Ecosystem development after mangrove creation: plant-soil change across a twenty-year chronosequence in Tampa Bay, FL

Michael J. Osland[1], Amanda C. Spivak[1], Janet A. Nestlerode[1], Alex E. Almario[1], Jeannine M. Lessman[2], Paul T. Heitmuller[3], Federico Alvarez[1], Marc J. Russell[1], Ken W. Krauss[3], Darrin D. Dantin[1] and James E. Harvey[1], (1)U.S. EPA, Gulf Breeze, FL, (2)Eckerd College, St. Petersburg, FL, (3)U.S. Geological Survey, Lafayette, LA

Background/Question/Methods
On a global scale, the loss of mangroves has been high (~1-2% loss per year in recent decades). Recognizing the important ecosystem services supported by mangroves, restoration and creation efforts are increasingly proposed as mechanisms to replace those services lost after mangrove removal. In this study, we used a 20-year chronosequence of created mangrove wetlands in Tampa Bay, FL to investigate vegetation and soil development following mangrove creation. Our research addresses the following three questions: (1) how similar are created and natural mangroves; (2) how quickly do mangrove plant and soil properties develop after creation; and (3) how does the rate of development in created mangroves compare to other tidal and non-tidal created and restored wetlands? Our study design included 18 sites: nine created wetlands of different ages (0-20 years) and nine natural reference wetlands in close proximity. We quantified differences in plant composition and structure, and measured soil properties at two depths (0-10 cm and 10-30 cm).

Results/Conclusions
Salt marsh grasses are thought to facilitate mangrove establishment; created tidal wetlands often begin as salt marshes, but eventually become mangrove forests in the Tampa Bay region. Stem density, percent cover, and biomass of salt marsh grasses (i.e., *Spartina alterniflora*) decreased significantly with site age, all reaching zero shortly after the tenth year as mangroves became more dominant. Mangrove recruitment and growth was relatively quick, and the density of juvenile trees in these created wetlands was high. Adult tree growth and density continued to increase significantly with site age with the largest increases occurring after 10 years. However, despite rapid woody plant recruitment and growth, the size and density of adult trees in these created wetlands was still significantly smaller than in natural mangroves. Not surprisingly, created and natural mangrove soils were significantly different. Relative to natural mangroves which have a deep carbon-rich peat layer, the soil at created sites had significantly more sand, higher bulk densities, lower soil organic matter (SOM), lower total carbon (TC), and lower total nitrogen (TN), especially in the deeper soil layer (10-30 cm). In the upper soil layer (0-10 cm), SOM, TC, and TN increased rapidly with created mangrove site age; a shallow carbon-rich peat layer had formed in the older created mangrove sites. Collectively, our results highlight important differences between created and natural mangrove ecosystems and quantify rapid soil and plant community change following mangrove creation.