Considerations and Options for Biogenic Emissions Accounting Framework for Biomass from Forest Systems Used by Stationary Sources

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POLICY OBJECTIVE:
Develop a metric to compare the carbon intensity across different biomass sources in order to create economic incentives to reward stationary sources for their use of fuels with lower carbon intensities.

FRAMEWORK PRINCIPLES: To achieve the policy objective within a biogenic accounting framework will require consideration of the following requirements:

1) The framework is economically operational for landowners, biomass manufacturers and facility operators.

2) The framework is scaled to use available, robust forest data with appropriate confidence intervals. [i.e. framework scale is not too small]

3) The framework is scaled to provide a meaningful feedback loop when biomass markets begin to affect forest carbon stores. [i.e. framework scale is not too large]

4) The framework minimizes and accounts for leakage.

5) The framework measures and tracks real-time, observable changes, in emissions, rather than estimates potential future carbon shifts.

REGIONAL APPROACH: How to balance accounting accuracy with data availability and transmitting economic incentives?

1) **Which lands to include in accounting system?**
    a. In order to help private actors differentiate the emissions impacts of different biomass sources, the goal of the framework should be to evaluate carbon stock changes on those "working" lands that can be potentially influenced by activities related to biomass use for energy. The accounting should exclude those lands not available to management though legal or practical considerations (e.g. slope) as carbon stock changes on these non-working lands are not relevant for measuring the impact of biomass use on net carbon emissions.

b. The available data from the U.S. Forest Service's Forest Inventory and Analysis (FIA) program provides a variety of information for excluding non-working lands.
    i. Legally reserved lands should be excluded.
    ii. Other legal or economic characteristics (e.g. high slopes) can be used to exclude additional lands combined with information on removals and history of management.
    iii. But it is not possible to perfectly screen out which lands are not working and not working based on the information in FIA. As discussed below, additional information can also be used in setting the baseline so as to adjust for carbon accumulation on non-working lands.

2) **What baseline to use to measure changes in net carbon?**
    a. Baselines should be defined accurately but simply based on empirical data.
        i. The anticipated future baseline approach is intuitively appealing, but economic modeling and projections introduces additional sources of uncertainty and complexity.
        ii. The reference point approach is appropriate as a benchmark against which to measure the effect of marginal changes of biomass use in the case that the carbon stocks in the region under examination are currently stable. In a managed forest case, this would be the situation in the case of a sustainable management regime with an even age class distribution.
        iii. An appropriate use of the reference point approach requires:
            1. a large enough working landscape and time scale such that carbon stocks are approximately stable
            2. Adjustment of the baseline to eliminate any free-riding off of 'non-working' lands
        iv. FIA data on the ratio of removals to growth in a region could be used to approximate the share of lands that are working versus non-working (e.g. figure 6). While a flat (reference point) carbon stock baseline could be assumed for the working share of the landscape, carbon accumulation on the non-working share could be projected based on data on the age structure of the forests. This approach would establish a baseline consistent with the empirical data available with minimal required assumptions.

3) What spatial and temporal scale required to get appropriate confidence intervals?

    a. An area at least the size of a state and generally larger is needed to detect a change in carbon stocks on non-reserved lands with a reasonable level of confidence. Figures 1 and 2 show that based on the best available data from FIA, there are large uncertainties in measuring carbon stock changes over a 5-year period on legally non-reserved lands at the level of states. This is reflected by the large confidence intervals relative to the measured changes.

b. The level of confidence for detecting changes rises with a larger forest area (Figure 3) and longer measurement interval (Figures 4 and 5). Figure 3 suggests that a region based on the immediate vicinity (e.g. 50 mile radius) of an individual facility will be too small to detect carbon stock changes on non-reserved lands with reasonable confidence given the best available data from the FIA. ***Bottom line – facility based accounting cannot be done with any statistical validity based on FIA data and would require full chain of custody accounting.***

c. Extending the measurement interval to two FIA cycles (about 10 years) in part reduces the improved precision from expanding the region size – longer measurement intervals can be coupled with slightly reduced regions if that were desirable. Nevertheless, confidence intervals relative to carbon stock changes do not fall below 22% at the level of states (figure 5).

