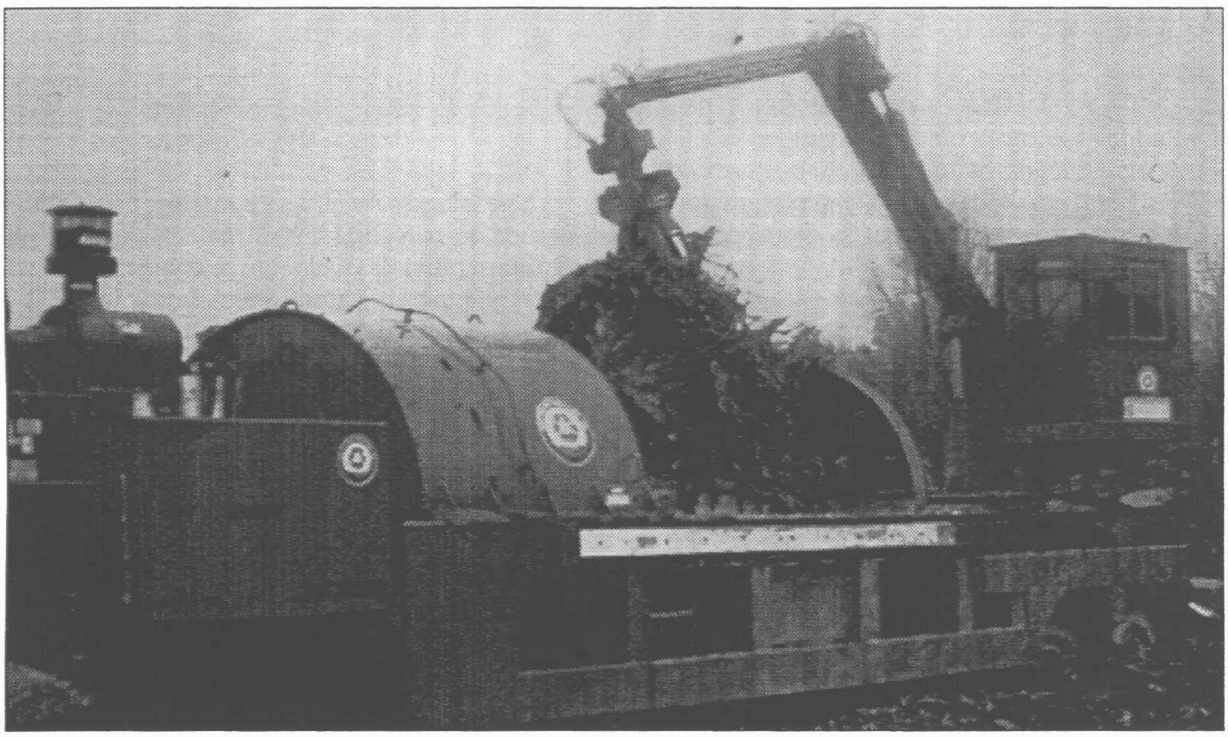
Hurricane Hugo



month, this mulch tends to heat up and can spontaneously combust. One mulch fire at a storage site took a week to extinguish.

The county initially hired a local contractor to shred the green waste into mulch using high-speed shredding equipment. One month after the hurricane, with four shredding systems working 12 hours per day, seven days a week, the county decided to contract for more grinders. Shredding was finally completed in February 1991 (16 months after the storm) at a cost of $7 million.

Communication

As the green-waste mulch was created, the county had yet another challenge on its hands: what to do with 400,000 tons of shredded green waste.

In October 1989, the county launched its "Take-a-Ton" mulch give-away program. The media was very supportive in getting the word out. The Charlotte newspaper published maps of the give-away locations, and radio and television stations ran announcements.

Initially, the product was too coarse to be used as mulch. But once the county reduced the shredder's screen size and provided loaders on site, citizens took home the mulch as fast as it could be produced. County officials also granted permits to contractors to haul away as much mulch as they could to sell to their customers. One company hauled away thousands of cubic yards to sell as boiler fuel to local paper mills.

Outside assistance

State and federal sources, including FEMA, provided funding to Mecklenburg County. FEMA required the county to maintain data on all incoming debris and equipment operations. Five full-time staff kept detailed records of the county's recovery expenses. At the site, county personnel recorded information on each vehicle, including delivery date, time, truck type, and user. The county hired temporary staff to record similar information for contracted grinding operations. As a result of its diligent record-keeping efforts, the county was reimbursed fully (75 percent from FEMA, 25 percent from the state of North Carolina) for its debris management costs, totaling over $7 million. The accounting also has proved helpful in planning for future natural disasters in the region.

