Forest Storm Risk

Nouvelle-Aquitaine and Euskadi

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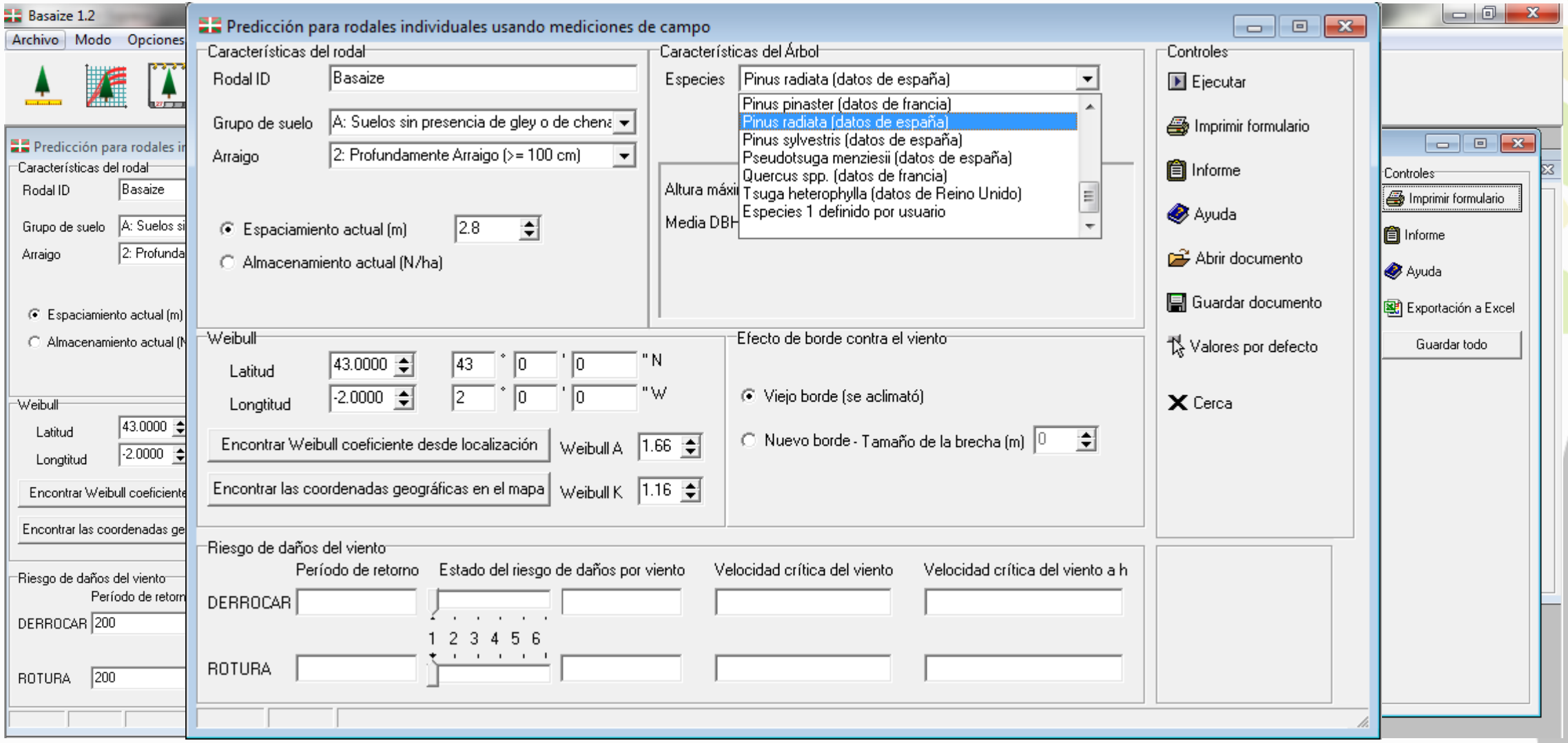
10 July 2019

Aims of the Wind Risk Work in PLURIFOR

- Develop forest damage wind risk models for Nouvelle-Aquitaine and Euskadi (and potentially useable across south-west Europe)
- Map wind risk levels to forests in Nouvelle-Aquitaine and Euskadi
- Provide training in the wind risk models for forest practitioners, planners and researchers in Nouvelle-Aquitaine and Euskadi
- Determine the best way to incorporate the risk models into forest contingency planning

