Presented by David Palange
Carbon Sequestration on Farm and Forest Lands Symposium
University of Delaware, October 21, 2008
DNR Carbon Footprint

- Background
- Goals
- Methodology
- Results
- Carbon-cutting strategies
Why did Maryland DNR do a carbon footprint?

- In 2007, Governor O’ Malley signed an executive order to form the Maryland Climate Change Commission (MCCC).
- MCCC chose DNR as a “lead by example” agency for a forest sequestration project.
Goals

- Determine baseline emissions for FY 2006.
- Design GHG emissions calculator.
- Identify and analyze different emission reduction strategies for ease of implementation and effectiveness.
The Big Picture

Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.
Analysis

- Used The Climate Registry General Reporting Protocol to calculate CO₂ baseline emissions for FY 2006
- Focus:
  - Scope 1
    - Mobile combustion: DNR vehicle fleets
    - Stationary Combustion: Heating fuels and biomass
  - Scope 2
    - Indirect Emissions: Electricity
Challenges

- Data was decentralized.
- Most estimates of energy use at facilities were based on financial figures.
- Some information collected was not in electronic form.
- Multiple fuel sources for vehicles made fuel use hard to track.
DNR Vehicle Fleets
<table>
<thead>
<tr>
<th>Vehicle Fleet</th>
<th>Description</th>
<th># Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Vehicles*</td>
<td>Cars, Pick-up Trucks, SUV’s and Vans</td>
<td>936</td>
</tr>
<tr>
<td>Marine Fleet</td>
<td>Outboards Inboards</td>
<td>358 55</td>
</tr>
<tr>
<td>Aircrafts</td>
<td>Helicopters Plane</td>
<td>2 1</td>
</tr>
<tr>
<td>Off-road vehicles</td>
<td>ATV’s, mowers, tractors, snowmobiles, heavy trucks (i.e. dumptrucks)</td>
<td>589</td>
</tr>
</tbody>
</table>

**Total**

DNR has **1941 vehicles**.

*Includes 5 hybrid and 200 flex-fuel vehicles.*
Breakdown by Unit

DNR Highway Vehicle Fleet

- Parks
- Natural Resources Police

# Vehicles

Unit

Vans
SUVs
Pick-ups
Cars

0 50 100 150 200 250 300 350

1 2 3 4 5 6 7 8 9 10 12 13 14 17
FACT: 95% of the fuel purchased is gasoline.

Source: Commercial Fuel Systems
Emissions vary by fuel type

Source: The Climate Registry General Reporting Protocol
Vehicle Fleet Carbon emissions

FY 2006

- Highway Fleet
- Off-road Vehicles
- Marine
- Aviation

Metric tons CO2
DNR Facilities
# Buildings

<table>
<thead>
<tr>
<th>Category</th>
<th>Buildings</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNR Owned and Operated</td>
<td></td>
<td>2,640,505</td>
</tr>
<tr>
<td></td>
<td></td>
<td>241,278</td>
</tr>
<tr>
<td>Leased from DGS</td>
<td></td>
<td>213,136</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,988</td>
</tr>
<tr>
<td>Leased from private entity</td>
<td></td>
<td>36,804</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3,141,711</td>
</tr>
</tbody>
</table>
Metric Tons CO2-e Emitted, FY 2006

- Electricity: 6,833 metric tons CO2-e
- Fuel Oil #2: 1,398 metric tons CO2-e
- Propane: 575 metric tons CO2-e
Maryland’s Fuel Mix

Maryland’s Net Generation
Coal 60.2 %
Nuclear 28.4 %
Natural Gas 3.2 %
Oil 1.2 %
Hydro 4.3 %
Non-Hydro Renewables and Other 2.6 %

Source: http://www.getenergyactive.org/fuel/state.htm
In FY 2006, DNR emitted 17,284 metric tons of CO₂ equivalents.
Breakdown of CO$_2$-e Emissions

- Vehicles: 52%
- Electricity: 38%
- Fuel Oil #2: 4%
- Propane: 6%
Equivalent to emissions from...

