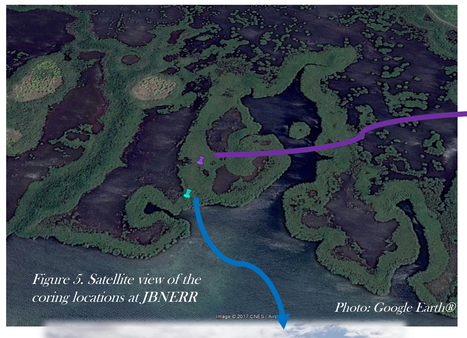


Figure 5. Satellite view of the coring locations at JBNERR

Figure 7. Basin Mangrove Forest at JBNERR

Figure 6. Fringe Mangrove Forest at JBNERR

At the Basin Forest:
Dominant species: Short Red *(Rhizophora mangle)* and Black *(Avicennia germinans)* mangroves.
Water chemistry taken in standing salt pan:
Temperature = 36.3°C (97.34°F)
Salinity: 85.96 ppt, pH = 7.8

At the Fringe Forest:
Dominant species: Short Black Mangroves

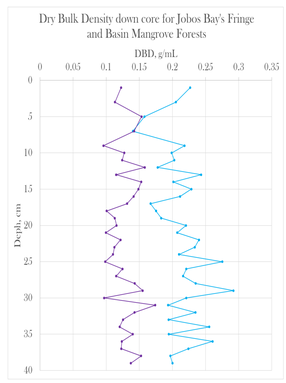
Methodology

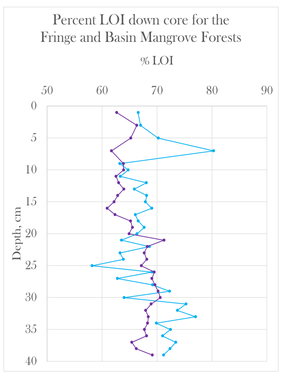
Field work – June 9th, 2017
A core of 50 cm of depth was taken in the basin and fringe forest, respectively.
Clear weather and low tide.
Water chemistry was taken in standing salt pan.
Lab work – From June 9th, 2017
The first 10 cm of the core were sliced into 2 cm, while the remainder of the core was divided into 1 cm samples.
Each slice was then divided for mollusk and root, C, N and P content, %LOI, DBD, and ^{210}Pb dating analysis.

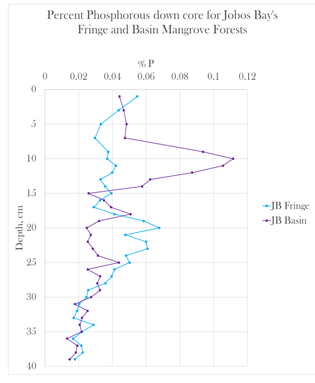
Photos: Dr. Danielle Ogurcak, Sean Charles & Jennie L. Rivera-Cruz

Figure 8. Photos of the field and laboratory work for the mangrove project

Preliminary Results







- Fringe shows greater variation in % LOI over time, perhaps the fringe is getting additional sediments of the estuary.
- Increasing trend in % P for both sites over time reflect the increase in the global nutrient delivery to streams that occurred during the 20th century (Beusen et al., 2016).
- Increase of %P at the 8-13 cm interval in the basin forest could be related to agricultural runoff in the watershed and likely reflects the increase in agriculture and urbanization on the area surrounding *JBNERR* (Field et al., 2002) and changes made to Jobos Bay's watershed since the beginning of the 20th century (DNER,2002).

References

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