ForêtTempête 1.1 and Basaize 1.2



Wind Risk Model Integrated in Excel

BERT Console

File Edit View Packages Help

excel-scripting.r | Welcome | Preferences | ForestGALES.r | functions.r

```
# CWS_Damage_Critical
#
cws_Damage_Critical <- function(species, mean_ht, mean_dbh, spacing) {
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, mean_dbh, spacing, weib_a = NA, weib_k = NA, full_output = 0, top_ht = NA, mean_cr
  mean_cr_depth = NA, soil_group = NA, rooting = NA, new_edge = NA, gap_size = NA, moe = NA, mor = NA, fknot = NA, stem_vol = NA,
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg = NA, c_drag = NA, n_drag = NA, drag_upper_limit = NA,
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA, z = NA, dams = NA)
   return(ucritical[3])
}
# CWS_Damage_Breakage
#
cws_Break <- function(species, mean_ht, mean_dbh, spacing) {
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, m
  mean_cr_depth = NA, soil_group = NA, rooting = NA, new_edge =
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA
    return(ucritical[5])
}
# CWS_Damage_Overturn
#
cws_Overturn <- function(species, mean_ht, mean_dbh, spacing) {
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, m
  mean_cr_depth = NA, soil_group = NA, rooting = NA, new_edge =
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA
    return(ucritical[6])
}
# CWS_Damage_Roughness
#
cws_Damage <- function(species, mean_ht, mean_dbh, spacing, wei
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, m
  mean_cr_depth = NA, soil_group, rooting, new_edge, gap_size,
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA
    return(ucritical[index])
}
# CWS_Damage_Breakage_Full
#
cws_Break_Full <- function(species, mean_ht, mean_dbh, spacing,
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, m
  mean_cr_depth = NA, soil_group, rooting, new_edge, gap_size,
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA
    return(ucritical[index])
}
# CWS_Damage_Overturn_Full
#
cws_Over_Full <- function(species, mean_ht, mean_dbh, spacing, weib_a, weib_k, soil_group, rooting, new_edge, gap_size, index) {
  ucritical <- fg_rou('Test', "2019-02-27", species, mean_ht, mean_dbh, spacing, weib_a, weib_k, full_output = 0, top_ht = NA, mean_cr_width =
  mean_cr_depth = NA, soil_group, rooting, new_edge, gap_size, moe = NA, mor = NA, fknot = NA, stem_vol = NA,
   crown_vol = NA, stem_density = NA, crown_density = NA, c_reg = NA, c_drag = NA, n_drag = NA, drag_upper_limit = NA,
    snow_depth = NA, snow_density = NA, ro = NA, x = NA, y = NA, z = NA, dams = NA)
    return(ucritical[index])
}
```

Ready | Line 7, Col 84 | R

R

```
R version 3.5.0 (2018-04-23) -- "Joy in Playing"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
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://bert-toolkit.com).

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Users\EPHYSE\Documents\BERT2\functions\functions.r
```

Insert Function

Search for a function:

Type a brief description of what you want to do and then click Go — Go

Or select a category: Exported R Functions

Select a function:

- R.cws_Break
- R.cws_Break_Full
- R.cws_Damage
- R.cws_Damage_Critical
- R.cws_Over_Full
- R.cws_Overturn
- R.EigenValues

R.cws_Break(species, mean_ht, mean_dbh, spacing)

