Slides for Discussion Session
Wood Carbon Seminars
Cynthia West
April 30, 2020
US Forests Net Carbon Flux Over Time

Southeastern plantation forests and biodiversity

Species Richness in US Forests

Acres of planted trees by county


Articles:
Components of the Nation’s Forest Sink
EPA 2020 GHG Inventory (2018 data)

Million metric tonnes CO2e/year

<table>
<thead>
<tr>
<th>Emissions</th>
<th>Woodlands</th>
<th>Non-CO2</th>
<th>Conversion From Forest</th>
<th>Conversion to Forest</th>
<th>Urban Trees</th>
<th>Harvested Wood Products</th>
<th>Forest Land</th>
</tr>
</thead>
</table>
| Total Net Sink = 752.9 MMTCO2e/yr
Land Use Conversion
Nation’s Forest Sink
EPA 2020 GHG Inventory (2017 data)

Million metric tonnes CO2e/year

**Components of Nation’s Forest Sink**

<table>
<thead>
<tr>
<th>Carbon Source</th>
<th>Carbon Sink</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To Forest Land Use</strong></td>
<td><strong>From Forest Land Use</strong></td>
</tr>
<tr>
<td>Cropland</td>
<td>-46.3</td>
</tr>
<tr>
<td>Grassland</td>
<td>-9.7</td>
</tr>
<tr>
<td>Other lands</td>
<td>-14.9</td>
</tr>
<tr>
<td>Settlements</td>
<td>-38.9</td>
</tr>
<tr>
<td>Wetlands</td>
<td>-0.9</td>
</tr>
</tbody>
</table>

Total Net Source = 16.7 MMTCO2e/yr

From Forests to Forests:
- Cropland: 48.7
- Grassland: 15.9
- Other lands: 62.9
- Settlements: 38.9
- Wetlands: 0.9

To Forests from Forests:
- Cropland: -46.3
- Grassland: -9.7
- Other lands: -14.9
- Settlements: -38.9
- Wetlands: -0.9

Source: USEPA 2017/FS data
Components of North Carolina’s Forest Sink
EPA 2020 GHG Inventory (2018 data)
Million metric tonnes CO2e/year

Carbon Sink
Total Net Sink = -43.23 MMTCO2e/yr

Carbon Source
-35  -30  -25  -20  -15  -10  -5  0  5  10

Woodlands
Non-CO2
Conversion From Forest
Conversion to Forest
Urban Trees
Harvested Wood Products
Forest Land

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td>0</td>
<td>0</td>
<td>5.5</td>
<td>-4.2</td>
<td>-8.2</td>
<td>-5.93</td>
<td>-30.4</td>
</tr>
</tbody>
</table>
Land Use Conversion

North Carolina’s Forest Sink
EPA 2020 GHG Inventory (2017 data)

Million metric tonnes CO2e/year

TO FOREST LAND USE

Carbon Sink

Settlements

Other lands

Cropland

FROM FOREST LAND USE

Carbon Source

Total Net Source = 1.3 MMTCO2e/yr

<table>
<thead>
<tr>
<th></th>
<th>Cropland</th>
<th>Other lands</th>
<th>Settlements</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Forests</td>
<td>2.5</td>
<td>0</td>
<td>1.3</td>
</tr>
<tr>
<td>To Forests</td>
<td>-1.7</td>
<td>-0.2</td>
<td>-2.2</td>
</tr>
</tbody>
</table>
Disturbances in regional context: management dominated

Effect of Different Disturbances, 1990-2011, on Carbon Storage in the Southern Region

- Harvest 67%
- Fire 24%
- Insect 5%
- Wind 4%

Healey et al. in review

14 National forests

(5a)
Components of Montana’s Forest Sink
EPA 2020 GHG Inventory (2018 data)

Total Net Source = 12.17 MMTCO2e/yr

<table>
<thead>
<tr>
<th>Carbon Source</th>
<th>Woodlands</th>
<th>Non-CO2</th>
<th>Conversion From Forest</th>
<th>Conversion to Forest</th>
<th>Urban Trees</th>
<th>Harvested Wood Products</th>
<th>Forest Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td>0</td>
<td>3.9</td>
<td>0.2</td>
<td>-1.7</td>
<td>-0.1</td>
<td>-0.63</td>
<td>10.5</td>
</tr>
</tbody>
</table>
Total Net Sink = -1.5 MMTCO2e/yr

Montana’s Forest Sink
EPA 2020 GHG Inventory (2017 data)
Million metric tonnes CO2e/year

Land Use Conversion

<table>
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<thead>
<tr>
<th>Land Use</th>
<th>From Forests</th>
<th>To Forests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grassland</td>
<td>0</td>
<td>-1.1</td>
</tr>
<tr>
<td>Other lands</td>
<td>0</td>
<td>-0.6</td>
</tr>
<tr>
<td>Settlements</td>
<td>0.2</td>
<td>0</td>
</tr>
</tbody>
</table>

Carbon Sink

Carbon Source
Components of Colorado’s Forest Sink
EPA 2020 GHG Inventory (2018 data)

Total Net Source = 10.39 MMTCO2e/yr

<table>
<thead>
<tr>
<th>Carbon Source</th>
<th>Carbon Sink</th>
<th>Million metric tonnes CO2e/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Land</td>
<td></td>
<td>11.1</td>
</tr>
<tr>
<td>Harvested Wood Products</td>
<td></td>
<td>-0.61</td>
</tr>
<tr>
<td>Urban Trees</td>
<td></td>
<td>-0.4</td>
</tr>
<tr>
<td>Conversion to Forest</td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>Conversion From Forest</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>Non-CO2</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Woodlands</td>
<td></td>
<td>0.6</td>
</tr>
</tbody>
</table>

Million metric tonnes CO2e/year

Woodlands: 0.6
Non-CO2: 0.1
Conversion From Forest: 0.6
Conversion to Forest: -1
Urban Trees: -0.4
Harvested Wood Products: -0.61
Forest Land: 11.1
Total Net Sink = \(-0.45\) MMTCO2e/yr

Land Use Conversion

Colorado's Forest Sink

EPA 2020 GHG Inventory (2017 data)

Million metric tonnes CO2e/year

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<td>0</td>
<td>0</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>To Forests</td>
<td>0</td>
<td>-0.4</td>
<td>-0.6</td>
<td>0</td>
</tr>
</tbody>
</table>
Disturbances in regional context:
natural disturbance dominated

Healey et al. in review

Effect of Different Disturbances, 1990-2011, on Carbon Storage in the Intermountain Region

- Fire: 52%
- Insect: 44%
- Harvest: 4%

12 National forests

![Map showing 12 National forests with different colors for each forest, with years 1991 to 2011 on the x-axis and percentage of forest disturbed on the y-axis.]

(5a)

- Abiotic
- Insects
- Harvest
- Fire

Healey et al. in review
Narrow view of the forest system

- Concerned with emissions on shorter time scales and limited geographical extent
- Source/sink trends main way to view impacts of management activates
- Considers narrower range of activities that influence carbon positively

E.g., timber harvesting would have an immediate negative impact.
Complete View of the Forest System

- Concerned with emissions on longer time scales and broader geographical extent
- Impacts of management activates are considered more holistically – closer to what the atmosphere actually “sees.”
- Considers broader range of activities that influence carbon positively

E.g., timber harvesting would have a positive impact right away.

McKinley et al. 2011