4) What spatial and temporal scale required to get desired economic incentives and feedback signals?

a. Data requirements to get reasonable precision in detecting stock changes requires bigger regions measured over longer time frames, while smaller regions and shorter times are required to get a strong signal and feedback loop to influence the actions of specific facilities.

b. Given existing data constraints, no transactionally viable framework can accurately measure the impacts of an individual facility, so conservative approach to ensure losses in carbon stocks are detected and avoided should be adopted:

   i. Use the lower end of the confidence bar in figure 1, for example, to detect sooner rather than later if carbon stocks are being reduced.

   ii. Concentrate incentives on the marginal actor, as described below.

c. In addition to a regional default factor, differentiating further by feedstocks and allowing individual facilities to demonstrate performance above the default BAF should be an option.

5) Which facilities to include in BAF vs. facilities to grandfather?

a. An average BAF for all facilities across a region will provide a weak signal to influence decisions.

b. The framework should focus on the marginal facility that is incrementally increasing biomass feedstock use over and above current installed capacity.

c. Figures 7a, b, and c provide an example for a region in eastern Virginia from a presentation by Christopher Galik and Bob Abt. Their modeling estimates that the net carbon impacts from having one facility (#3809) are near zero and that the major share of the total net carbon changes come from having a third facility (#3793) versus just one or two. The framework should target incentives to influence the behavior of this marginal actor.

d. This can be done by treating existing facilities as part of the baseline (with a 0 BAF at least for some time) and assigning future changes in BAF to the marginal entrants. The current capacity used by existing actors with a BAF of 0 can be treated as a free allocation that could potentially be tradable.

6) How can leakage be accounted for?

a. Accounting for international leakage can be accomplished with a simple methodology despite relatively high volatility in associated markets (pulp; timber). By using ratios of the amount of net trade (importation minus exportation) versus national production over time it is possible to adjust the baseline to reflect any increase in the relative rate of net trade. This captures any increase in pressure on the rest of the world from either greater net imports or lowered net exports.

b. This calculation is simplest if done on a national scale by product category, but could be also done so as to adjust among regions as well. If proportional net trade rises by more than the 95% confidence interval then BAFs would adjusted to compensate for the displaced emissions.

<u>Appendix</u>. ***Figures 1-5 based on Forest Inventory and Analysis (FIA) database, prepared by Ray Sheffield.***

Figure 1.