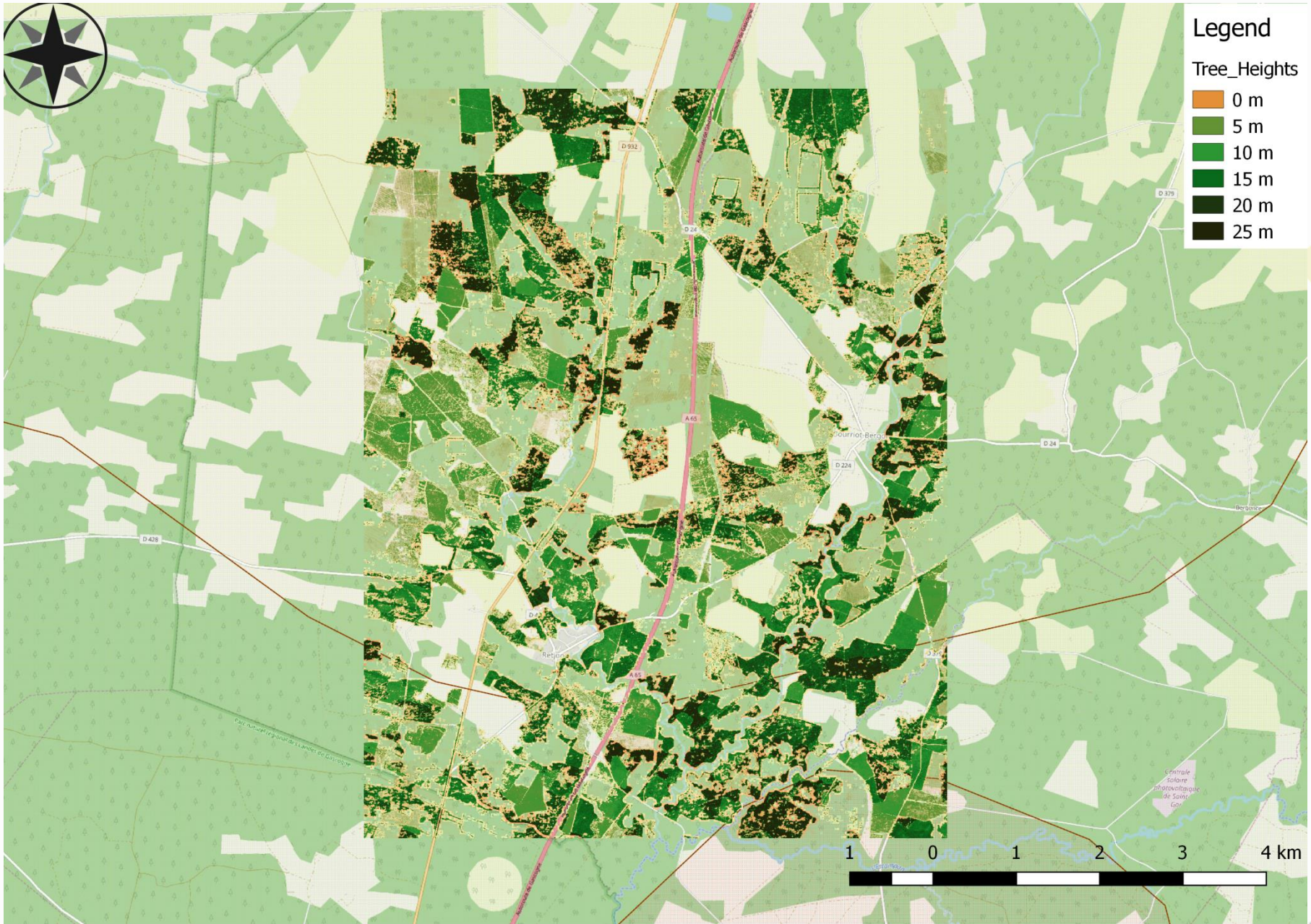
Exported Function.

Help on this function — OK — Cancel

	A	B	C
1	Only enter data in the white cell		
2	SIMULATION	WIND CLIMATE	
3	Number	Weibull A	Weibull
4	1	8.000	2.00
5	2	8.000	2.00
6	3	8.000	2.00
7	4	8.000	2.00
8	5	8.000	2.00
9	6	8.000	2.00
10	7	8.000	2.00
11	8	8.000	2.00
12	9	8.000	2.00
13	10	8.000	2.00
14	10	8.000	2.00

	W	X	Y
1	lations is selected in Excel Options. Stand results a		
		ProbabilityBreak	ProbabilityOverturn	uhBreak
	.32	0.00%	1.24%	27.76
	.26	3.48%	0.20%	16.81
	.14	1.82%	0.11%	18.08
	.70	1.09%	0.08%	19.10
	.94	0.77%	0.06%	19.85
	.86	0.66%	0.07%	20.31
	.43	0.69%	0.09%	20.49
	.59	0.93%	0.16%	20.25
	.31	1.63%	0.37%	19.73
	.27	0.72%	0.20%	22.21
	.13	32.60%	43.21%	15.37

Risk Maps in GIS based on Wind Risk Model



ForêtTempête 1.1 and Basaize 1.2

Where we started

- Wind risk model for UK (ForestGALES) and Basaize 1.0 (FORRISK project)
- Single age, monospecific, stand level model

What is new?

