TREE MORTALITY WITHIN TREE ISLANDS AFTER HURRICANE IRMA

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Introduction

Background: In the Everglades, both marl prairie (MP) and ridge and slough (R&S) landscapes are, spotted by woody dominated tree islands. Tree islands are a vital component of the complex Everglades ecosystem as biogeochemical hot spots for phosphorus accumulation, keystone habitats as refugia for marsh plant and animal species, and culturally important archeological sites.

These islands often include different plant communities along a hydrologic gradient. These communities are hardwood hammocks, bayhead, and bayhead swamp forests. They are sensitive to hydrologic changes, natural as well as those related to the Comprehensive Everglades Restoration Plan (CERP).

Natural disturbances can also influence the dynamics of these tree islands. Among the major disturbances, hurricanes are perhaps most frequent and have a greater influence. Previous results have shown higher mortality 3-4 years after a hurricane disturbance (Ruiz et al., 2011). In 2017, Hurricane Irma hit the Everglades affecting several tree islands

Objective: The objectives of this study were to explore the relationship between hurricane-induced tree damage and structural variables, and to assess the vegetation recovery during the first year after the hurricane.

Hypothesis: Hurricane Irma caused an immediate increase in tree mortality.

Study Site

ENP

Figure 1. Location of 8 Hardwood Hammock plots within Tree Islands in ENP.

- Pre-hurricane data was available from eight tree islands including one prairie island (Grossman Hammock) along the eastern boarder of the Park, six islands (Black Hammock, Gumbo Limbo, Satinleaf, Irongrape, Vulture, and Chekika) in Shark River Slough, and one (SS-81) in Northeast Shark River Slough (Figure 1).
- Sampling was done in permanent hardwood hammock plots (varying in size from 300 to 625 m²) within the tree islands. Those plots had been sampled 1-6 years prior to the hurricane, and the post-hurricane sampling was done 3 and 14 months after the hurricane.

Methods

- The sampling included recording the status (live and dead), height, and diameter at breast height (DBH) of tagged trees. Tree damage was recorded in 3 months after Hurricane Irma.
- Tree data was summarized for the period of 2010-2018.
- Tree mortality and mean tree DBH of live and dead trees were calculated for the eight islands.
- Logistic regression was used to analyze the relationship between tree mortality along with the tree damage type and tree DBH.

