Potential of land use and land management for mitigation of carbon emissions and local climate change

David Lawrence (NCAR) and George Hurtt (University of Maryland) and ??
<table>
<thead>
<tr>
<th>Main Scenario</th>
<th>SSP1-2.6 Afforest</th>
<th>SSP3-7 Deforest</th>
<th>SSP5-8.5 Weak Deforest</th>
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Biogeophysical climate impacts of LULCC; assess land management for regional climate mitigation

Assess how impact of LULCC differs at different climate change and CO$_2$ levels
Carbon gained due to re/afforestation differs at different CO$_2$ levels

IAM Projections of Accumulated Land C
IMAGE SSP1-2.6: +27 PgC
AIM SSP3-7: -98 PgC

So, SSP1-2.6 Lu rather than SSP3-7Lu should result in +125 Pg C gain on land
1. Select grid cells with >20% change in tree fraction (2060-2015) in SSP1-2.6
2. For these grid cells, evaluate grid cell carbon difference between SSP1-2.6 and SSP1-2.6wSSP3-7 Land use

Lots of grid cells show little or no C gain and some even show C losses? Why?

• Climate doesn’t support tree growth?
• Trees ‘lose’ competition for water or nitrogen resources?
Delta $T_{\text{air}}$: SSP1-2.6 Land Use – SSP3-7 Land Use

SSP3-7

SSP1-2.6

![Delta $T_{\text{air}}$ maps and line graphs showing the impact of land use changes between SSP1-2.6 and SSP3-7.]
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Biogeophysical climate impacts of LULCC; assess land management for regional climate mitigation

Assess how impact of LULCC differs at different climate change and CO\textsubscript{2} levels

Full effects of LULCC through both biogeophys and biogeochem processes
Emissions-driven: SSP5-8.5 vs SSP5-8.5 with SSP1-2.6 land use

SSP5-8.5
SSP5-8.5 w/ SSP1-2.6Lu

CO2 concentration

total ecosystem C, incl veg but excl cpool

net primary production

conversion C flux (immediate loss to atm)

Wood Harvest C (to prod pools)
Emissions-driven: Impact of differing land use scenarios at SSP1-2.6?

Figure from Kate Calvin