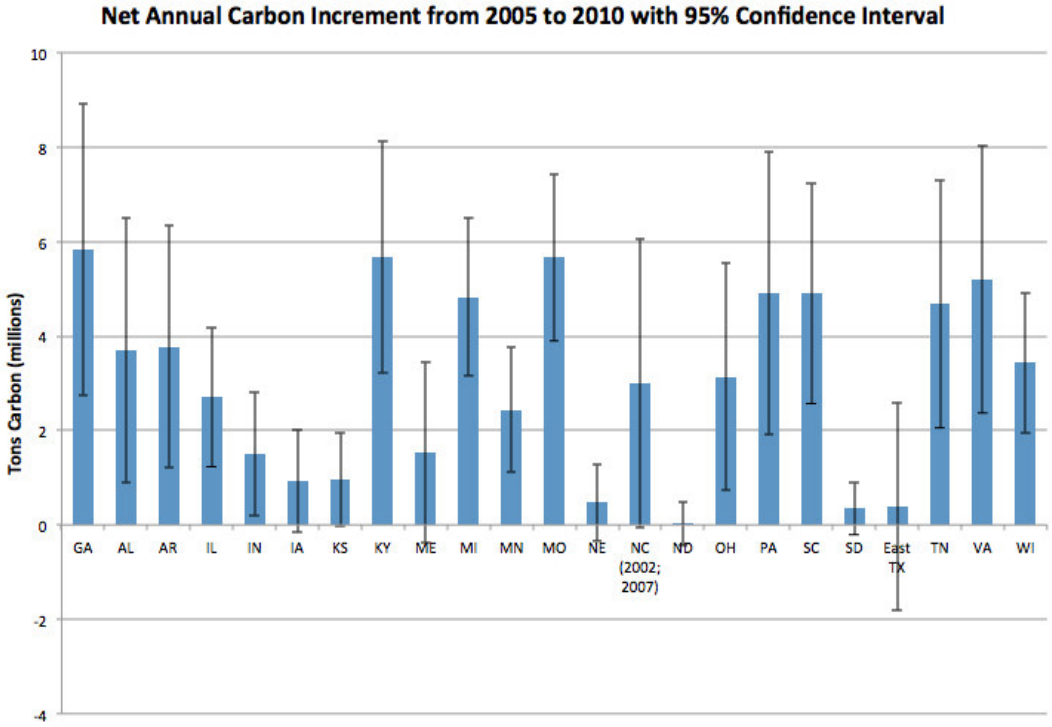


Figure 2.

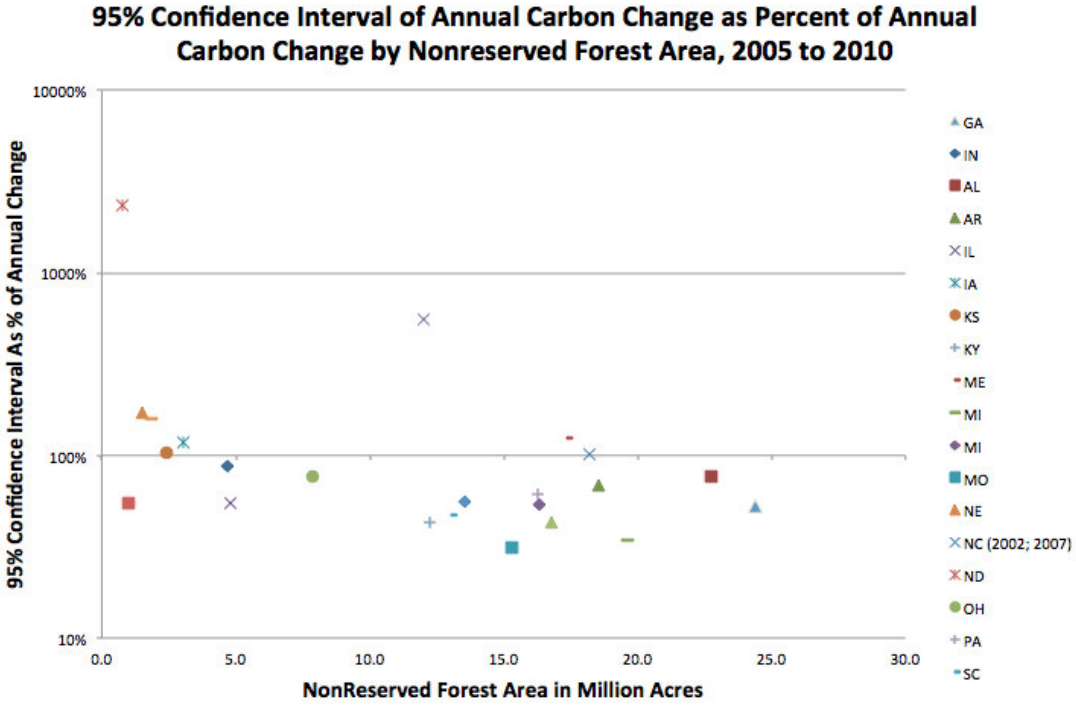


Figure 3.

