Sand Dune Restoration in Florida

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Increased frequency of hurricanes and inland and coastal flooding are some of the biggest threats Florida faces over the next century (Florida Oceans and Coastal Council 2009). With sea level rise and global warming, major flooding events are expected to drastically increase, and the resulting damage is expected to cost the state between $137 billion and $277 billion by 2050 (Borisova, Breuer, and Carriker 2008).

Located along high energy shorelines on both the Atlantic and Gulf coasts, sand dunes act as barriers against storm surge and flooding. These critical ecosystems occupy 800 miles, or 62%, of Florida's shorelines (Williams 2007). However, they are rapidly eroding due to the increased frequency of storm events and coastal development preventing natural dune migration (Barbier et al. 2011). As such, research on this critical ecosystem is necessary for Florida to adapt to future climate change threats.

Sand dune restoration by planting grass plugs is a widely utilized solution along both the Gulf and Atlantic Coasts (Williams 2007), but these projects are very expensive and have high failure rates (Barbier et al. 2011). One cause of this high failure is the lack of understanding about sand dune grass species. Restoration guidelines recommend planting multiple grass species during a given restoration attempt to increase the resiliency of the restored sand dune to future storms and flooding. However, the majority of dune restoration attempts in Florida only plant *Uniola paniculata* (sea oats). Sea oats are widely studied compared to other dune grass species, but planted sea oat plugs can take up to 5 years to reach maturity, suggesting they may not be the ideal dune restoration solution along coasts that are constantly under treat by hurricanes and flooding (Williams 2007).

Panicum amarum (bitter panicgrass) is the second most common dune grass species in the state (Williams 2007) and can reach densities of up to 60% at some sand dunes (personal data). Of note, this grass establishes more rapidly than sea oats, and is able to stabilize dunes within a year of planting. It also has wide stems that reduce wind velocity, allowing sand to accumulate and building dunes, and an extensive belowground root system to stabilize existing dunes (Williams 2007). However, little is known about this grass species and there are no scientific publications on its use for restoration in Florida.

My PhD research will focus on if planting panicgrass and sea oats together can improve dune restoration outcomes. As sea oats grow much taller than panicgrass but panicgrass establishes faster, co-planting the species will likely increase the success of sand dune restoration attempts. I plan to plant dune grasses along both the Gulf and North Atlantic coasts to test this theory. The money from this scholarship will be used to purchase grass plugs from a local supplier. The Florida Department for Environmental Protection has offered support for this project, saying "your interest in bitter panicgrass, the "other" dune grass, is greatly appreciated!" (Fitz Wettstein, Officice of Relilience and Coastal Protection, FDEP)

Works Cited:

Barbier, Hacker, Kennedy, Kock, Stier, and Silliman. 2011. The value of estuarine and coastal ecosystem services. *Ecological Monographs*: 81(2) pp. 169-193.

Borisova, Breuer, and Carriker. Published 2008, Reviewed 2018. Economic Impact of Climate Change on Florida: Estimates from Two Studies. University of Florida IFAS Extension: Publication #FE787.

Florida Oceans and Coastal Council. Revised June 2009. The effects of climate change on Florida's ocean and coastal resources. A special report to the Florida Energy and Climate Commission and the people of Florida. Tallahassee, FL. 34 pp.

Williams. 2007. Native Plants for Coastal Restoration: What, When, and How for Florida. USDA, NRCS, Brooksville Plant Materials Center, Brooksville, FL. 51p.

Future Goals:

Throughout my PhD, I intend to work with local coastal managers to test and deploy dune restoration strategies. By collaborating with practitioners actively restoring sand dunes, I hope to test new restoration techniques at large spatial scales and improve the success of dune restoration. After my PhD, I intend to keep working on the interface of academic research and coastal restoration. I do not yet know if I will hold a government, private, or academic position, but I will work to bridge the gap between this three institutions and unite behind the goal of improving natural coastal protection in Florida.