

# Managing Invasive Species in the Face of Natural Disaster: Obstacles and Opportunities

by Gary N. Ervin

Storms such as hurricanes and tornados provide obstacles for invasive plant control as they provide opportunity for the establishment of new weed populations through wind and water movement of plant propagules, or by transport of propagules in and on vehicles that assist in recovery efforts (e.g., Hodkinson & Thompson 1997). Less immediately obvious, such storms may affect landscape habitat properties (e.g. resource availability and heterogeneity) which may allow for an increase in invasive plant establishment.

Research in forests following hurricanes and experimental canopy destruction provides insight into the potential effects these storms can have on the spread of invasive species. Work in the Harvard Experimental Forest (Harvard University) demonstrated

a significant shift in both resource availability and variation among resources in microhabitats created by experimentally damaged canopy trees. For example, light availability increased three-fold in damaged plots and was twice as variable as in undisturbed forests (Carlton & Bazzaz 1998). After Hurricane Fran struck North Carolina in 1996, Boutet & Weishampel (2003) found the height of forest canopies to be reduced considerably. This reduction would have increased light availability in the understory. They also found significant increases in spatial variability in the canopy. Such increases in resource and microhabitat variability are expected to enhance the ability of colonizing species to establish in disturbed areas, including potentially invasive weeds. Work in herbaceous wetlands where soils had been disturbed by tillage showed exactly such a pattern (Ervin unpublished). Variability in the plant litter layer and soil microtopography both decreased with time after disturbance, as did the number of non-native and invasive plant species. Statistical analyses demonstrated a close positive correlation between microhabitat heterogeneity and exotic species richness, at scales from 25m<sup>2</sup> to 812m<sup>2</sup>.

The disturbance of forest canopies by storms can provide new pathways for dispersal of invasive species. This effect would be expected to be greatest when the timing of damage corresponds with the timing of natural propagule maturity and dispersal. For example, Yager et al. (2005) showed that wind can disperse spikelets of cogongrass (*Imperata cylindrica*) considerably farther through relatively open, savanna-like habitats than through pine forests with a dense shrub mid- or understory. This is particularly troublesome considering cogongrass seed matures around the time that Mississippi and adjacent states annually experience tornadoes, some of which can cause large-scale forest damage.

While storm disasters with their ensuing chaos and destruction may present obstacles to invasive plant management, land managers should learn from recent and previous disasters to improve our abilities to rapidly respond to new threats created by large, destructive storms. Ramsey et al. (2001) used remote sensing to accurately estimate forest canopy damage in southern Louisiana following Hurricane Andrew in 1992. Such approaches could be implemented easily with the modern accessibility of land cover and meteorological data. Results then could be coupled with maps or models of species distribution across a region of

interest to predict areas where particular species would be most likely to establish following a storm, and management efforts could be focused in those areas. These activities represent the essence of the Early Detection-Rapid Response approach advocated by Westbrooks (2004) and others and may be the most efficient means of reducing risk after natural disasters.

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## Observations Concerning the Spread of Non-native Plants in the Wake of Hurricane Events

by Riley Hoggard

The northern Gulf coast has experienced a number of tropical storm events in recent years, specifically Hurricane Ivan in 2004 and Hurricanes Dennis, Katrina, and Rita in 2005. With a number of park sites along the Florida, Mississippi, Louisiana, and Texas coasts, The National Park Service has experience in restoration following storms, plus realistic expectations of additional plant infestations. Examining the spread of non-native species following the earlier storms provides some insight on what to expect along the Mississippi coast in the wake of Hurricane Katrina.

Following Hurricane Ivan, Gulf Islands National Seashore observed a substantial spread of torpedograss (*Panicum repens*). The highly invasive grass was observed mainly along the northern shorelines of the barrier islands and the southern shorelines of the mainland where a sizeable margin of it became established between the water and the uplands. Drainage ditches and other areas that would have been inundated with persistent storm surge seemed also to be particularly susceptible to torpedograss establishment. In areas where a natural understory remained, torpedograss has rarely been seen.

The spread of previously existing cogongrass (*Imperata cylindrica*) appears to have been facilitated through the loss of both canopy and understory, as well as the ground disturbance resulting from cleanup and restoration activities. Chinese tallow (*Sapium sebiferum*)

re-infested previously treated sites and infested new sites with even minimal canopy loss or mechanical disruption.

Certain non-natives are being watched but not actively controlled such as rattlebox (*Sesbania punicea*). Following Hurricane Opal in 1995, rattlebox infestations were short lived with no observable change in the native plant cover. Mobile Bay experienced a major rattlebox infestation following Opal that only persisted for about two years. With no control, rattlebox disappeared without displacing any of the natives and Mobile Bay has essentially been clear of rattlebox since.

In anticipation of the spread of Chinese tallow into Hurricane Katrina canopy-damaged and blow-down areas, Jean Lafitte National Historical Park has undertaken a policy of preemptive strikes. Using crews of volunteers, employees, and National Park Service Exotic Plant Management Teams, the park has begun to remove existing tallow trees from multiple sites within the Barataria Preserve in an effort to remove the source material.

The spread of non-native plants is facilitated and enhanced by tropical storm events. Unfortunately, this spread can be over hundreds of miles. A case-in-point is Padre Islands National Seashore. Several weeks after Hurricane Katrina, the park's south Texas beaches were covered with the rotting vegetative matter of giant cut grass (*Zizaniopsis miliacea*). Cut grass is used extensively in Louisiana, especially around New Orleans, on flood control levees to stabilize the soil and prevent erosion. Although no new cut grass growth has been observed on Padre's beaches, is it just a matter of time?

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