- New tree pulling data added
- New species added (total of 20) using data from France, Spain, UK, Finland, New Zealand
- New wind climate data included
- Model now works both for single trees and stands (allows complex silviculture)
- Models incorporated in GIS and Excel

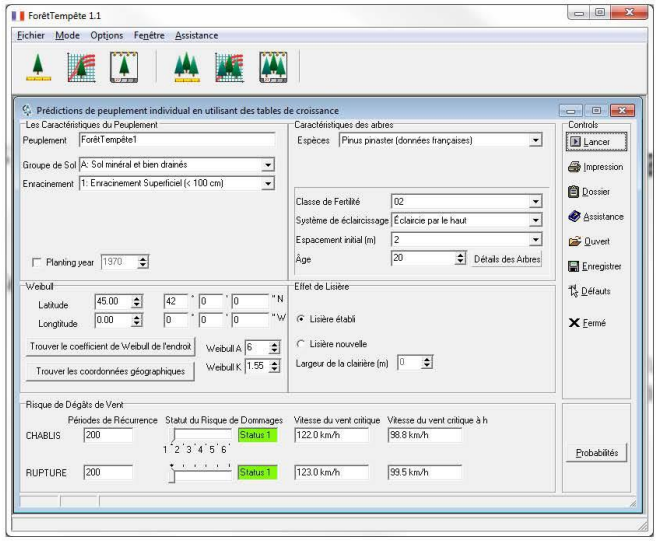
What will it be used for?

- Forest management support
- Regional planning

Storm Risk Workshops

Euskadi (11/12th September 2017 and 7th June 2019)
Nouvelle-Aquitaine (18th February 2019 and 5th March 2019)

ForetTempete 1.1 : Guide d'utilisation et exemples



Configuration requise

1. Windows OS (Windows 3 à 10)
2. Apple OS (seulement si des logiciels tels que Bootcamp, VMWare Fusion ou Parallels Desktop 6 pour Mac ont été préalablement installés pour permettre à l'ordinateur de démarrer en mode Windows ou de faire fonctionner Windows en parallèle)
3. 30MB d'espace disponible sur le disque dur.

Compatibilité avec d'autres logiciels

Il est recommandé d'avoir Microsoft Excel et Word pour aider à la production de rapports. Les résultats peuvent être exportés sous des formats compatibles avec Excel et Word ou en fichier texte ASCII.