Kauai, Hawaii

Hurricane Iniki

Hurricane Iniki struck the Hawaiian island of Kauai in September 1992. The storm generated more than 5 million cubic yards of debris—seven years' worth of Kauai's normal refuse—for a landfill with less than four years of remaining capacity. Kauai needed the four years to plan and design a new landfill, and shipping the debris off the island for disposal was not economically feasible. Island officials therefore chose to develop an efficient collection and recycling plan that saved both money and the dwindling landfill space.

Collection and recycling

Within days of the storm, island officials, with the cooperation of local landowners, established five temporary hurricane debris receiving sites. Officials trained temporary site operators to separate recoverable materials on site, but encountered many problems during the early stages of the cleanup effort. Hauling contracts had been written quickly and did not include incentives to keep materials free of contaminants. Consequently, some reusable materials became unusable. Haulers mixed clean loads of green waste with other trash and combined hazardous materials with recyclable debris. Stores and household refrigerators generated tons of food waste, which was mixed with recyclable materials. In the absence of instruction to do otherwise, residents began creating spontaneous dumps and at some sites burned or buried debris. In addition, the initial collection contractors were construction crews with little or no experience in handling and recovering solid waste.

Because Kauai is an island, officials could not easily spread the burden by transporting hurricane debris to unaffected communities. Without an adequate management plan, the collection sites were overwhelmed until December, when officials implemented a debris management plan and contracted with professional solid waste personnel to manage the sites and the collection process.

The island's solid waste management plan focused on recycling. From the beginning, local and state officials made a firm commitment to divert the massive amounts of debris from Kauai's landfill. A response team that included local, state, and federal government staff, contractors, and the county's solid waste consultants developed the plan. Team members agreed that materials recovery was the most environmentally sound and economical method of managing the hurricane debris.

The plan aimed to divert debris in a cost-effective manner by separating materials at the point of generation. It also proposed methods to maintain separation through the collection, transportation, storage, and processing stages. The plan required residents to separate materials into five piles at the curb: green waste; metals and appliances; wood debris; aggregate materials, including toilets, tile roofing, and concrete; and mixed debris. The plan also banned the burning of debris and instituted curbside collection across the island to accommodate those unable to haul the debris themselves. The plan ensured that processed debris was usable and met market specifications. Officials decided to hold off grinding any materials until a processing and end-use plan was developed. While this delay increased stockpiles of materials, it was essential to cost-effective diversion.

All of the metals, appliances, tires, and aggregate materials were reused. The aggregate was used to make revetment walls to shore up county shore-front property. A local company processed more than half of the 100,000 tons of green waste created by the storm into compost, thereby saving the county millions of dollars and precious landfill space. As a result of delays, the recycling plans for the remainder of the green waste and mixed debris fell through, and the waste was buried or landfilled.

Although the plan took three months to prepare, it resulted in much higher debris diversion rates, minimized environmental impacts, reduced waste management costs,

minimized threats to health and safety, and significantly shortened the duration of the cleanup effort. In addition, the plan instituted specific controls at collection sites across the island to monitor incoming debris, contain odors, and minimize water runoff.

Communication

One of the first orders of business after the storm was to inform residents about what to do with hurricane debris scattered across their property. With all communication systems down for several weeks, however, it was nearly impossible to reach all island residents to instruct them on how to separate materials. Kauai had only a fledgling recycling program, and source separation was not a household practice. As the communication systems recovered, island officials posted signs, ran articles in the newspaper, and broadcast radio announcements to inform citizens of upcoming collection efforts. After several weeks of intense outreach, the public caught on and began separating materials before pickup or dropoff. Discrete piles of green waste, metals, wood, and mixed debris soon lined the streets of Kauai. During this process, island officials realized that mobilization for recovery would have occurred more rapidly and effectively if they had planned ahead. By developing a clearly defined organizational structure and public information materials in advance, officials could have saved time and money and streamlined cleanup efforts in the chaotic aftermath of the storm.

Outside assistance

Most of the funding for the cleanup efforts came from a FEMA grant. Shortly after the storm, more than 2,000 military and National Guard personnel arrived to help in the cleanup effort, and the aid of 27 private contractors was secured. Together with county and state road crews, military units and contractors systematically swept the entire island to collect source-separated debris placed curbside by residents. With FEMA's assistance, officials are preparing for future disasters by establishing a permanent collection and storage site with proper environmental controls.

Hurricane Iniki