



Restoring bottomland hardwood forests in post-Katrina Louisiana

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For the past four years ESRM 492: *Service Learning in New Orleans* classes from California State University Channel Islands have spent Spring Break touring and working in the greater New Orleans area. We investigate the drivers of wetland loss, factors contributing to the Katrina-spawned devastation, and help with recovery efforts. As part of each trip we spend four-five days in and around Woodlands Trail and Park (Belle Chasse, LA) documenting Katrina impacts and supporting restoration efforts. Our on-going site assessment was the first detailed documentation of this former well-functioning cypress-tupelo forest since Hurricane Katrina struck the region in 2005. Our assessment initially provided important baseline conditions with which to evaluate the effectiveness of subsequent management efforts in the region and paved the way for our first small-scale 8 ha (20 ac) active restoration effort in the fall of 2009. Armed with the initial results from this first phase, we are currently planning the large-scale, site-wide active removal of these invasives. We also plan to return with future Service Learning classes to continue our active collaboration with managers working towards effective conservation of Gulf Coast resources.



Woodland Trail and Park

Located 10 km (6.5 mi) from downtown New Orleans, Woodlands Trail and Park covers 609 ha (1,505 ac) of bottomland hardwood forest in Plaquemines Parish. It is the largest non-federal stand of cypress-tupelo forest in this region of Louisiana. This parish land was largely ignored for the last several decades. Pressure to develop the land (spurred by the conversion of neighboring land into golf courses and residences) catalyzed the incorporation of the *Woodlands Trail and Park* 501(c)(3) in 2001. This community-based effort seeks to establish permanent urban greenways that incorporate educational, historical and recreational components around a core nature trail.

Two 9.7 km (6.8 mi) primary trails, an array of lesser trails, and associated wooden bridges were destroyed along with essentially the entire forest canopy by Hurricanes Katrina and Rita in 2005. Treefalls and other hurricane debris heavily restricted site access until 2007. Trail clearing/repair consumed all funds leaving none left for environmental impact assessment.



Woodlands Trail and Park Location

Restoration Methods

In October 2009, we began actively herbiciding our three woody, non-native invasive species of concern with Garlon from backpack sprayers. Smaller individuals were directly sprayed. Larger individuals were cut through their cambium and then the herbicide was applied directly into this cut. The largest individuals were girdled deeply across the entirety of their circumference or simply chopped down. Seedlings of cypress (*Taxodium distichum*), water oak (*Quercus nigra*), and other native trees were outplanted from December 2009 through April 2010.

In addition to our standard plant monitoring, we also began monitoring mobile vertebrates this year with camera traps deployed in various long-term monitoring plots first established in September 2010.



Woodlands Trail animals detected by camera traps from March-April 2010



↓ invasive trees = ↑ animals

Restoration plots had 4 times as much animal activity (3.8 ± 1.6 vs. 1.1 ± 0.3 triggers per day, mean \pm 1se) as our control plots, although overall animal richness (6 vs. 7 spp.) did not significantly differ between areas.

Documenting Wetland Loss



Note the dramatic increase in blackberry and other opportunistic woody species over the span of 1 year. The pink flagging tape right of center in each image was the same piece deployed in 2007.

Results to Date

Our focal invaders are common throughout the site and all of southern Louisiana. While established, their vegetative growth was originally suppressed by the often thick blackberry (*Rubus* spp.) canopies that developed across much of this landscape post-Katrina. Our fears began to manifest themselves in 2008 with a massive increase in the density and height of invaders (particularly Chinese tallow) as they began to escape suppression. Most tallow trees were <0.1 m tall in 2007 whereas we commonly encountered individuals ≥ 1 m in 2008 (0.24 ± 0.27 m, mean \pm 1 SD) and ≥ 2 m by 2009 (2.7 ± 2.8 m) with some individuals now >10 m tall. Our 2009 surveys confirmed this 2008 recruitment pulse threatens to make these invaders the dominant woody species within a decade. 2010 data are still being analyzed, but show a marked decrease of our invaders (particularly tallow) in restoration areas. Animals appear to be responding to these changes.

A note about Louisiana's vanishing wetlands...

California and Louisiana represent two extreme examples of wetland loss in the United States. California has the unfortunate distinction of being the state with the highest proportion of wetland loss (91% lost over the past 200 years). Louisiana claims a similarly embarrassing mantle as the state with the largest quantity of absolute wetland loss (492,100 ha during the 20th century alone). Currently an average of 21.3 ha (53 ac) of coastal Louisiana wetlands are lost daily. No single factor is to blame for this erosion of our national heritage. Rather a synergistic combination of factors are conspiring to rapidly degrade these communities. Chief among these stressors are 1) reduced sedimentary inputs from the channelization of the Mississippi River, 2) subsidence associated with oil and gas extraction, 3) vegetation diebacks from saltwater intrusion following over pumping of coastal aquifers, 4) fragmentation of remnant wetlands by linear waterways, roads, and development, & 5) altered ecosystem structure and function due to the expansion of non-native, invasive species. Unless major restoration efforts are undertaken immediately, we stand to lose virtually all coastal marsh in southern Louisiana over the next century.

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