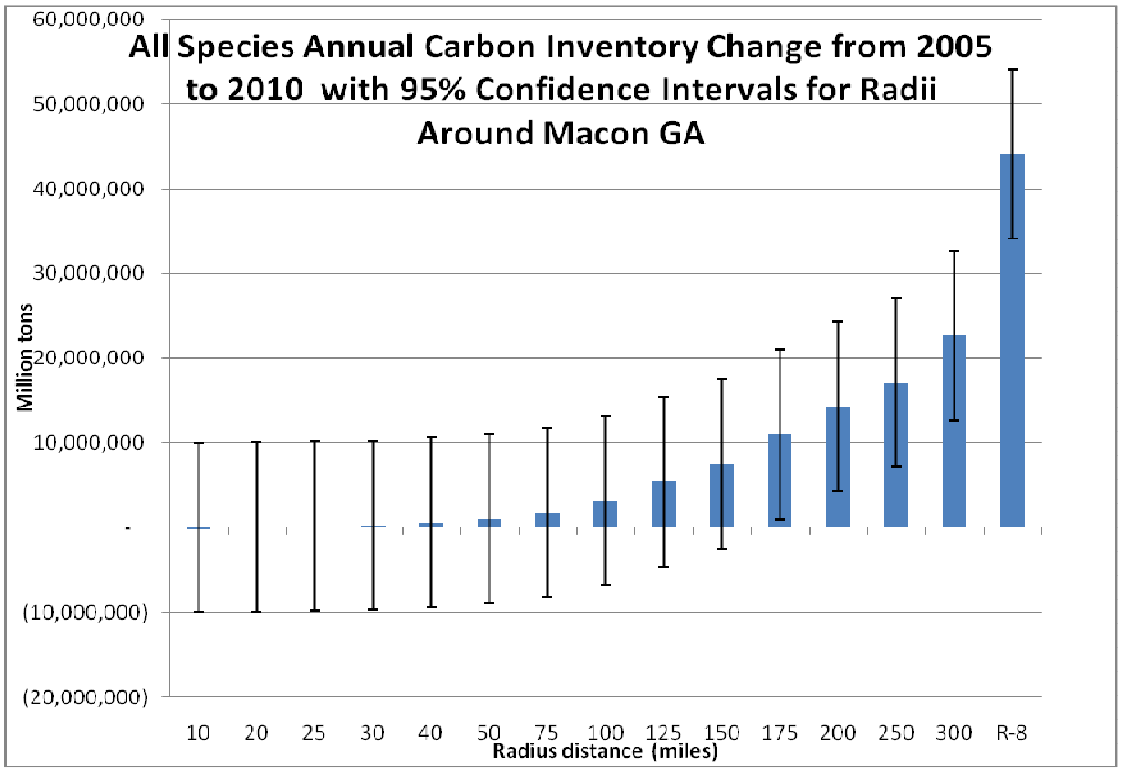


Figure 4.

