

# Biomass Harvest v3.0 LANDIS-II Extension User Guide

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# 1 Introduction

This document describes the Biomass Harvest Extension for the LANDIS-II model. Users should read the LANDIS-II Model User's Guide prior to reading this document.

The Biomass Harvest Extension for LANDIS-II is derived from the Base Harvest extension and therefore generally behaves the same as Base Harvest. The largest change is that Biomass Harvest supports partial thinning of cohorts; other changes are listed below. Consult the user guide for Base Harvest for further information.

**Note:** The Biomass Harvest Extension is *only compatible* with succession extensions that use the same cohort type, in this case cohorts with species, age, and aboveground biomass data. Currently, the Biomass Succession, Forest Carbon Succession and PnET-Succession extensions meet this criterion. Therefore, Biomass Harvest is *not compatible* with the Age-only Succession, Century Succession or BFOLDS Forest Succession extensions.

## 1.1 Major Releases

### 1.1.1 Version 3.0

September 30, 2015

Added biomass harvested (Mg) for each species to Event Log

All version 3.0 enhancements recorded in the Base Harvest user guide also apply to Biomass Harvest.

The extension was updated to include restructured versions of the harvest libraries. Biomass Harvest version 3.0 is compatible with Land Use version 1.0.

### 1.1.2 Version 2.2

March 30, 2014

The metadata library was incorporated. All outputs are now recorded in designated xml files with units, etc.

### 1.1.3 Version 2.1

March 5, 2013

Fixed a bug with partial harvesting when percentages < 100% were specified (issue #23).

#### 1.1.4 Version 2.0

Biomass Harvest version 2.0 is compatible with LANDIS-II version 6.0.

#### 1.1.5 Version 1.3

Version 1.3 incorporated the numerous fixes that were applied to the Base Harvest version 1.3.

### 1.2 Minor Releases

#### 1.2.1 Version 2.0.4

Bug fixed regarding ages, age ranges, and partial removal percentages in the species list for cohort removals. In some cases the first or last species listed was not properly assigned to the prescription.

#### 1.2.2 Version 2.0.3

Compatible with Base Harvest 2.1.2, which added capability for selecting a percentage of stands as the harvest target, and add potential for interaction with the Base BDA extension to allow presalvage prescriptions.

#### 1.2.3 Version 2.0.2

Bug fixed that caused improper simulation of repeat harvests.

#### 1.2.4 Version 1.3.1

The log files were changed to be more explicit about the biomass removed units, both in the output maps and the event log file. Output maps units are now **kg ha<sup>-1</sup>**. Event log units are now **Mg biomass removed** and **Mg ha<sup>-1</sup>** biomass removed per damaged site.

### 1.3 Acknowledgements

Funding for the development of LANDIS-II has been provided by the Northern Research Station (Rhinelander, Wisconsin) of the U.S. Forest Service.

## 2 Input Files

The inputs for this extension are identical to those listed in the Base Harvest User Guide with the exceptions listed below. The text file must comply with the general format requirements described in section 3.1 Text Input Files in the LANDIS-II Model User Guide.

### 2.1 LandisData

This parameter's value must be "Biomass Harvest".

### 2.2 PreventEstablishment

The user can use the PreventEstablishment keyword after the SiteSelection choice to indicate that no new cohorts can establish after this prescription has been applied to a site.

Example:

```
Prescription SmallDevelopments
  StandRanking      Random
  MinimumTimeSinceLastHarvest 0
  SiteSelection     PartialStandSpread 1 1
  PreventEstablishment
```

### 2.3 Species List for Cohort Removal

When SpeciesList is specified for the CohortsRemoved parameter in a prescription, the user may specify a percentage after any individual age or range of ages. The percentage indicates what proportion of the biomass of a cohort(s) will be removed. For example:

```
CohortsRemoved SpeciesList
acersacc 1-40 (50%) 50 (65%) 65-70 71-107 (15%)
```

The default percentage is 100%. If no parenthetical biomass removal values are given, the Biomass Harvest extension will behave identically to the Base Harvest extension and remove 100% of the cohort. Age ranges not listed are not removed.

## 2.4 Biomass Maps

The new `BiomassMaps` parameter comes after the `PrescriptionMaps` parameter.

The parameter specifies the template for the names of output maps of biomass removed from harvested sites. Like the `PrescriptionMaps` parameter, the `BiomassMaps` parameter requires that the `timestep` variable be used in its value:

```
BiomassMaps harvest/biomass-removed-{timestep}.img
```

This parameter is optional. If it is not present, then no output maps are created.

## 3 Output Files

The outputs for this extension are identical to those listed in the Base Harvest User Guide with the exceptions listed below.

### 3.1 Biomass Maps

The biomass maps indicate the amount of biomass removed from each site in  $\text{g/m}^2$ . A map is produced for each harvest timestep.

### 3.2 Event Log

The columns in the Biomass Harvest event log are: year, management area, prescription used, stand affected, event ID, that stand's current age, that stand's current rank, total event size (number of sites), number of sites where cohorts were removed, number of sites where cohorts were damaged, Mg biomass removed,  $\text{Mg ha}^{-1}$  biomass removed per damaged site, total number of cohorts partially removed (damaged), total number of cohorts removed (killed), number of cohorts affected (damaged or killed) for each species, and Mg biomass removed for each species.

### 3.3 Summary Log

The columns in the Biomass Harvest summary log are: year, management area, prescription used, total number of sites where cohorts were damaged, total Mg biomass removed, total number of cohorts partially removed (damaged), total number of cohorts removed (killed), total number of cohorts affected (damaged or killed) for each species, and total Mg biomass removed for each species.