Approaches to Quantifying and Reducing Net GHG Emissions from Forests, Wetlands, and Agriculture

Scientific and Technical Working Group of the Maryland Climate Change Commission

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Scope of this Presentation

- Possible improvements to the GHG inventory
- Scenario analyses to identify potential GHG source reductions & C sink increases
- Identify co-benefits of reducing net GHG emissions

Wetlands

- Wetlands are included in the inventory only with respect to their drainage for cultivation or construction, but wetlands also gain or lose C through other processes.
- Depending on policy responses to sea level rise (SLR), wetlands could be significant C sources or sinks
- Where there are barriers to inland migration of wetlands, wetland loss and C loss due to SLR will not be offset by wetland gains inland
- Policy options to avoid C loss from SLR and promote C gain include living shorelines, avoiding hardened shorelines, & managing hydrology to provide sufficient sediment supply for marsh accretion.
- Remote sensing, DEM models, and studies on C accretion/loss rates have permitted regional estimation of these potential sinks and sources (see next slide)
- Co-benefits to C sinks include increasing or not losing wetland habitat important for biodiversity, fisheries, and recreation

Predictions of Coastal Vegetation Change Associated with Sea Level Rise

Andrew J. Elmore, et al. , Univ. MD Center for Environmental Science

The fate of coastal habitats in the Potomac River estuary in response to sea level rise was modeled:

- If all developed land is protected through the construction of sea walls and levees, 10% of tidal habitat is lost by 2050 and 40% is lost by 2100.
- However, if uplands are allowed to become tidal wetlands, then there is no net habitat loss.
- The sacrificed upland that converts to tidal habitat is 60% NPS land and 40% private land.
- All map products and interpretation are available online: https://irma.nps.gov/DataStore/Reference/Profile/2223826

Forests

- **Current inventory assumes continuing trend in growth rates measured in USDA-FS FIA plots. However:**
- **FIA plots are known to under-represent disturbance due to fire, insects, and land use fragmentation, which are known concerns in MD**
- **Increasing recognition of need for fire risk management is likely to require more controlled burns and/or thinning**
- **Decreasing nitrogen (N) deposition due to the Clean Air Act (generally a good thing) is reducing N availability for forests, which could lead to future decreases in growth rates (see next slide)**
- **Regional scale models, supported by remote sensing & biometric data, can assess the regional magnitude of fire, insect, fragmentation, and N impacts on forest growth and the state's assumption that it can count on a future forest C sink**
- **Co-benefits include improved fire management**

nature plants

LETTERS

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Earlier springs are causing reduced nitrogen availability in North American eastern deciduous forests

Andrew J. Elmore[1]*, David M. Nelson[1] and Joseph M. Craine[2]

"Given current trajectories of environmental changes, nitrogen limitation is likely to continue to increase for these forests, possibly further limiting carbon sequestration potential."

Agriculture

- **Emissions attributable to agriculture** are probably higher than only 2% of total statewide emissions. Some of the emissions from agriculture are either accounted under other sectors or not accounted at all (e.g. on-farm energy use and energy consumption embedded in fertilizer products).
- **Mitigation opportunities**
  - Improved Nitrogen use efficiency and water use efficiency could reduce GHGs from fertilizer production, irrigation, & other energy uses.
  - Several Nitrous Oxide Reduction Protocols have been developed in other US regions to calculate GHG “credits” for farmers who adopt BMPs (see next slide). Scenario analysis would demonstrate the potential of net GHG emission reduction efficacy if such credits were offered in the MD context
- **Co-benefits** include reduced nitrogen leaching to groundwater and to the Chesapeake Bay and potential economic advantages for farmers

Nitrous Oxide Reduction Protocols:

Verified Carbon Standard. http://www.v-c-s.org/
American Carbon Registry. http://americancarbonregistry.org/
Climate Action Reserve. http://www.climateactionreserve.org/

Field-to-Market's Fieldprint Calculator:

https://calculator.fieldtomarket.org/fieldprint-calculator/

Conclusions

- **Management of wetlands, including responses to sea level rise, will likely affect net GHG emissions in the near future, if not already.**
- **Responses to decreasing N deposition and impacts of fire risk management could alter past trajectories of forest C sinks**
- **The agriculture sector has potential to reduced net GHG emissions through improved energy and N use efficiencies and through innovative credits for BMPs**
- **In each case, current inventories could be improved, scenario analysis could demonstrate important future changes, and co-benefits can be identified**