- **Annual electricity use of 2289 households**
- **40,196 barrels of oil**
- **3166 cars**
- **196 acres deforestation**
<table>
<thead>
<tr>
<th>State Entity</th>
<th>Washington</th>
<th>Maryland</th>
<th>Oregon</th>
<th>Florida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>FY 2006</td>
<td>FY 2006</td>
<td>FY 2006</td>
<td>FY 2006</td>
</tr>
<tr>
<td>Scope</td>
<td>Department of Ecology Headquarters</td>
<td>Maryland DNR</td>
<td>State agencies (70) including Oregon University System (7)</td>
<td>Selected state agencies</td>
</tr>
<tr>
<td>Protocol</td>
<td>Personalized Spreadsheet based off of many sources</td>
<td>The Climate Registry</td>
<td>Clean Air-Cool Planet</td>
<td>WRI/WBCSD</td>
</tr>
<tr>
<td>GHG included</td>
<td>Unclear</td>
<td>CO₂, N₂O, CH₄</td>
<td>All</td>
<td>CO₂</td>
</tr>
<tr>
<td>Stationary Combustion</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Indirect Emissions</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mobile Combustion</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Employee Commuting</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Purchases</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>GSF Office Space</td>
<td>3 million</td>
<td>20 million owned / 4 million leased</td>
<td>16.8 million</td>
<td></td>
</tr>
<tr>
<td><strong>Total GHG emissions</strong> (metric tons)</td>
<td>5,556</td>
<td>17,284</td>
<td>544,821</td>
<td>899,107</td>
</tr>
</tbody>
</table>
Carbon Cutting Strategies
Options to ESCape emissions

- **Efficiency**
  - Use fossil fuels more efficiently.
    - Technology
    - Behavioral Changes

- **Substitution**
  - Replace fossil fuels with renewable sources and lower emission sources.

- **Capture**
  - Implement projects and manage resources to sequester carbon.
Transportation

Formation of a transportation task force to consider the following:

- Policies to Reduce Vehicle Miles Traveled
- Fleet purchasing policy
  - System to promote hybrids and downsizing
- Use of lower emission fuels (i.e. ethanol)
- Maintenance education program and tracking system
Facilities

- Energy standards for upgrades and new buildings
- Prioritize upgrades on energy demanding facilities (focused)
- Agency-wide purchases (general)
  - Fluorescent bulbs
  - Light sensors
  - Insulation
  - Software
- Demonstration sites for renewable energy
Capture

- Afforestation and reforestation on newly acquired DNR lands.
- Improved forest management on existing DNR lands.
- Combining carbon sequestration with ecosystem restoration
  - Salt marsh
  - Riparian Zones
- Using easements to meet multiple DNR goals: sea level rise adaptation, green infrastructure and carbon sequestration.
DNR progress

- Formation of a transportation working group.
- Energy audits at 4 state parks.
- Geothermal heating at Rocky Gap State Park.
- Energy Upgrades at Deep Creek State Park.
- Going forward with Carbon Forest Sequestration Project.
## Transportation Strategies

<table>
<thead>
<tr>
<th>Action</th>
<th>Quantity</th>
<th>Carbon emission reduction</th>
<th>Costs/Savings</th>
<th>ESC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce mileage (13,200,000 miles)</td>
<td>15%</td>
<td>7%</td>
<td>+++</td>
<td>E</td>
</tr>
<tr>
<td>Replace gasoline with ethanol (710,600 gallons gasoline)</td>
<td>10%</td>
<td>5%</td>
<td>-</td>
<td>S</td>
</tr>
<tr>
<td>Increase mpg fleet (15 mpg)</td>
<td>+ 2 mpg</td>
<td>5%</td>
<td>---</td>
<td>E</td>
</tr>
</tbody>
</table>

**TOTAL**                                      | 17%      |              |               |     |
## Facilities Strategies

<table>
<thead>
<tr>
<th>Action</th>
<th>Quantity</th>
<th>Carbon emission reduction</th>
<th>Costs/Savings</th>
<th>ESC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce electricity use (13,059 MWh)</td>
<td>25%</td>
<td>9%</td>
<td>+/-</td>
<td>E,S</td>
</tr>
<tr>
<td>Replace fuel oil with propane (106,691 gallons fuel oil)</td>
<td>50%</td>
<td>5%</td>
<td>-</td>
<td>S</td>
</tr>
<tr>
<td>Replace electricity with renewable energy</td>
<td>10%</td>
<td>3%</td>
<td>-</td>
<td>S</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>17%</th>
</tr>
</thead>
</table>
Cutting the pie

Emission reductions

- Transportation: 17%
- Facilities: 17%
- Other: 66%
Acknowledgements

- Advisory Team: Zoe Johnson, Christine Conn, Sean McGuire, Steve Koehn, John Sherwell, David Burke, and Joel Dunn
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- Facilities: Diane Russell, Rich Norling, Jordan Loran, John Moore, and Allan Pitts
- Land: Gene Piotrowski and Jean Lipphard
- Office for a Sustainable Future
- Commercial Fuel Systems
- Maryland DGS
QUESTIONS?