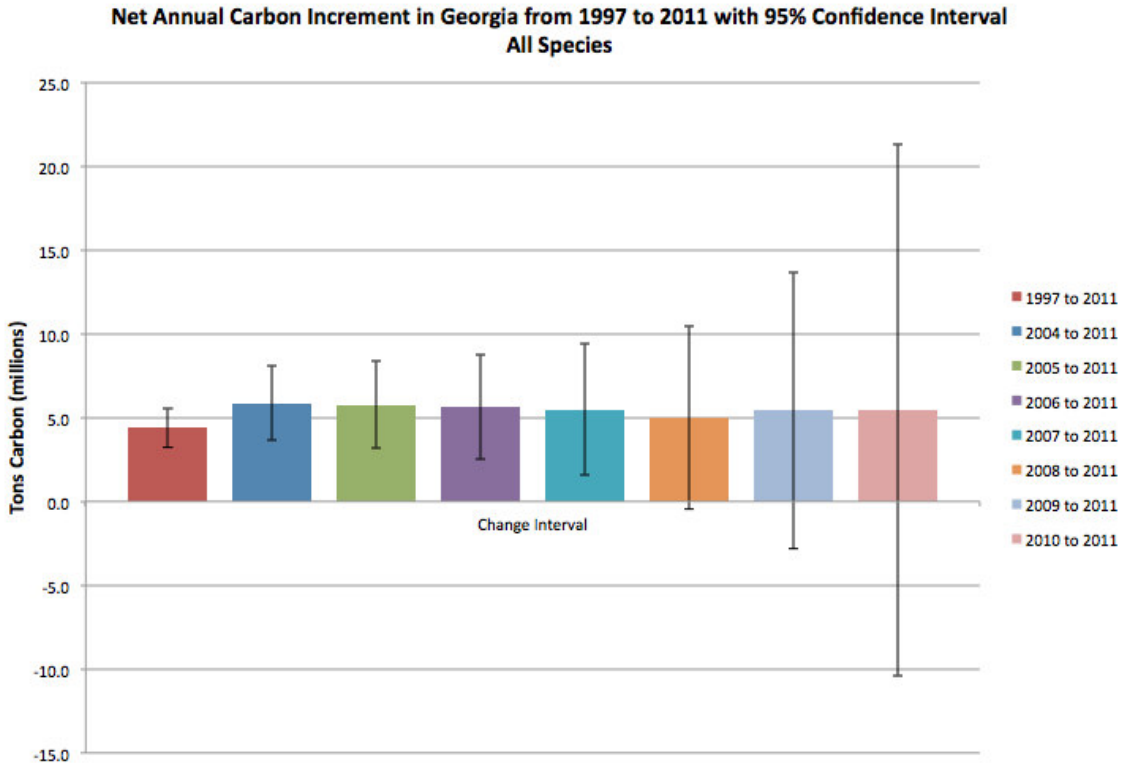


Figure 5.

