In the Danger Zone

How to Manage Forests in Hurricane Impact Zones

by Zoë Hoyle

Coastal forests are well adapted to both fire and wind, but those adaptations only go so far when hurricanes hit. (Photo by Dennis Jacobs, U.S. Forest Service)

In 2005, Hurricanes Katrina and Rita laid waste to over 5.5 million acres of forest land in Texas, Louisiana, Mississippi, and Alabama. Natural resource managers and landowners were overwhelmed by the damage. Many of them didn't have strategies or plans in place to help them get started on sometimes massive salvage operations, let alone come up with plans to make their forests more resilient when future storms strike.

"Coastal areas in the Southern United States are well adapted to disturbance from both fire and wind," says **John Stanturf**, project leader of the **SRS Center for Forest Disturbance Science** based in Athens, GA. "But those adaptations only go so far when major hurricanes like Katrina and Rita hit. Forest owners and natural resource managers need to have strategies in place to deal with that level of damage."

In the last decade, hurricane seasons have been among the most active on record, with climatologists predicting that heightened activity could continue for at least another 10 to 40 years. The National Oceanic and Atmospheric Administration predicted above average activity for the 2008 season, with 12 to 16 storms, 6 to 9 hurricanes, and 2 to 5 major hurricanes. In the Gulf Coast area, forests are bound to be affected this year—maybe every year—so why not help landowners and managers plan ahead?

Can't Stop the Storm

With fellow disturbance center scientists—research meteorologist **Scott Goodrick** and research plant ecologist **Ken Outcalt**—Stanturf developed a conceptual approach that builds the likelihood of major disturbance into forest management. They applied their framework to a case study on the effects of Hurricanes Katrina and Rita on the coastal forests of the northern Gulf of Mexico. Their work resulted in an adaptive strategy that owners and managers can use in the short term to respond to hurricane damage, and in the long term to manage recovery efforts.

A hurricane is an unstoppable force; there's no way to divert it from its path or move forests out of its way. But

there are ways to determine the areas where the damage from hurricanes will be the most severe. The SRS scientists started by developing a threat matrix, an approach that maps out all the potential disturbances in an area, then assesses the risks of severe hurricanes in that context.

"If disturbances such as major hurricanes are in the threat matrix, policies and procedures should be in place prior to an event to manage effects," says Stanturf. "First on the list is communication and access. Preparing and prepositioning equipment will pay dividends once a hurricane makes landfall."

Managers and landowners also need a plan for the actions they take as soon as they have access to their land. After the storm, they'll need a rapid assessment of damage to guide recovery efforts and mobilize the political and financial support necessary to meet both short-term and long-term needs. They'll also need a salvage plan to recover value from downed timber and prevent damage from wildfire, insects, and disease.

Though most fires in the Southern United States are confined to relatively small areas and suppressed quickly, downed wood in hurricane damaged stands increases the potential for wildfires to burn over large areas. The risk of fire combined with the need to get salvaged timber on the market before prices go down sometimes means rushed salvage decisions that may not take into account damage to sensitive ecosystems or habitat for species of concern.

"If managers put a plan together before major disturbance, they can exempt areas where ecological values outweigh potential financial value from salvage logging," says Stanturf. "Strict guidelines for operating in sensitive

(continued)

Managers need to have a plan in place for timber salvage after major disturbances. (Photo by Patrick Hesp, Louisiana State University Hurricane Katrina and Rita Clearinghouse Cooperative)

Quick Guide to Salvage

- **Salvage pine stands first: Pines are more susceptible to pest outbreaks than broadleaves.**
- **Salvage promptly, in one operation, to reduce the vulnerability of remaining trees to bark beetles, borers, and fungi.**
- **Minimize logging damage to remaining trees, especially high-value broadleaves.**
- **Remove twisted trees or those with root damage, as well as all trees with major wounds.**

For a more detailed guide, see the table on page 25.

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areas such as riparian zones and endangered species habitat should be set in advance."

Damaged stands that are not salvaged will need to be monitored for up to 5 years for delayed mortality or insect or disease infestations. "After the initial flurry of cleanup and salvage logging comes the recovery period, which is a good time to look at long-term risks and restoration," says Stanturf. "The 2005 hurricane season in the northern Gulf of Mexico provided a good opportunity to restore coastal forest ecosystems to less vulnerable conditions."

Building Future Resiliency

The forests in the Gulf Coastal Plain area of the case study are composed mostly of pine (in the uplands) and hardwoods (in the floodplains of rivers). Though most of the upland areas were once covered with longleaf pine, they're now dominated by loblolly pine, with numerous intensely managed industry plantations. Katrina created an opportunity for landowners and managers in areas prone to destruction by hurricanes to replace loblolly with the more resilient longleaf pine. Restoration of the longleaf pine forest that once dominated the southern Coastal Plain is popular in the region; SRS research has developed many of the methods that have made longleaf pine restoration more viable and accessible to owners and managers at multiple levels.

Forests can be made less vulnerable to future storms by converting to tree species such as longleaf that are less susceptible to wind damage, but also by controlling the structure of stands. Using information from their case study on damage from Hurricanes Katrina and Rita, Stanturf and fellow scientists drew up nine theoretical pine stands and simulated damage to each from hurricane-strength winds.

"Our simulation of the potential of stems to break under hurricane winds was fairly simple, but we were able to show that managers potentially could manipulate stand spacing and tree height to reduce damage. We are looking into this further and plan to develop guidelines for both public and private forests," says Stanturf. "Managers should be prepared to take advantage of the opportunities provided by severe hurricanes to make changes in composition, structure, or both."

For more information:

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Recommended reading:

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Peterson, C.J. 2000. **Catastrophic wind damage to North American forests and the potential impact of climate change.** Science of the Total Environment. 262: 287–311.

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