**Description of Application Operation**

The Carbon Containment Lab’s “Woody Biomass Evaluation Tool” runs a customizable scenario to generate sets of values and visualizations representing the potential volume of carbon within five key states: California, Washington, Oregon, Idaho, and Nevada. Users are able to input a host of methodological distinctions which filter the existing carbon pools by specific tailored conditions, then the output can be returned in either bone-dry or CO2-equivalent tons, as a total sum or on a per acre basis. The full list of options given to the user includes:

* **Region**
  + California, Oregon, Washington, Idaho, Nevada
* **Potential carbon pool by size/type**
  + Only <5 inch diameter wood, only <9 inch diameter wood, only <12 inch diameter wood, <12 inch diameter wood and tops of additional trees to capacity
* **Method of Biomass Restoration**
  + Treatment to 60/80/100% of the full stocking amount
* **Fire Risk Field**
  + Burn probability percentile (state), burn probability percentile (nation), wildfire hazard potential (state), wildfire hazard potential (nation)
* **Deadwood additionally considered in removal**
  + Include/ignore salvageable dead wood
* **Distance from road**
  + 100 ft or less, 300 ft or less, 500 ft or less, ½ mile or less, 1 mile or less, 3 miles or less, 5 miles or less

Data are read in through a custom query to the FIA’s Evalidator tool, depending on the selection provided from the above options. Values are recorded on a county-level, within those states that are included in the full analysis. Depending on selection for the potential carbon pool, accessible wood types are limited to the diameter and size specifications of interest. For example, if the user selects “<12 inch diameter wood and tops of additional trees to capacity,” the web application will filter the data to only include biomass that is either in trees <12 inches, or is in the tops of trees that are larger.

Primarily, the total amount available is driven by the method of biomass restoration, which most dramatically impacts the carbon pools from which restoration efforts can draw. The FIA provides a prescriptive level of biomass which it considers to be a “full” level of stocking values to individual trees, and forest type, stand size, and stocking class in all Forest Inventory and Analysis plots nationwide. These are assigned using species specific functions of diameter developed from normal yield tables and stocking charts. For the purposes of restoration treatment, the web application allows for the thinning of eligible plots to specific percentages of this full stocking amount, set at 60%, 80%, and 100%. In all scenarios, biomass which is considered overstocked is eligible removal, and in the more progressive strategies, we allow for thinning to levels that are consistent with similar restoration projects run regionally. Wood is drawn from carbon pools, starting at the smallest diameter and ascending to the largest allowed diameter until capacity is reached or the method of restoration is fulfilled. In the instance where the user has selected to allow for tops to be removed, they are considered from trees that exceed the diameter limit.

With region, size, and methodology sorted, further restrictions or additions are added to the model. Analysis can be limited to counties that meet comparative fire percentile criteria, either on a state or national level. The first compares relative rates of burn probability, either ranked as a national or statewide percentile, while the second compares wildfire hazard potential. The user may, for example, select only counties in California and Oregon which are in the top 20th percentile nationally for wildfire risk. The distance from road can also be added as a limiting factor, to several discrete distances. Selecting for 500 ft or less restricts the acres considered to those where the straight-line distance to the nearest improved road (a road of any width that is maintained as evidenced by pavement, gravel, grading, ditching, and/or other improvements) is within the given range. The user may also elect to include salvageable dead wood, which is restricted to only dead wood in the Decay Class 1.

The visualizations provided illustrate the above queried data to communicate a couple key facets depending on the user input. The first visualization provides a map showing available biomass on a county-level in millions of short dry tons, as well as the sum totals across states in a bar plot. Error bars are provided in scope with the uncertainty attached to the underlying calculations on generalized FIA data and counties with missing data are grayed out and removed from consideration. White counties represent regions that do not meet the criteria, or where there is no available biomass that fit within the customized restrictions.

The second set of illustrations provides a summary view of the short dry tons of biomass by distance from road and fire percentile. Reading the first plot from left to right, the user gets a view for each state of the cumulative amount of biomass within each distance from the road. Reading the second plot from right to left, the user gets a similar narrative showing the cumulative total of biomass available at each consecutively decreasing percentile. The amount considered across these two variables is first filtered by all other inputs, including size, restoration strategy, and dead wood inclusion.

The third set of illustrations exhibits the make-up of the total for each state of the resulting candidate biomass. The top-left plot gives amounts by wood size, as well as the inclusion of salvageable dead wood from Decay Class 1. The top-right plot gives the dry tons of biomass by ownership group.

* Ownership groups
  + Bureau of Land Management, County and Municipal Ownership, Department of Defense, Fish and Wildlife Service, National Forest Grassland, National Forest System, National Park Service, Other Federal, Other Local Government, Private, State

The bottom-left plot shows biomass depending on the slope of the land, binned by discrete 20% widths. Finally, the bottom-right plot shows the elevation of usable land, binned by 1000 ft widths. From this collection of plots, the user can get a sense not only of the type of wood that the scenario retains, but also the ownership, make-up, and geographic context in which the candidate biomass is location. The final element of the output is a table which shows each county’s respective biomass total and fire percentile. There are intermediate sums for totals within states, and a cumulative sum (identical to the sum provided in the first bar graph) at the bottom.