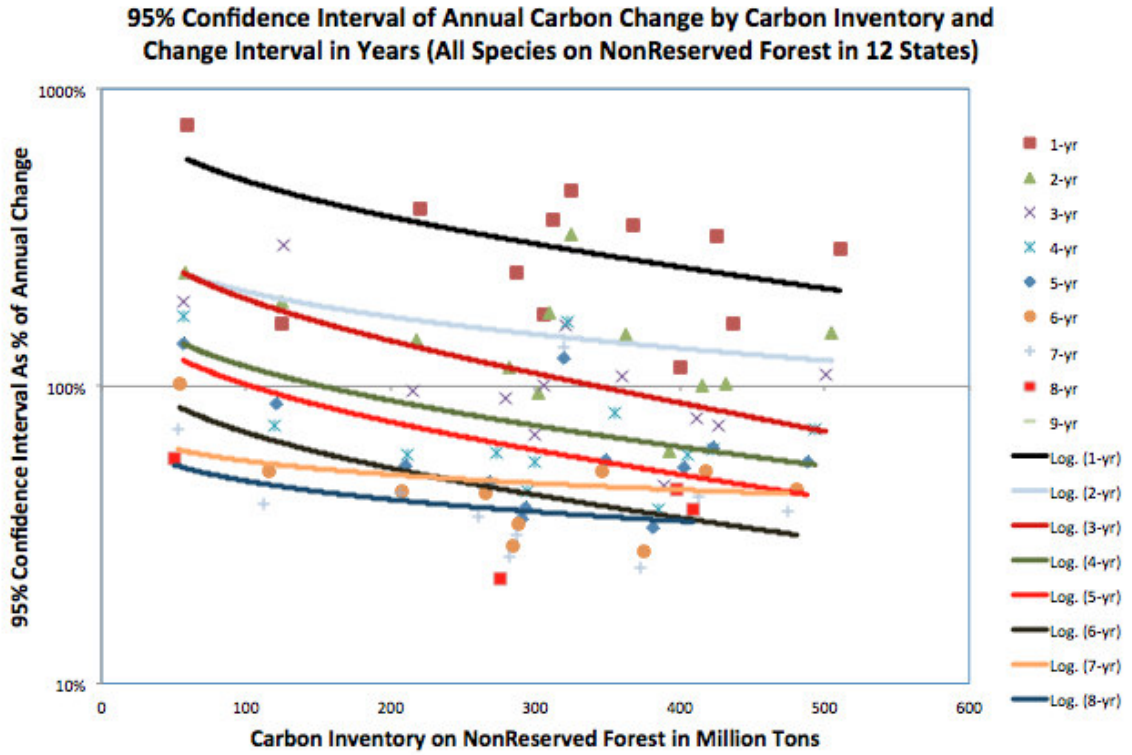
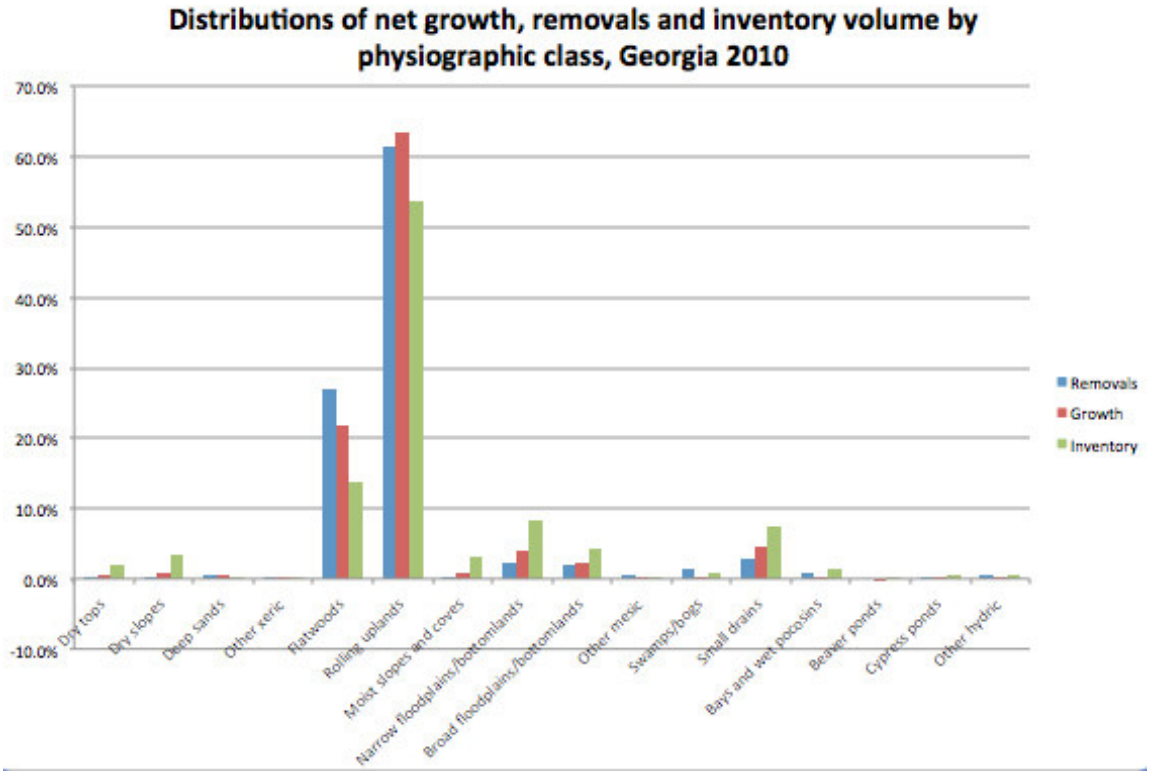
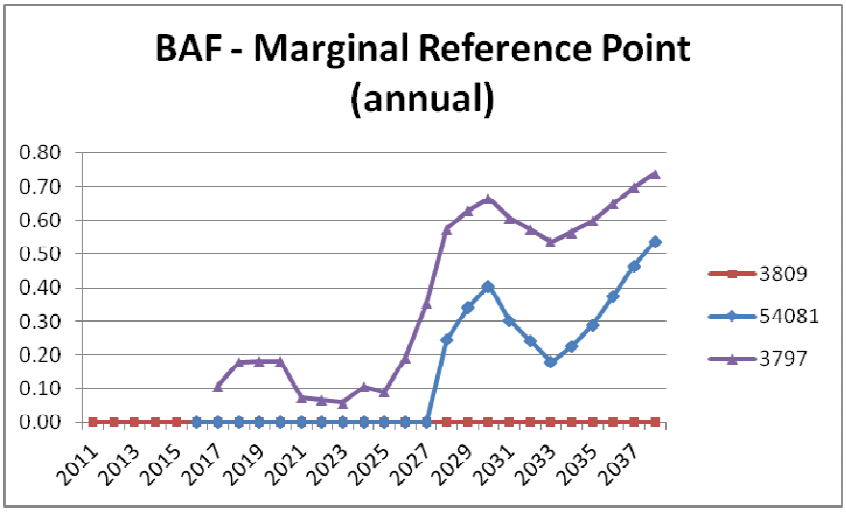
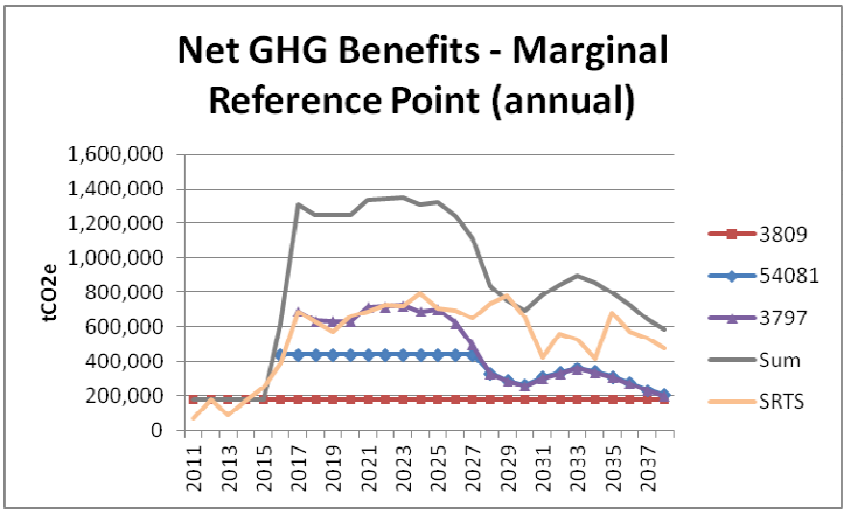


