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# Instructions for the use of *Sylvaccess*

**Author:**

Sylvain Dupire.  
Irstea, Grenoble center,  
Mountain Ecosystems and Societies Research Unit (LESSEM)



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## 1 Preamble

*Sylvaccess* model enables an automatic mapping of forest accessibility. The following forest operation systems are taken into account:

- skidder
- forwarder
- cable yarding

Calculation processes and need data are described in the two following scientific papers:

- a. Dupire S, Bourrier F, Monnet J-M, Berger F, 2015. *Sylvaccess* : un modèle pour cartographier automatiquement l'accessibilité des forêts. *Revue forestière française*. 2015, 70, 2. pp 111-126. DOI: [10.4267/2042/57902](https://doi.org/10.4267/2042/57902)
- b. Dupire S, Bourrier F, Berger F, 2015. Predicting load path and tensile forces during cable yarding operations on steep terrain. *Journal of Forest Research*. DOI: [10.1007/s10310-015-0503-4](https://doi.org/10.1007/s10310-015-0503-4).

Paper *a* (in French) describes all the processes involved and the different data needed. Paper *b* focuses on the cable yarding module.

## 2 Conditions of use

***Sylvaccess* is provided for free, users are encouraged to mention the following points in their publications and realizations:**

- **Name and version of the software + mention « © Irstea – S. Dupire 2019 »**
- **References of the scientific papers *a* and *b* given above**

Furthermore, *Sylvaccess* model is governed by the open source license [GNU-GPLv3](https://www.gnu.org/licenses/gpl-3.0.html).

In consideration of **access to the [source code](#)** and the rights to copy, modify and redistribute granted by the license, users are provided only with a **limited warranty** and the software's author, the holder of the economic rights, and the successive licensors only have limited liability.

**Any distribution of the *Sylvaccess* model (modified or not) enters under** the terms and conditions of the **GNU-GPLv3** license and must provide:

- i. a copy of the GNU-GPLv3 license
- ii. a notice relating to the limitation of both the Licensor's warranty and liability

### 3 Recommendations for use *Sylvaccess*

#### 3.1 General recommendations

**All spatial information layers** used as inputs of *Sylvaccess* (rasters and shapefiles), must be in the same spatial reference.

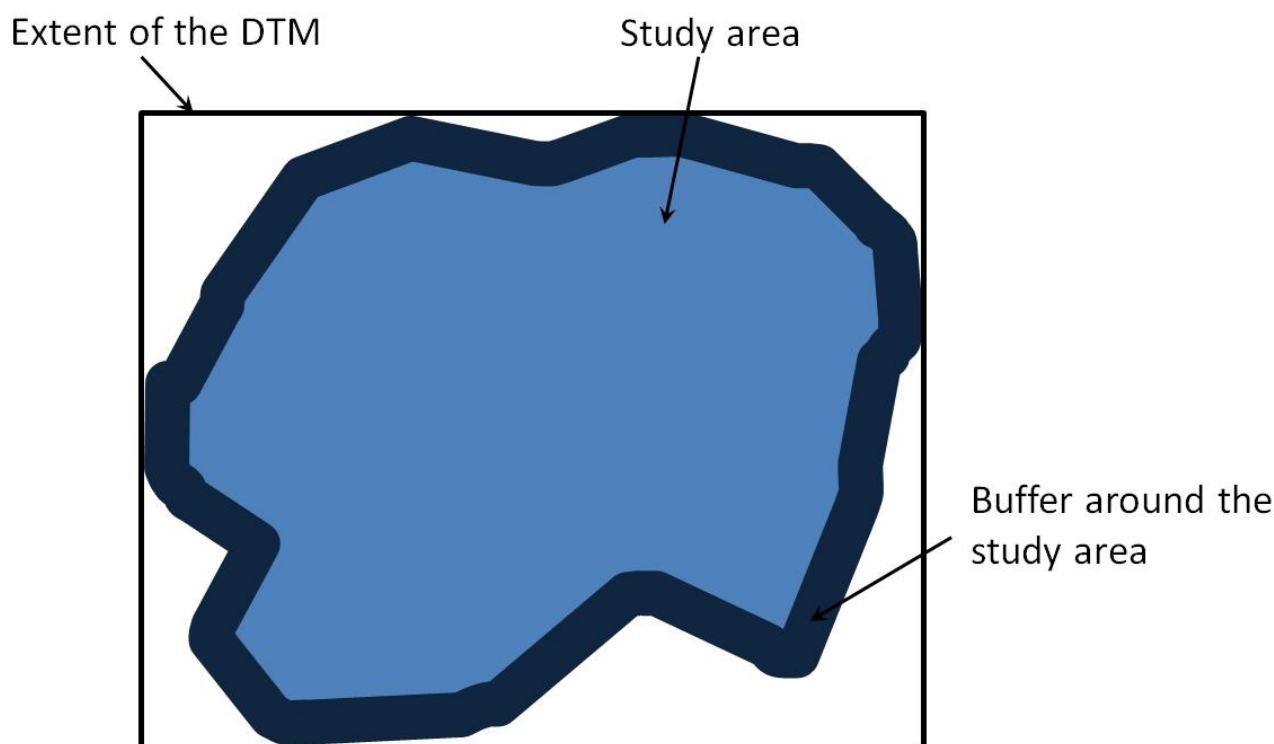
Using the [Qgis](#) open source software to prepare spatial input is highly recommended as both *Qgis* and *Sylvaccess* use the same spatial library (GDAL).

