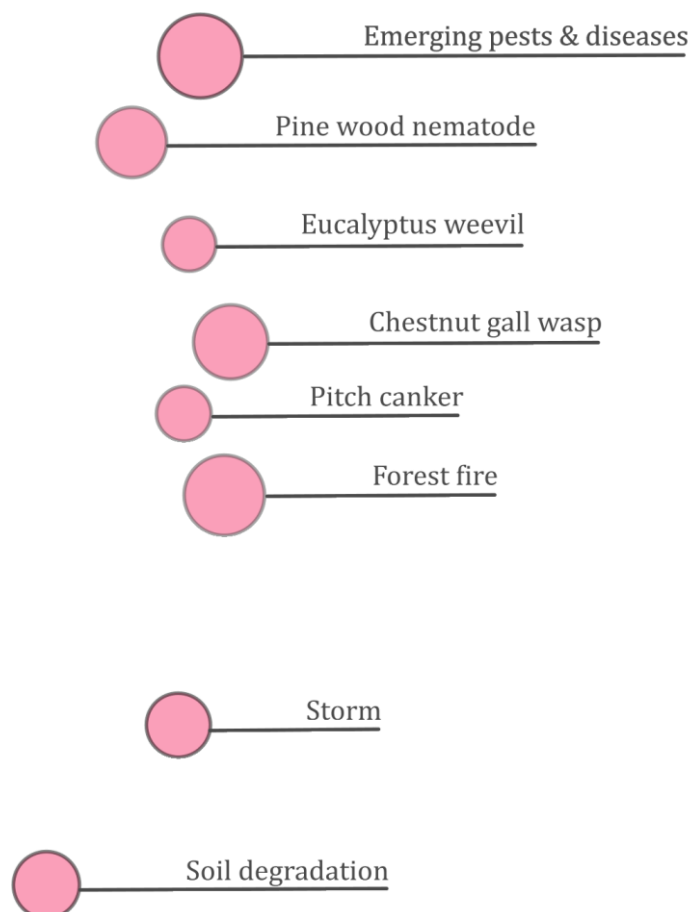


Minutes of the experts exchange on wind forest damage risk management

Aquitaine – Basque Country – Belarus



**Bordeaux and
Gironde and Landes
departments
19 and 20 April 2018**

Experts exchange on wind forest damage risk management

Authors of the minutes: Hernán Serrano León, Stephanie Hayes, Eduard Mauri (EFI)

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Foreword

In January 2018, at the 2nd Technical Committee of the PLURIFOR project, the wind risk team, composed by EFIATLANTIC (now the EFI Planted Forests Facility) and HAZI (in Basque Country, Spain), decided that one output of the project would be an exchange of experts on wind risk management. A Basque delegation of forest authorities would visit Nouvelle-Aquitaine region (severely hit by the 1999 Martin and 2009 Klaus storms) and learn from the experiences of the different French actors that were involved managing both crises. The purpose was to, ultimately, implement or adopt some of the measures in Basque Country, along with a wind risk management plan that HAZI will develop within the PLURIFOR project. Meanwhile, through the World Bank, Belarussian forest authorities contacted the EFI office in Bonn with a similar request: to organise an exchange of experts on wind risk management, so that Belarusian forest authorities could learn from previous experiences in post-storm crisis recovery in order to manage recent and exceptional forest damage caused by wind. Naturally, both exchanges were merged.

The EFI Planted Forests Facility staff organised the event. During the months before the event, both delegations were asked about any particular topics of their interest in order to adjust the content to their knowledge needs. The first day (indoor presentations) took place in Bordeaux downtown, where most of the speakers of the afternoon session work. The second day visits (field trip) were in the Landes de Gascogne forest, the most severely hit area by the 1999 Martin and 2009 Klaus storms.

The purpose of this document is to summarise the information that was exchanged during the two-day event in Nouvelle-Aquitaine, the answers as well as the questions. The document can also be used to prepare the structure of future similar events.

Agenda & Contacts

Date and time	Activity	Contacts in Nouvelle-Aquitaine/location
19 April	INDOOR EXCHANGES	
8h45 – 11h45	SITUATION IN BELARUS AND IN THE BASQUE COUNTRY	
	Half a day private exchange with Belarussian foresters, Basque foresters and EFI. Basques join at 10h15.	At a hotel meeting room, in Bordeaux
11h45 – 13h15	LUNCH	
13h15 – 17h45	SITUATION IN NOUVELLE-AQUITAINE & WIND RISK MANAGEMENT IN NOUVELLE-AQUITAINE: PRESENTATIONS BY MAIN REGIONAL FOREST ACTORS	
	<p>Forest history in Landes de Gascogne and storm damage</p> <p>REGIONAL ACTORS:</p> <p>DRAAF (Regional public authorities)</p> <p>GIP ATGeRI (Public risk management coordination)</p> <p>CRPF (Regional private forest centre)</p> <p>SSSO (Union of forest owners)</p> <p>ONF (Public forest management agency)</p> <p>Groupama (Forest insurances)</p>	<p>Barry Gardiner, EFI Planted Forests Facility, 69, route d’Arcachon, 33612 Cestas 05 35 38 52 50 barry.gardiner@efi.int</p> <p>Marion Grua (replacing Hugues Cruse, chargé de mission risques et développement forestier), DRAAF Nouvelle-Aquitaine, Bordeaux 05 56 00 42 99 marion.grua@agriculture.gouv.fr hugues.cruse@agriculture.gouv.fr</p> <p>Sarah Fermet-Quinet, Risk management coordination, GIP ATGeRI, Bordeaux 05 57 85 40 42 sarah.fermet-quinet@gipatgeri.fr</p> <p>Amélie Castro, CRPF Nouvelle-Aquitaine, Maison de la forêt, Bordeaux 05 56 01 54 75, 06 79 06 68 21 a.castro@crpfaquitaine.fr</p> <p>Gaëlle Burlot, Chargée de mission, Caisse Phyto Forêt, Maison de la forêt, Bordeaux 05 57 85 40 73 g.burlot@maisondelaforet.fr</p> <p>Francis Maugard, 9, avenue Raymond Manaud, 33524 Bruges, ONF Gironde 06 25 69 21 34 francis.maugard@onf.fr</p> <p>Pascal Mayer, Directeur Général, 32 Allées d’Orléans - 33 000 Bordeaux 05 56 528 528 pascal.mayer@groupama-misso.com</p>
18h00	END	Move to Arcachon, to be close to the forest for the field trip