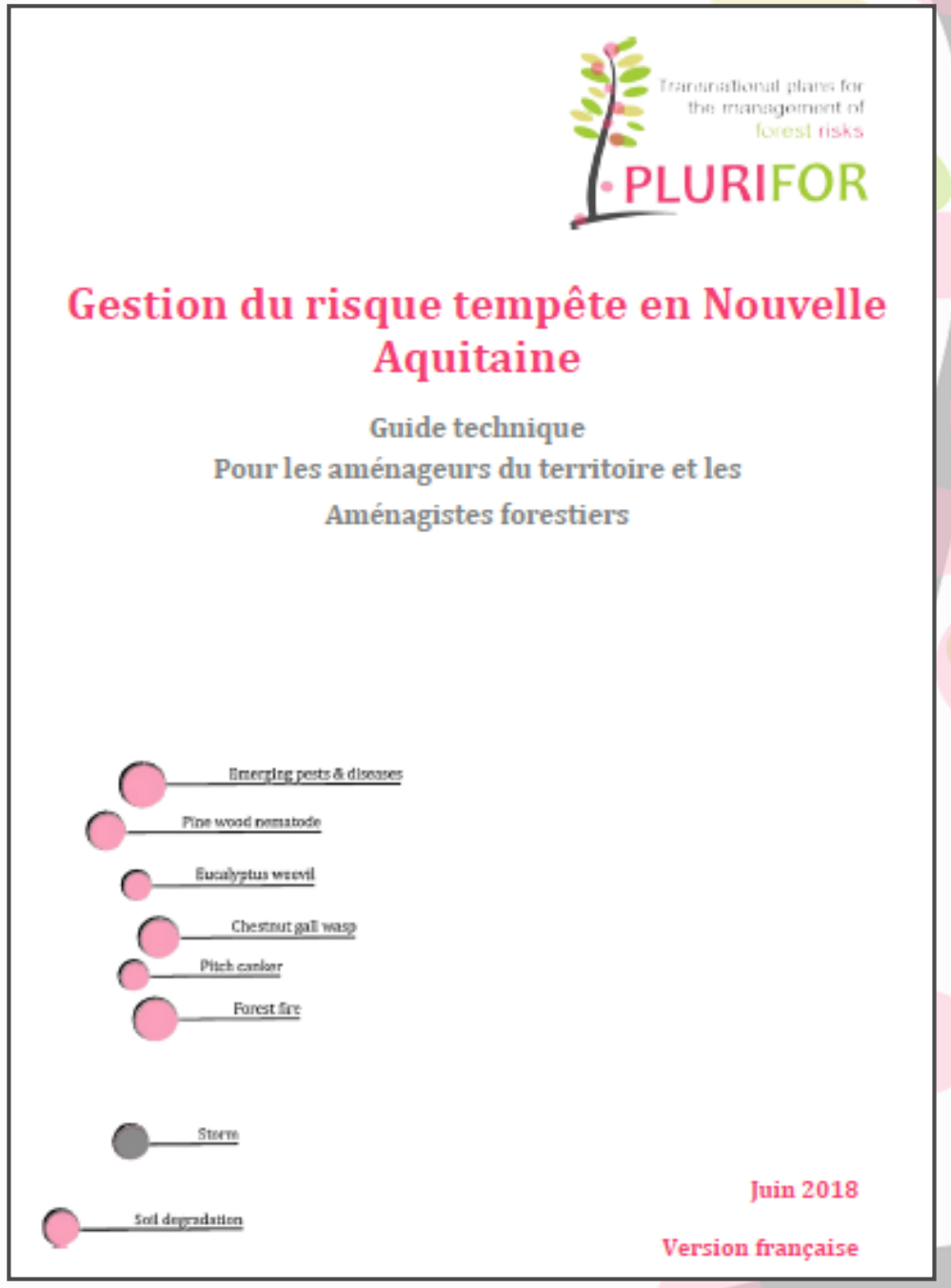
Gestion du Risque Tempête en Nouvelle-Aquitaine

(Managing Wind Risk in Nouvelle-Aquitaine)

