

The Eastern Redcedar Supply Chain Model



The annual economic damage caused by the uncontrolled spread of Eastern Redcedar is an estimated \$447 million¹. Much of this damage is due to decreased livestock forage, increased fire risks, and displacement of native wildlife. Mitigation costs can exceed \$160 per acre, further hindering control efforts². The cost of mitigation is one of the primary reasons Redcedar has spread unhindered throughout Oklahoma (Figure 1). However, it may be possible to offset the cost of tree removal by taking advantage of the wide array of products that can be manufactured from Redcedar. These products include bioenergy, biofuels, cedar oil, wood flour, lumber, mulch, pesticides, particle board, animal bedding, and pharmaceuticals. Despite this potential, redcedar-based industries have not flourished. The primary reason is supply chain uncertainty. Another factor is the lack of consolidated information to accurately estimate a system's economic feasibility. An effective means of closing the gap between economic potential and economic reality is a logistics model to evaluate different supply chain strategies. This involves assigning costs throughout the supply chain, from facility to consumer product.



Figure 1. Eastern Redcedar invasion of a field.

A web-based supply chain modeling system, Geospatial Logistics and Agricultural Decision Integration System (GLADIS), has been developed (<http://gladis.okstate.edu/>) to identify potential Eastern Redcedar processing facility locations and to evaluate transportation, harvesting, processing, and refinement costs (Figure 2).

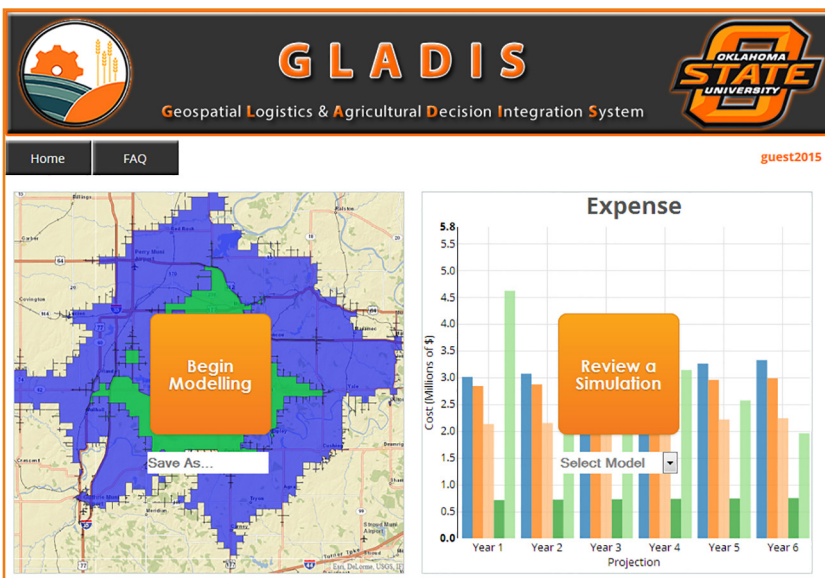


Figure 2. Screen shot of the supply chain model homepage.

The model uses mapping software to show where a facility should be located to access the largest amounts of Redcedar, using NRCS yield maps and up-to-date road networks. Transportation costs are estimated based on user-specified costs for trucks, trailers, fuel, maintenance, and other factors. Harvesting costs are approximated in a similar manner and use machine retail cost, productivity, fuel, labor, and machine size to estimate hourly machine costs. These data are used in a refining cost module that also incorporates additional client inputs to estimate the cost of establishing a processing facility. The model is capable of simulating multiple consumer product streams that can be important in developing a profitable redcedar commodities industry (Figure 3).

