Shelter from the Storm
Increasing Beneficial Use of Disaster Debris

Michael Alexander
NEWMOA Web Session
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Innovative waste solutions
# Hurricanes of 2004

<table>
<thead>
<tr>
<th>Name</th>
<th>Where</th>
<th>When</th>
<th>Category</th>
<th>Winds (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charley</td>
<td>Punta Gorda, FL</td>
<td>Aug. 14</td>
<td>4</td>
<td>145</td>
</tr>
<tr>
<td>Frances</td>
<td>Hutchinson, FL</td>
<td>Sept. 6</td>
<td>3</td>
<td>120</td>
</tr>
<tr>
<td>Ivan</td>
<td>Pine Beach, AL</td>
<td>Sept. 16</td>
<td>3</td>
<td>120</td>
</tr>
<tr>
<td>Jeanne</td>
<td>Hutchinson, FL</td>
<td>Sept. 26</td>
<td>3</td>
<td>120</td>
</tr>
</tbody>
</table>
## Hurricanes of 2005

### Landfall Stats

<table>
<thead>
<tr>
<th>Name</th>
<th>Where</th>
<th>When</th>
<th>Category</th>
<th>Winds (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dennis</td>
<td>Santa Rosa, FL</td>
<td>July 10</td>
<td>3</td>
<td>120</td>
</tr>
<tr>
<td>Katrina</td>
<td>Hallendale, FL</td>
<td>Aug. 25</td>
<td>1</td>
<td>90</td>
</tr>
<tr>
<td>Rita</td>
<td>Florida Keys</td>
<td>Sept. 20</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Wilma</td>
<td>Cape Romano, FL</td>
<td>Oct. 24</td>
<td>3</td>
<td>120</td>
</tr>
</tbody>
</table>
Saffir-Simpson Scale

**CATEGORY 1**
- Barometric pressure: 28.94
- Winds: 74 to 95 mph
- Storm surge: 4 to 5 feet
- Damage: Minimal; signs, tree branches, power lines down

**CATEGORY 2**
- Barometric pressure: 28.50 to 28.93
- Winds: 96 to 110 mph
- Storm surge: 6 to 8 feet
- Damage: Moderate; larger signs, tree branches blown down

**CATEGORY 3**
- Barometric pressure: 27.91 to 28.49
- Winds: 111 to 130 mph
- Storm surge: 9 to 12 feet
- Damage: Extensive; minor damage to buildings, trees blown down

**CATEGORY 4**
- Barometric pressure: 27.17 to 27.90
- Winds: 131 to 155 mph
- Storm surge: 13 to 18 feet
- Damage: Extreme; almost total destruction of doors, windows

**CATEGORY 5**
- Barometric pressure: Less than 27.17
- Winds: More than 155 mph
- Storm surge: More than 18 feet
- Damage: Catastrophic; buildings, roofs, structures destroyed

Source: Palm Beach Post
Storm Debris by Type

- Vegetative: 76%
- Mixed: 16%
- C&D: 7%
- White Goods: 1%
Storm Debris by Type

Vegetative 76%
Storm Debris by Type

White Goods
1%
Storm Debris by Type

Mixed 16%
Storm Debris by Type

C&D 7%
Methods for Managing Vegetative Disaster Debris

- Landfilling
- Burning in pits or air-curtain incinerators
- Beneficial uses, such as:
  - composting
  - land spreading
  - soil amendment
    (agricultural applications)
  - fuel in industrial boilers
Vegetative Storm Debris Management

- Incinerated: 11%
- Landfilled: 14%
- Beneficial Use: 75%
Mulch from Vegetative Disaster Debris

Source: Common Purpose Institute
Vegetative Debris Beneficial Use Markets

- Landfill Cover: 6%
- Compost: 2%
- Boiler Fuel: 51%
- Agriculture: 41%
Disposition of Materials Beneficially Used

- Upcycled: 44%
- Downcycled: 56%
Vegetative Storm Debris Management Methods

- Landfilled: 14%
- Incinerated: 11%
- Upcycled: 33%
- Downcycled: 42%
Challenges

“During and after a major storm event, the overriding concern is picking up the debris and getting rid of it as quickly and cheaply as possible. Any extra costs, time or complications are just going to fail. It is the reality of the situation.

... We do not even have markets or capacity for vegetative mulch and products under normal circumstances.”

~ Florida County Official from storm hit areas in 2004/2005
Key Barriers to Increasing Beneficial Use

- Lack of local beneficial markets
- Quantities overwhelm processing capacity
- Contamination of vegetative stream
- Diversion more expensive than disposal
- State environmental regulations

Number of Respondents

0 5 10 15

20
Additional Impediments to Beneficial Use

- High transportation costs required to access distant markets
- Inadequate pre-planning to identify and secure end-markets
- Lack of control and oversight over management of final debris disposition by contractors
Most Important Benefits of Diversion

- Conserving landfill space
- Protecting the environment
- Reducing disposal costs
- Creating value-added material

Importance

0 2 4 6

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Resources & Assistance to Increase Beneficial Use

- Expanded and localized beneficial-use markets for vegetative debris
- Online database of available beneficial-use markets for disaster debris, including:
  - quality & quantity requirements
  - costs & revenues
  - location & contact information
- Model contract language to provide financial incentives to vendors for increasing volume of beneficially used and recovered debris
Key Elements of Debris Management Contracts

- Contractors required to maximize recycling and beneficial use of debris
- Only debris waste stream accepted for landfilling is putrescible waste & residue from debris reduction/recycling operations
- County holds right to approve or deny final disposal methods and disposal sites utilized by debris contractors
- To the maximum extent possible, contractors use recycled wood chips from vegetative debris for agricultural purposes
Debris Collection

Note: Please Do Not Do This!
Please place bulk debris at the curb in a pile separate from vegetative debris

Source: Palm Beach County Solid Waste Authority
It Could Happen Here
Path of Great New England Hurricane of 1938
Impacts of 1938 Hurricane

- Killed 700 people
- Damaged or destroyed over 57,000 homes
- Caused $6 billion in property losses
- If it happened tomorrow- $30 billion in damages
2 Billion Trees Downed
2006 Mothers Day Flood
Typical Flood Debris

- **White Goods** - furnaces, air conditioners, stoves, hot water heaters, washers/dryers, refrigerators
- **Electronics** - computers, stereos, televisions, gaming systems, video equipment
- **Household Hazardous Waste** - paint, solvents, cleaners, petroleum products
- **Furniture** - beds, chairs, sofas, tables.
- **Wall Coverings and Flooring** – sheet rock paneling, carpeting, area rugs, vinyl/linoleum flooring.
- **Motorized Equipment** - lawn mowers, gas trimmers, chain saws, power tools
Typical Segregation Streams for Flood Debris

- C&D debris/furniture
- Yard waste and tree debris
- Household hazardous waste
- Appliances/White Goods/Other Metals
- Electronics
Challenges to Beneficial Use of Flood Debris

- Contamination from sewage and hazardous materials
- Diverse and multi-material debris stream
- Localized nature of flash floods means small amount of debris, increasing per ton management costs
Opportunities to Beneficial Use of Flood Debris

- Some materials easily segregated and recycled, e.g., steel, white goods, clean wood, tree debris
- High-cost of NE disposal and energy expands type of materials that can be cost-effectively recovered for beneficial use, e.g., furniture, carpet, electronics, some C&D
Workshop: Maximizing Beneficial Use of Disaster Debris

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