In final editing stages. Will be published online

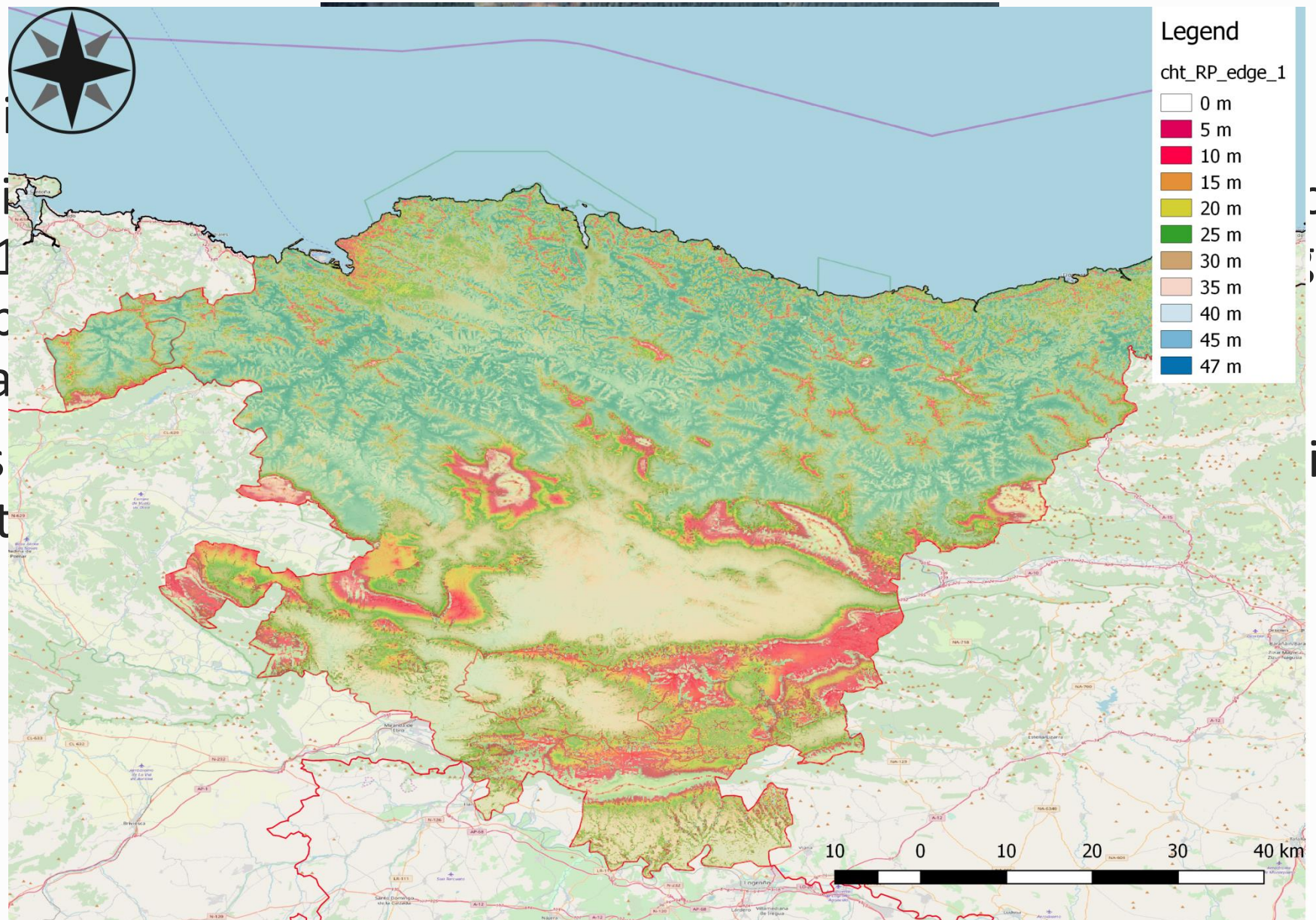
Principes généraux sur le risque tempête et la résistance des peuplements au
Recommandation à l'échelle des peuplements

- Gestion forestière traditionnelle des principales essences
  - i Pin maritime
  - ii Douglas
  - iii Chêne
  - iv Peuplier
  - v Châtaignier
- Impact des différents choix de gestion
  - i Choix des espèces
  - ii Préparation du site
  - iii Qualité du drainage
  - iv Lisières
  - v Eclaircies
  - vi Coupes rases et durée des révolutions
  - vii Implantation des peuplements



Plan National de Gestion de Crise Tempête

- Meeti
- Decisi of risk (e.g. 1 glas fir, oak, p proba
- Maps ill updat



Forest Storm Risk in PLURIFOR: Summary

- Wind risk models built for Nouvelle-Aquitaine (and all France) and Euskadi in Northern Spain. ForêtTempête 1.1 and Basaize 1.2
- ForêtTempête 1.1 and Basaize 1.2 can be run as:
  - Stand-alone program in Windows or Apple Operating System
  - Called directly from Excel
  - Called directly from QGIS
  - Incorporated in R programs
- Maps of critical heights created for Nouvelle-Aquitaine and will be used as part of crisis planning (maritime pine, oak and Douglas fir)
- Maps of critical height for Euskadi for radiata pine/eucalyptus/beech
- Risk maps using detailed height data (Landes Departement only)
- Guidelines for management of wind damage risk in Aquitaine