Results

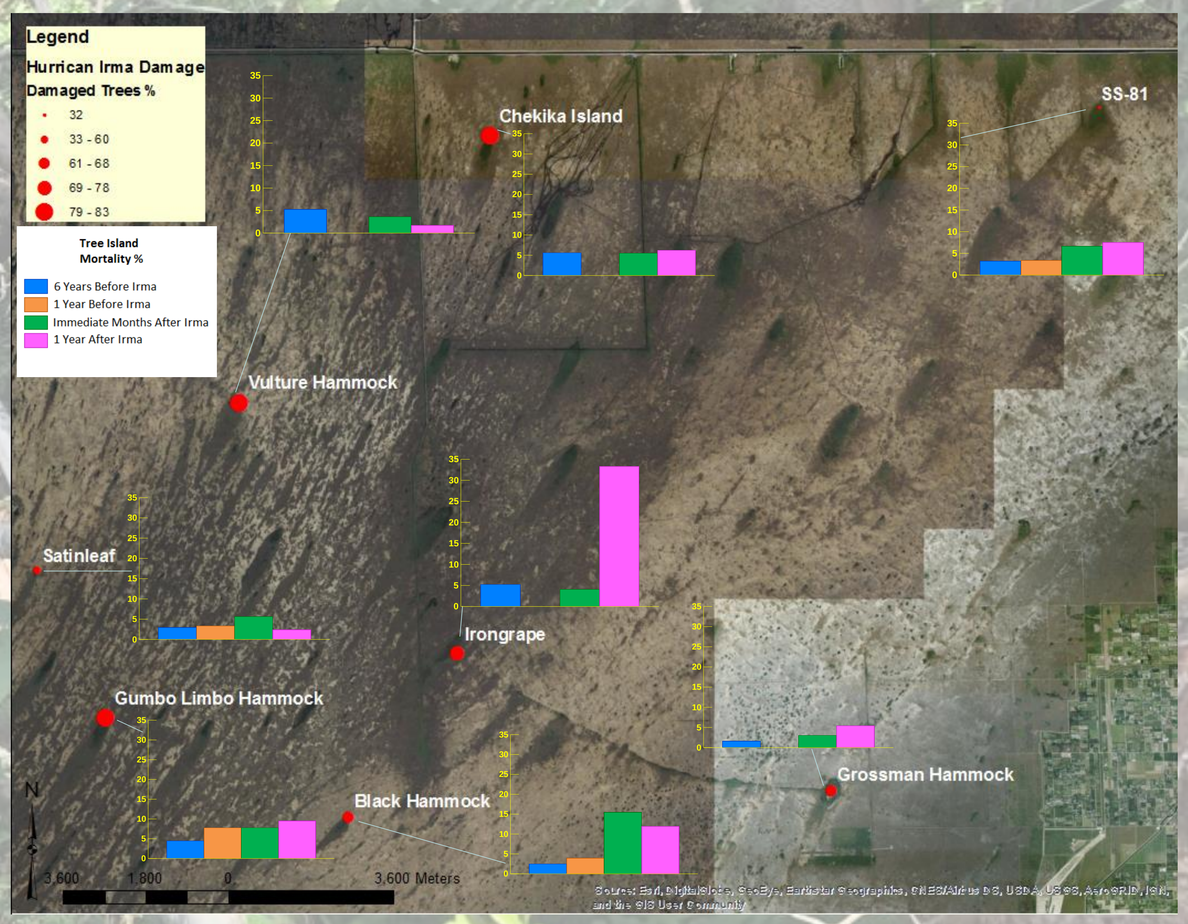
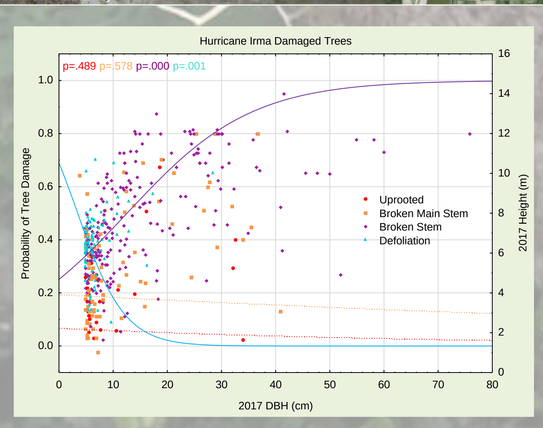
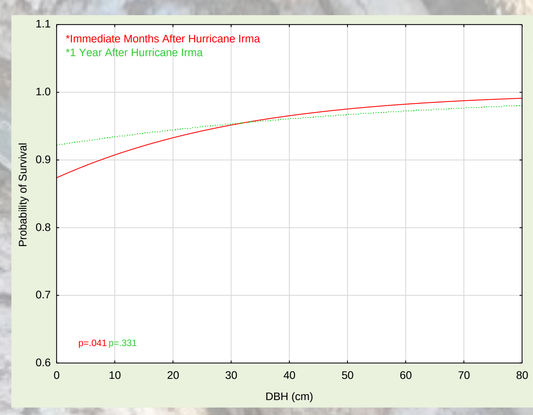


Figure 2. Hurricane damage and mortality across 8 Hardwood Hammock plots within Tree Islands in ENP.

- Mortality increased in 4 islands (Satinleaf, Grossman, Black Hammock, SS-81) the months after Irma. Mortality increased again the year after in Grossman and SS-81.
- Mortality increased in Gumbo Limbo, Irongrape, and Chekika the year after Irma.
- Hurricane damage was the highest in Gumbo Limbo, Irongrape, Vulture, and Chekika.





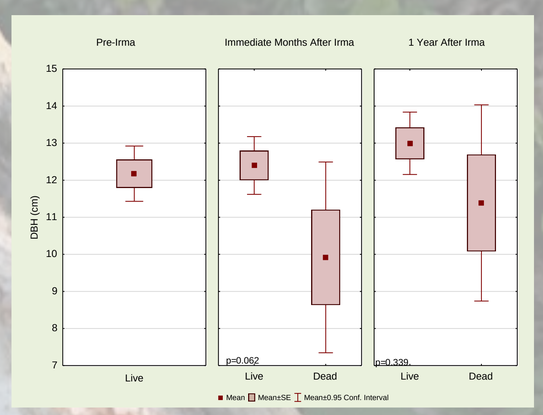


Figure 3. Probability of hurricane damage based on tree DBH (top right).
Figure 4. Probability of tree survival based on tree DBH (bottom left).
Figure 5. Mean DBH of live trees pre-Hurricane Irma and live and dead trees post-Hurricane Irma (bottom right).

Conclusions

- Larger trees were more likely to be damaged due to broken stems by wind.
- Probability of survival increases in trees with larger DBH.
- Hurricane did have an immediate effect on mortality in some islands, and mortality continued to increase in two islands the year after.

Bibliography

1. Ruiz, P.L., J.P. Sah, M.S. Ross, D. Rodriguez and A. Lambert. 2011. Monitoring of Tree Island Conditions in the Southern Everglades: The Effects of Hurricanes and Hydrology on the Status and Population Dynamics of Sixteen Tropical Hardwood Hammock Tree Islands. USACOE – US Army Engineer Research and Development Center. Cooperative Agreement: W912HZ-09-2-0019 (136 pp).

Acknowledgements

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