GUIDANCE FOR THE SELECTION OF A MORE COST EFFECTIVE ANIMAL CARCASS MANAGEMENT OPTION FOR TRANSPORTATION DEPARTMENTS

Bridget M. Donaldson
Research Scientist, Environmental

Audrey K. Moruza
Research Scientist, Economics
Then…
Now…

Illustration credit: Cornell Waste Management Institute
States with Highest Number of DVCs (2008-2009)*

- Pennsylvania: 105,843
- Michigan: 104,561
- New York: 74,958
- Ohio: 67,331
- Virginia: 48,303
- Georgia: 43,673
- Texas: 43,432
- Wisconsin: 43,392
- Illinois: 42,844
- North Carolina: 42,126

1.2 million DVCs in U.S. from July 2008-June 2009

*State Farm insurance projections for the entire insurance industry. Includes deer, elk, and moose
Labor and associated benefits (insurance, etc.) account for about 70% of these costs
Many DOT maintenance areas need help with removal and disposal options

- Landfills do not accept carcasses or are too far away

- Burial in right-of-way is no longer viable in many areas
PURPOSE

• Investigate cost-efficient options for carcass management

• Create cost models to guide the selection of a more economical alternative management method.
Tasks

1. Survey maintenance area staff regarding current means of carcass management
2. Create cost models to allow for comparison of different methods of carcass management
3. Investigate alternatives for carcass management
   - incineration
   - composting
Carcass Disposal Methods used by VDOT Maintenance Areas

Bury/set aside:  
Alternatives NEEDED: 42%

Landfill users:  
Would like Alternatives: 64%  
No change needed: 36%

- Disposal Facility Only
- Combination Disposal Facility and Burial/set Aside
- Burial/set Aside Only
- Contractor
- Compost
Cost Models

Cost tables illustrate whether a particular maintenance area’s costs can be reduced by replacing current their form of carcass management with an alternative

Costs considered:
• Travel costs (in fuel and labor) to off-route disposal facilities
• Disposal facility fees
• Contract fees
• Costs to purchase and operate disposal equipment
Cost Models

Contracts (Out-sourcing)

Problems with Contracts:
• Expensive
• Dishonest practices

Benefits of Contracts:
• Savings to DOT in labor and fuel
• DOT Labor can be allocated to other maintenance activities

Switching to a contract can be less expensive for areas that incur high mileage for “carcass patrols” and disposal
Cost Models

Landfill users:

- 21% are charged a fee, ranging from $30-$55 per ton
- 47% have to travel out of the way to reach landfill (most travel 20-40 miles)

Off-route travel to disposal facility incurs a significant cost.

On-site carcass management can save tens of thousands of dollars per year and/or hundreds of labor hours per year for maintenance areas that travel off-route to a disposal facility.
On-site Alternatives

- Incineration

- Composting
  - compost bins
  - compost windrows
  - compost vessel/drum
Incineration

- State environmental permit required
  - Emissions test
  - Visible smoke test
- Additional equipment components required

Illustration credit: Southern Breeze Fabrications, Inc.
## Incineration

<table>
<thead>
<tr>
<th>Monthly Number of Deer Carcasses</th>
<th>Fuel Costs per Carcass</th>
<th>Start-Up Cost (Includes Unit, After-Burner, and Permit)</th>
<th>Annual Fuel Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-60</td>
<td>$10.38</td>
<td>$40,000</td>
<td>$0 - $7,472</td>
</tr>
<tr>
<td>61-120</td>
<td>$7.78</td>
<td>$60,000</td>
<td>$8,406 - $11,208</td>
</tr>
</tbody>
</table>
On-site Alternatives

- Incineration
- Composting
  - compost bins
  - compost windrows
  - compost vessel/drum
Composting

The conversion of nitrogenous and carboniferous materials into a stable mixture of humic acids, bacterial biomass, and organic residues
Compost bins

- Requires $ for construction and a permit for building
- Requires turning of materials
- May not provide sufficient space
Compost Windrows

Photo credit: Cornell Waste Management Institute
• Begin with hard surface (paved asphalt, concrete, or compacted millings)
• Monitor temperatures regularly (should have internal temp of 120-150º)
• Add water as necessary (wood chips should be moderately moist)
• Turning pile is not necessary
• Let the pile sit for 4 to 6 months after the last carcass is added
Space needed: Length = \((3 \times X)/2 + 4\), where X is the number of deer being composted.

For example, for 30 deer

Length = \((3 \times 30)/2 + 4\)

= 49 ft.
Example: A Maintenance area that has 60-90 deer a month and travels round trip 40-60 miles to landfill:

Can save up to $25,000/year and 640 hours of labor with on-site composting windrows
Composting Vessel (Ecodrum)

Minimal space and site requirements needed for compost vessel
<table>
<thead>
<tr>
<th>Monthly Number of Deer Carcasses</th>
<th>Compost Vessel Daily Capacity</th>
<th>Equivalent Number of Lbs</th>
<th>Deer</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30</td>
<td>370</td>
<td>3.5</td>
<td>$29,000</td>
<td></td>
</tr>
<tr>
<td>31-60</td>
<td>570</td>
<td>5.4</td>
<td>$37,000</td>
<td></td>
</tr>
<tr>
<td>61-90</td>
<td>570</td>
<td>5.4</td>
<td>$37,000</td>
<td></td>
</tr>
<tr>
<td>91-120</td>
<td>740</td>
<td>7.0</td>
<td>$46,000</td>
<td></td>
</tr>
<tr>
<td>Case Study</td>
<td>Annual Deer</td>
<td>Disposal Facility Cost</td>
<td>Estimated Off-Route Distance to Disposal Facility</td>
<td>Annual Savings With Compost Windrows</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>192</td>
<td>Free</td>
<td>15 miles</td>
<td>$2,225</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>$32/ton</td>
<td>20 miles</td>
<td>$2,487</td>
</tr>
<tr>
<td>3</td>
<td>332</td>
<td>$55/ton</td>
<td>25 miles</td>
<td>$7,460</td>
</tr>
<tr>
<td>4</td>
<td>250</td>
<td>$0.50/deer</td>
<td>40 miles</td>
<td>$7,543</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
<td>Free</td>
<td>30 miles</td>
<td>$4,450</td>
</tr>
</tbody>
</table>

- Composting: Drum
- Incinerator
If one or both composting methods are found to be viable techniques, strategic composting locations will be identified that maximize the travel efficiency for as many surrounding maintenance areas as possible.