

Carbon Consequences of forest disturbance and recovery across the conterminous United States

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Objectives:

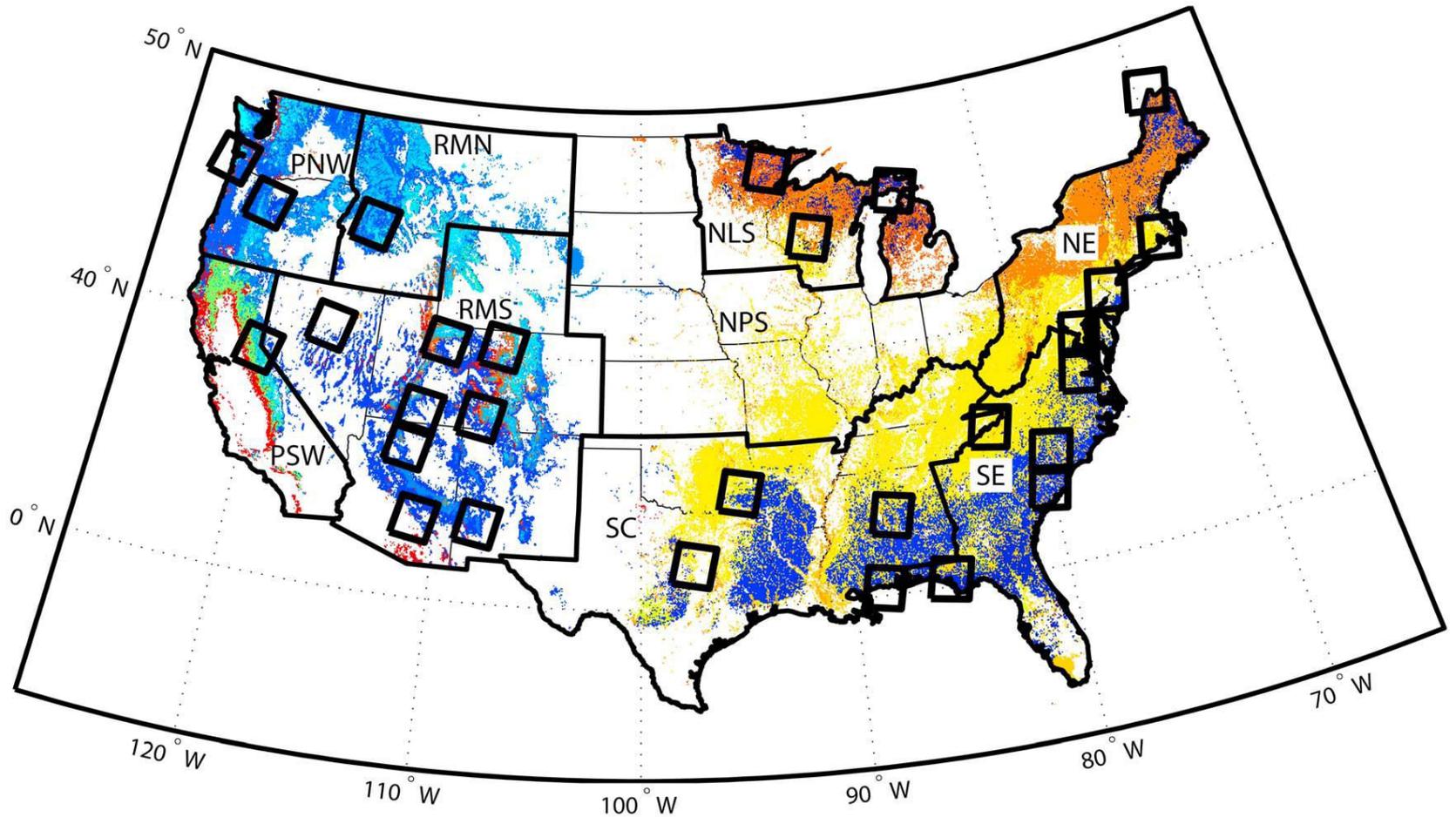
- This study seeks a comprehensive assessment of the carbon consequences of past and present forest disturbance and recovery across the conterminous United States.
- FIA data on the age structure of US forests and carbon stocks as a function of age are used to parameterize forest disturbance and recovery processes in the carbon cycle model.
- The two-step analysis includes fitting a first-order terrestrial carbon cycle model (CASA) to grow wood stocks consistent with FIA data, then applying the trajectories to landscapes with forest age maps obtained from FIA age distributions to derive maps of NEP and biomass.
- Analysis centers on 28 representative climate settings distributed among forested regions of the conterminous U.S.
- An assessment of discrepancies between FIA estimates of stock changes and those from the model are assessed in terms of modeling errors and potential growth enhancements above and beyond recovery.