Raster data must be in « .tiff » or « .asc » formats. Any other extension will not be recognized by the software

Vector data must be in the « .shp » format (shapefile).

#### 3.2 Recommendations for the digital elevation model (DEM)

It is recommended to work with a DEM with an extent that covers an area bigger than the study area. Generally, consider a buffer of 500 m around the study area is sufficient (see the following figure).



To avoid bugs, elevation of all pixels located in the dark and light blue areas must be known (study area+ buffer area).

**The recommended DEM resolution is 5 m (Dupire et al. 2015a)**

### 3.3 Content of the forest roads shapefile

For all forest operation systems, the attribute table of the forest roads shapefile must have a **numeric field named « CL\_SVAC »** (in capital letters) coded as follow:

Code	Description
1	Forest tracks: not accessible to wood trucks, accessible with skidder and forwarder
2	Forest road: accessible to wood trucks, skidder, forwarder and cable yarder
3	Public network: accessible to wood trucks, forbidden to skidder, forwarder and cable yarder

It is recommended to delete all the entities that do not correspond to one of the previous situation (hiking tracks for example).

Forest roads shapefile has to be exhaustive on study and buffer areas.

For cable yarding, the attribute table of the forest roads shapefile must have an **additional numeric field named « CABLE »** (in capital letters) allowing to identify and locate the potential starting point of cable lines and coded as follow:

Code	Description
0	Not a potential cable road start
1	Potential cable road start for uphill yarding
2	Potential cable road start for downhill yarding
3	Potential cable road start for uphill and downhill yarding

PS : ideally, starts should be located on forest roads.

### 3.4 Content of the forest areas shapefile

The attribute table of the forest areas shapefile must have a **numeric field named « Foret »** (F in capital letters, others letters in lowercases) coded as follow:

Code	Description
0	Non forested area
1	Forest area

### 3.5 Integration of obstacles

Sylvaccess offers the possibility of individually integrating obstacles for each forest operation system. If it is considered, the process is as follow:

- i. Create a folder and name it with an explicit name (example : obs\_skidder)
- ii. Add in this folder, all the shapefiles corresponding to obstacles. Be careful about the reference system used.
- iii. Select this folder when it is asked in the graphic interface

*Sylvaccess* will compile automatically all the obstacles in a single layer. Be careful, all entities present in each shapefile will be considered as obstacle

Generally the following obstacles are considered:

Skidder	Forwarder	Cable
<ul style="list-style-type: none"><li>Rivers, lakes</li></ul>		<ul style="list-style-type: none"><li>Power lines</li><li>Lakes</li></ul>
<ul style="list-style-type: none"><li>Principal and secondary roads</li><li>Railways</li><li>Buildings</li></ul>		

For skidder, it is possible to add a second type of obstacles (partial obstacles) that corresponds to area where only winching from forest tracks and forest roads is possible (example: wetlands, lapiaz)

## 4 Information about the results

*Sylvaccess* creates a folder for each forest operation system tested. In each folder, spatial results are saved in raster format. Two text files are also saved: one corresponds to the parameters used in the modeling; the second summarizes statistics about the accessible areas for the forest operation tested.

### 4.1 Particularities of cable yarding modeling

Results of cable yarding modeling are strongly linked to the quality of the DEM provided. Practically, it is not recommended to use a DEM where pixel size is above 5m. Ideal DEM comes from Lidar data resampled at 5m resolution.

For cable yarding operation, *Sylvaccess* saves a big database containing all the lines technically feasible on the study area. This database is used to select the best lines according to the criteria chosen.

It is possible to effectuate several selections from the same database. To do this, with the graphic interface process as follow:

- tick only « Select best cable lines according to several criteria » on the tab «General »
- give the folder where the results of the cable simulation were saved, the forest spatial layer and eventually the raster of volume per hectare and average tree volume in the tab « Cable - Line selection »

Since *Sylvaccess* v3.0 it is also possible to give threshold and weight values for each criterion of selection in order to avoid selecting cable line that are not wanted by the user.