



# Drivers of Land Use Change in Southern Appalachia

## Background

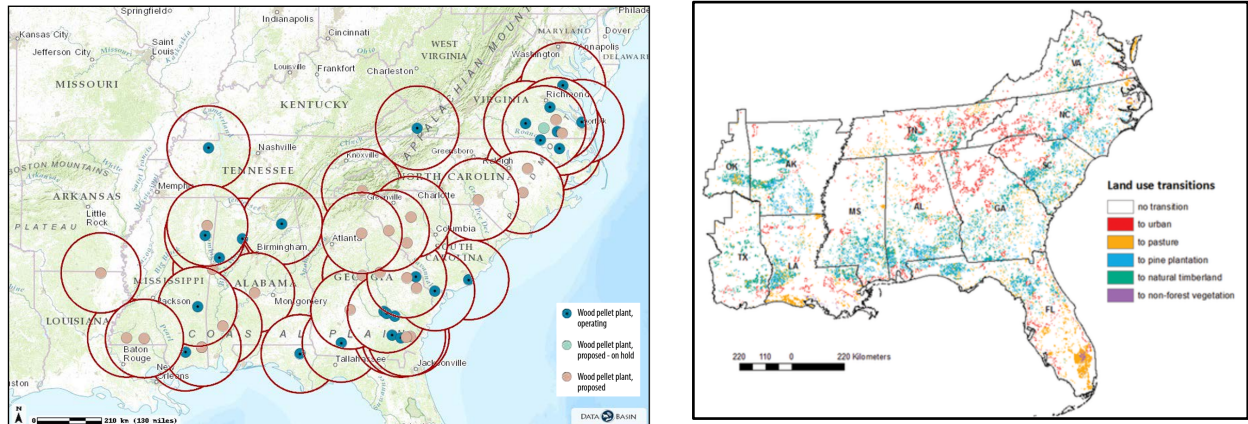
The working economy of Southern Appalachia has always been rooted firmly in the lands it occupies. The foundational socioeconomic and cultural heritage of the region has played out through various legacy land uses, centered on subsistence agriculture and various resource extraction. Over 98% of the landscape has been altered, whether by farming, logging, roads, or mining. This hallmark of Appalachian working lands defines the present landscape, and also constrains future applications.

Multi layered forces make up the present-day driving changes behind a shifting landscape in Appalachia. Fluctuations in the trends of the region's ecologically verdant forests are illustrated through examined scholarly literature:

- 1) With over 80% of lands being privately held, industry market drivers (such as residential and commercial construction and international biomass energy production) dominate the demand of older forests. From a landscape scale view, the land use applications within Southern and Central Appalachia are overwhelmingly held within the purview of private forest landowners.
- 2) Southern Appalachia experienced more than a 10% population growth from 2010 to 2021, surpassing the national average.
- 3) Urban sprawl, the rapid low-density development on the outskirts of large and medium size cities, continues to be most severe in Southern Appalachia, with an expansion rate of 261% from 2006 to 2060.
- 4) Through controversial climate action, the demand to fuel the EU's bioenergy industry is growing rapidly. However, Europe's forests have stringent rules around capacity, and so this demand is therefore largely supplied by



Appalachia's bottomland hardwood forests. In fact, Appalachia afforded 83% of the US's total wood pellet supply amounting to 6.4 million metric tons in 2017 and an even larger proportion granted to the country's exports.



Left: Operating and proposed biomass facilities in the US Southeast and approximate sourcing areas (Source: [NRDC](#)) Right: Modeling the impacts of wood pellet demand on forest dynamics in the southeastern United States. (Source: Duden et. al)

- 5) Regional and conventional BMPs (Best Management Practices) of forests are centered around minimal oversight, resulting in clearcutting, logging, wetland logging, and natural forest conversion to plantations.

## Discussion

Anthropogenic forces, inextricably linked to the sloped terrain, have molded the mosaic of fragmented habitat use over the past millennia. Systematic avenues to development, discussed above, are the driving forces behind land use alterations. Ways to counterbalance these drivers to mitigate further forest canopy loss include preservation of current forests and conversion of diminishing agricultural lands to restored forest canopy. The need for a viable supply-side market solution to the myriad of diverse backgrounds of landowners facing external market pressure is imperative. Offering a pioneered market incentive through the voluntary carbon market to private landowners is a core mission of the Appalachian Carbon Exchange.



## References

- Christensen Jr, N. L., & Fesenmeyer, K. (2012). Fire history in a southern Appalachian deciduous forest.
- Duden, A. S., Verweij, P. A., Junginger, H. M., Abt, R. C., Henderson, J. D., Dale, V. H., ... & van der Hilst, F. (2017). Modeling the impacts of wood pellet demand on forest dynamics in southeastern United States. *Biofuels, Bioproducts and Biorefining*, 11(6), 1007-1029.
- Galik, C. S., Abt, R., & Wu, Y. (2009). Forest biomass supply in the southeastern United States—implications for industrial roundwood and bioenergy production. *Journal of Forestry*, 107(2), 69-77.
- Gragson, T. L., & Bolstad, P. V. (2006). Land use legacies and the future of southern Appalachia. *Society and Natural Resources*, 19(2), 175-190.
- Gragson, T. L., Bolstad, P. V., & Welch-Devine, M. (2008). Agricultural transformation of southern Appalachia. *Agrarian landscapes in transition: comparisons of long-term ecological and cultural change*. Oxford University Press, New York, New York, USA, 89-121.
- Hodges, D. G., Chapagain, B., Watcharaanantapong, P., Poudyal, N. C., Kline, K. L., & Dale, V. H. (2019). Opportunities and attitudes of private forest landowners in supplying woody biomass for renewable energy. *Renewable and Sustainable Energy Reviews*, 113, 109205.
- Lowenthal-Savy, D. (2015). UK's renewable energy targets drive increases in US wood pellet exports. US Energy Information Administration.
- Nedd, R., & Anandhi, A. (2022). Land use changes in the southeastern United States: quantitative changes, drivers, and expected environmental impacts. *Land*, 11(12), 2246.
- Terando, A. J., Costanza, J., Belyea, C., Dunn, R. R., McKerrow, A., & Collazo, J. A. (2014). The southern megalopolis: using the past to predict the future of urban sprawl in the southeast US. *PloS one*, 9(7), e102261.
- Turner, M. G., Wear, D. N., & Flamm, R. O. (1996). Land ownership and land-cover change in the southern Appalachian highlands and the Olympic Peninsula. *Ecological applications*, 6(4), 1150-1172.
- Yarnell, S. L. (1998). *The southern Appalachians: a history of the landscape* (Vol. 18). Diane Publishing.