New Science:

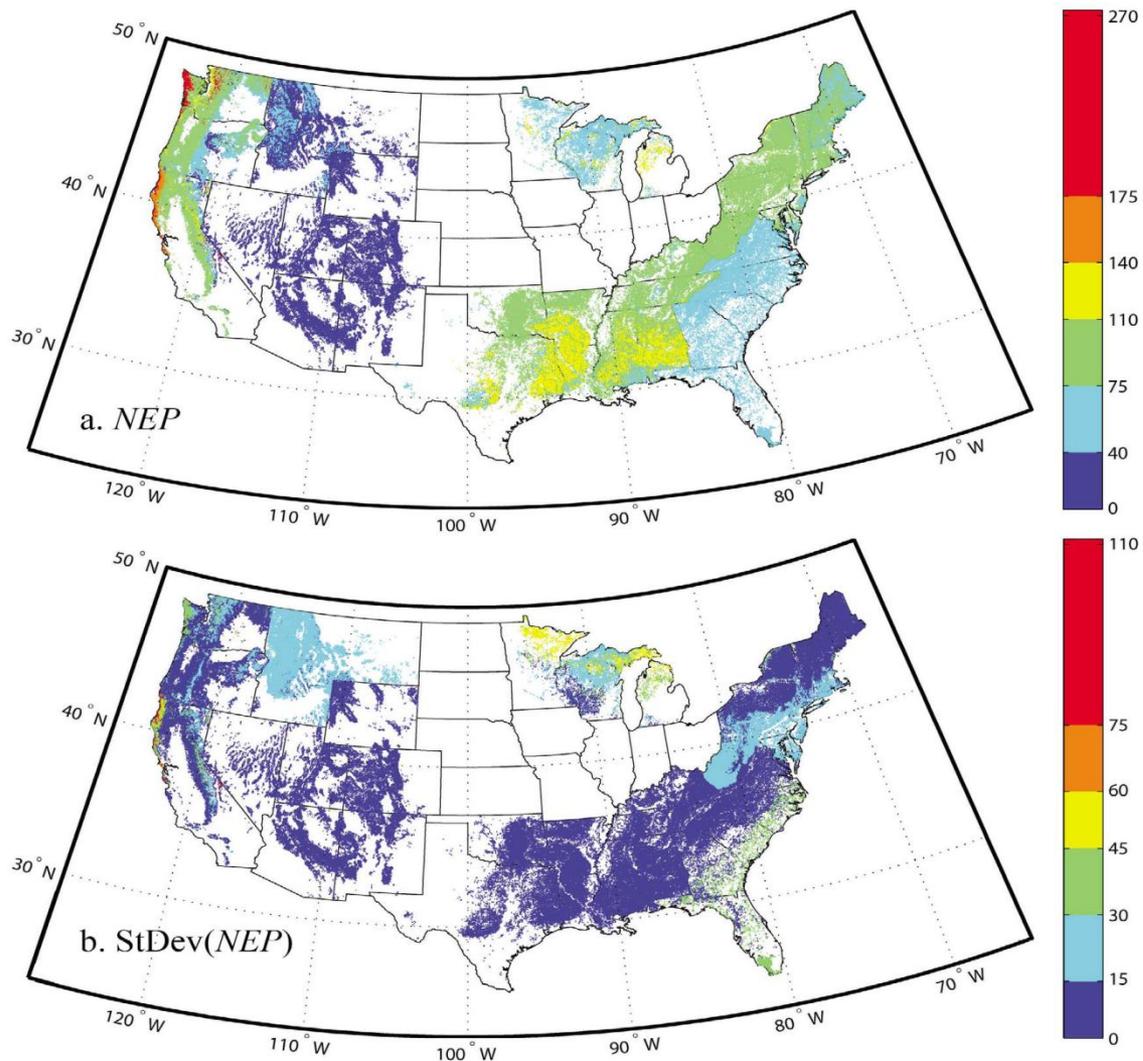
- The major finding is that the study's age-accumulation model estimated a much smaller net sink of carbon in conterminous U.S. forests than have been previously estimated when using the stock-change approach as used in UNFCCC reporting and FIA estimates of stock changes.
- The source of the large across-study inconsistencies of carbon estimates remains largely unexplained.
- Paucity of data regarding observed net ecosystem productivity and biomass chronosequences limits the ability to evaluate modeled responses.
- Such observations are critically necessary in order to adequately test models representing disturbance and subsequent recovery.

Significance:

- The mechanisms underlying forest stock may include recovery of forests from past disturbances, net increases in forest area and growth enhancement driven by climate or by fertilization by CO₂ and Nitrogen.
- Additional observations on net ecosystem productivity and biomass chronosequences are inadequate at the present time to ensure accurate estimation of models of carbon consequences of forest disturbance and recovery.



Conterminous U.S. distribution of forest type groups shown with thick state boundaries that trace regions from the Resource Planning Act Assessment by the U.S. Forest Service. Colors differentiate FIA forest type groups. The rectangles represent areas where gridded climate and phenology were used in the simulation of fluxes and stocks for each forest type within each rectangle.



Map of average (a) net ecosystem productivity and (b) uncertainty expressed as one standard deviation (NEP in $\text{g C m}^{-2} \text{a}^{-1}$) for forests of the conterminous United States.