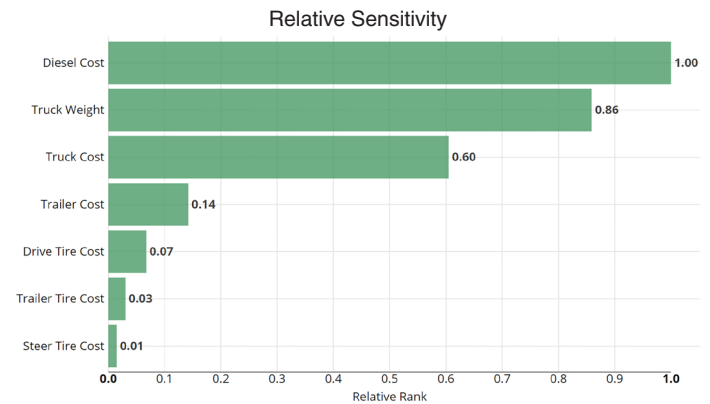
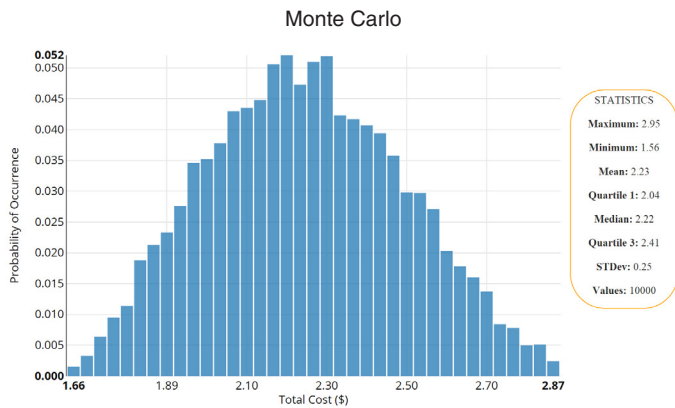
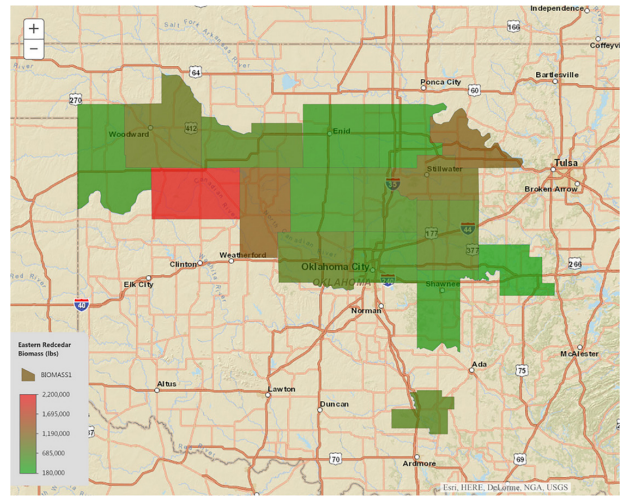
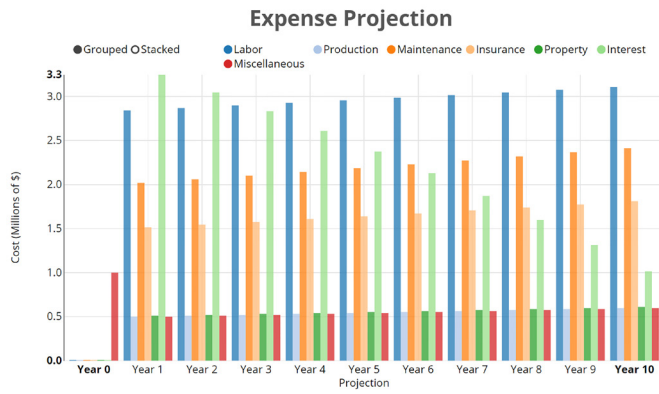


Figure 3. Example of outputs generated by the supply chain model.

A critical component of the model is the extensive sensitivity analysis. By using ranges associated with cost variables, the minimum and maximum potential costs can be calculated for harvesting and transporting redcedar. This information can provide users a better idea as to the variability of costs associated with a given supply chain strategy. The model has been segregated into major components allowing users to tailor the model to their specific niche, such as custom harvesting or commodity transport. This model is available online to facilitate development of eastern redcedar industries and aid businesses, entrepreneurs, and governmental agencies in stimulating the state economy. GLADIS, the OSU bioenergy supply chain model, can be an important tool in unlocking Oklahoma’s Eastern Redcedar door of opportunity.

- ¹Drake, B., Todd, P., England, D., Atkinson, K., Gerondale, G., Hart-Berton, D.,... Hiziroglu, S. S. (2002). A strategy for control and utilization of invasive juniper species in Oklahoma: Final report of the “Redcedar Task Force”. Oklahoma City, OK: Oklahoma Department of Agriculture, Food and Forestry.
- ²Bidwell, T. G., Weir, J. R., & Engle, D. M. (2007). Eastern Redcedar control and management – best management practices to restore Oklahoma’s ecosystems (NREM Fact Sheet No. 2876). Stillwater, OK: OSU Oklahoma Cooperative Extension Service.

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Visit <http://gladis.okstate.edu/> for more information.

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