



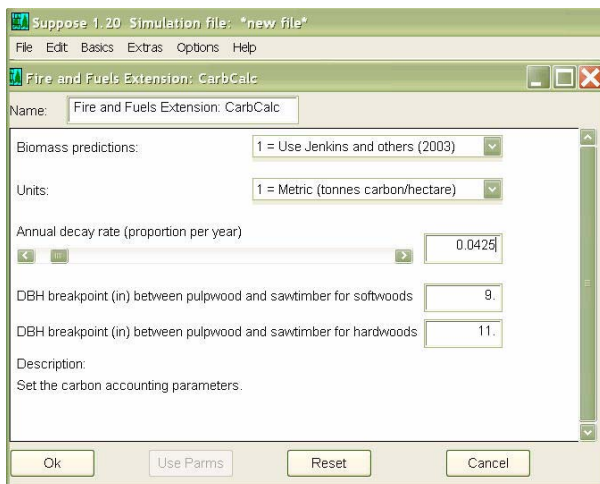
Stand Level Carbon Reporting Using the Forest Vegetation Simulator (FVS)



The ability to create stand level carbon stock estimates is now fully integrated into the Forest Vegetation Simulator (FVS), allowing users to produce carbon reports along with traditional FVS output. This added capability can be easily used by managers who are current FVS users and requires just a few additional keywords. The carbon reports are part of the Fire and Fuels Extension (FFE).

Carbon stocks reported include: live tree biomass (above-and belowground), dead tree biomass (above-and belowground), down dead wood, forest floor, herbs and shrubs. The methods used are consistent with the US Carbon Accounting Rules and Guidelines. If harvesting is simulated, users can also request a report tracking the fate of carbon in the wood removed from the stand during harvest.

Why use this and who is interested: Stand level carbon stock estimates can be produced along with traditional FVS output. Managers familiar with FVS can easily generate carbon estimates and assess the carbon consequences any forest management activity that can be simulated in FVS, including harvesting and prescribed fire.



User Options: In the **CarbCalc** dialog box, the user can select the aboveground biomass calculation method: either the default volume based method or generalized biomass equations. The user also can choose imperial or metric units, as well as setting the diameter breakpoints for sawtimber and pulpwood. The annual decay rate for coarse roots can also be adjusted. In fact, FVS gives the user a great deal of flexibility throughout the model. While each region of the US has a specific geographic variant of FVS, the user can modify many of the variables and coefficients to meet local conditions.

Example of the Stand Carbon Report

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***** CARBON REPORT VERSION 1.0 *****
          STAND CARBON REPORT
STAND ID: 2849          MGMT ID: NONE
  
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YEAR	Aboveground Live		Belowground		Stand Dead	Forest			Total Stand Carbon	Total Removed Carbon	Carbon Released from Fire
	Total	Merch	Live	Dead		DDU	Floor	Shb/Hrb			
	T/HA	T/HA	T/HA	T/HA		T/HA	T/HA	T/HA			
2006	114.4	75.2	21.4	12.5	0.0	18.1	14.9	0.7	182.1	48.5	0.0
2011	119.6	77.8	24.3	10.1	0.1	11.4	15.7	0.7	181.9	0.0	0.0
2016	123.2	80.4	23.5	9.1	1.2	10.2	16.2	0.7	184.1	0.0	0.0
2021	128.2	83.4	24.2	7.6	1.1	9.7	16.6	0.7	188.1	0.0	0.0
2026	132.7	85.8	25.0	6.5	1.6	10.2	17.1	0.7	193.7	0.0	0.0
2031	138.2	88.6	26.0	5.5	1.8	10.8	17.4	0.7	200.4	0.0	0.0

Stand Carbon Report: Aboveground biomass is reported for both the total amount of aboveground live biomass, and also for biomass contained in the merchantable volume only. If a harvest is scheduled, then a value will appear in the Carbon Removed column of the report for the year of harvest. Carbon in material removed from the stand is not included, but is available by requesting the Harvested Carbon Report using the **CarbCut** keyword. Output may be written to a spreadsheet or database file for analysis. The user selects the reporting duration and the reporting interval for both the Stand Carbon Report and the Harvested Carbon Report.

Harvested Carbon Report: The fate of carbon harvested and incorporated into products, is allocated to products in use, landfills, emitted to the atmosphere with concomitant energy capture, or emitted without energy capture, following the methods of Smith et al. (2006). As with the Stand Carbon Report, reporting units may be either metric or imperial, and the diameter breakpoints for sawtimber and pulpwood can be adjusted to meet local conditions using the **CarbCalc** dialog box. The Carbon Removed column reflects the carbon removed from the stand at the time of harvest, while the Carbon Stored column includes the carbon in products and landfills. Carbon in the Energy and Emissions columns is considered to have been released to the atmosphere.

Example of the Harvested Carbon Report

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***** CARBON REPORT VERSION 1.0 *****
HARVESTED PRODUCTS REPORT
MGMT ID: NONE
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YEAR	Products	Lndfill	Energy	Emissns	Merch Carbon	
					Stored	Removed
	T/HA	T/HA	T/HA	T/HA	T/HA	T/HA
2006	25.6	0.0	9.4	6.4	25.6	41.4
2011	18.2	3.9	11.3	8.1	22.1	41.4
2016	13.7	6.1	12.5	9.1	19.8	41.4
2021	10.9	7.4	13.2	9.9	18.4	41.4
2026	9.1	8.2	13.7	10.4	17.3	41.4
2031	7.9	8.7	14.1	10.8	16.6	41.4

Complete documentation of the carbon reporting methods and assumptions is provided in the Fire and Fuels Extension (FFE) Addendum document (Reinhardt, E. et al. 2007): http://www.fs.fed.us/fmsc/fvs/documents/gtrs_ffeaddendum.php.

Resources :

<http://nrs.fs.fed.us/carbon/tools/>

Hoover, C. M. and Rebain, S. A. In press. The Kane Experimental Forest Carbon Inventory: Carbon Reporting with FVS. In: Havis, Robert N., Crookston, Nicholas L., eds. 2008. Third Forest Vegetation Simulator Conference: 2007 February 13-15; Fort Collins, CO. Proceedings RMRS-P-00. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

Reinhardt, E., N. L. Crookston, and S.A. Rebain (Technical Editors). 2007. Addendum to the fire and fuels extension to the Forest Vegetation Simulator. http://www.fs.fed.us/fmsc/fvs/documents/gtrs_ffeaddendum.php

Smith, James E.; Heath, Linda S.; Skog, Kenneth E.; Birdsey, Richard A. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p.

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