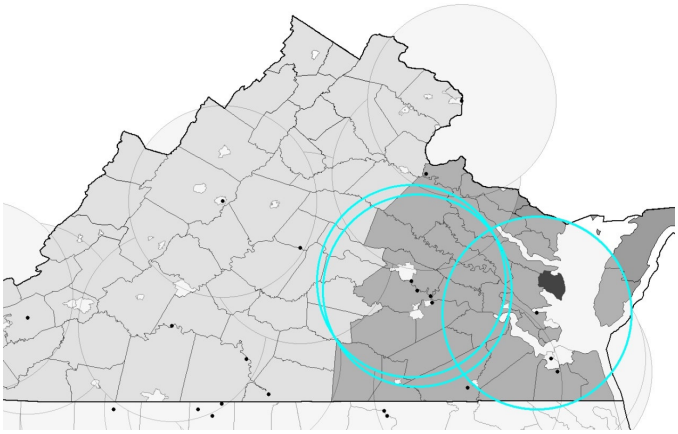
Figure 6.



Figures 7a, b, and c. Modeling of Marginal Facility-Level Accounting in a Virginia Region







Source: Christopher Galik and Robert Abt. Presentation on "Empirical Assessments of Woody Biomass Greenhouse Gas Accounting Perspectives." Washington, DC. 14 May 2012.