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Date and time	Activity	Contacts in Nouvelle-Aquitaine/location
20 April	FIELD TRIP	
Morning	REPLANTED MARITIME PINE STANDS DAMAGED IN 2009	
	Private lots Public lots Experimental trials	Amélie Castro, CRPF Private forests in south-west Gironde department, in Landes de Gascogne forest Francis Maugard, ONF Forêts domaniales de Lagnereau et de la Teste, in south-west Gironde department, in Landes de Gascogne forest REINFFORCE (if time available): trail DS27 Belin-Béliet (broadleaved hedgerow), Christophe Orazio (EFI) and Amélie Castro (CRPF).
Midday	LUNCH AT NEARBY RESTAURANT	
Afternoon	FACILITIES TO STORE AND PROCESS BLOWDOWN TIMBER	
14h00 – 15h00	Commensacq Timber storage area	David Cosme, Alliance Forêts Bois 06 71 58 02 31 david.cosme@alliancefb.fr
15h45 – 17h15	Labadie Sawmill processing salvaged timber	Chantal Lalanne, Scierie Labadie Route de Bordeaux, Roquefort, 40120 06 10 58 69 00 administratif@scierie-labadie.com
17h30	END	

Attendance

Attendees

EFI (organisers)

Barry Gardiner, Stephannie Hayes, Christophe Orazio*, Hernán Serrano León (Planted Forests Facility); Alexander Held, Andreas Schuck (EFI Bonn)

Belarussian delegation

Aliaksandr Uhryn (Forestry management department, Ministry of Forestry of the Republic of Belarus); Yauheni Filipau (Vitebsk state production forestry association); Siarhei Tarasau (Gomel state production forestry association); Volha Sharafanovich (journal "Forestry and Hunting Economy"); Viktor Amelyanovich (Borisov experimental forestry); Dzmitry Hryshkevich (Starodorozhsky experimental forestry); Mikalai Kochyk (Kobrin experimental forestry); Дмитрий Кулагин (State Institute for Forest Research of the National Academy of Sciences of Belarus); Vadzim Nosnikau, Andrei Liadnitski (Forestry Faculty, Belarusian State Technological University)

Basque delegation

Aitor Omar, Juan Carlos Uriagereka (Diputación Foral de Bizkaia); Aitor Onaidina (Confederación de forestalistas del País Vasco), Ander Arias* (NEIKER)

World Bank delegation

Vladislava Nemova (Environment and natural resources Management Global Practice, World Bank); Yekaterina Zayash (World Bank Minsk Country Office, interpreter)

* Only during the field trip.

Apologies

EFI (organisers)

Eduard Mauri (Planted Forests Facility)

Experts exchange on wind forest damage risk management

Basque delegation

Alejandro Cantero (HAZI)

Topics for Nouvelle-Aquitaine discussions and field trip

Moderator: Barry Gardiner; project support: Hernán Serrano, Stephanie Hayes.

Thursday 19 April	INDOOR EXCHANGES (in Bordeaux)
<p>Morning</p>	<p>From Aquitaine (Barry Gardiner, EFI; Gaëlle Burlot, SSSO): Presentation of the history, composition, structure, dynamics and management of the forests in Aquitaine, with particular attention to the 1 million ha maritime pine planted forest in Landes de Gascogne. Presentation of the last two wind damage episodes in the region: storm Martin (1999) and storm Klaus (2009).</p> <p>From Belorussia: Current forest composition, structure and management. Description of past wind damage events. Existing wind risk management plans and/or new ones to come.</p> <p>From the Basque Country (Alejandro Cantero, HAZI): Current forest composition, structure, management and choice of species. Description of past wind and snow damage events. Existing wind risk management plans and/or new ones to come.</p>
<p>Afternoon</p> <p>Aquitaine experts presentations (25 min each)</p> <p>All speakers will present their contributions to the creation of the French wind risk management plan and its adaptation to Aquitaine region.</p>	<p>Barry Gardiner (EFI) Summary of the morning session to the afternoon speakers (15 min).</p> <p>DRAAF: Hugues Cruse - Regional public authorities Dealing with wind damage to forest from the perspective of regional forest authorities.</p> <p>GIP ATGeRI: Sarah Fernet-Quinet - Public risk management coordination Forest damage diagnostic and road clearance follow-up after Klaus storm (2009); set up the Forest Cleaning and Restoration Observatory and the FORETDATA project.</p> <p>CRPF: Amélie Castro - Regional private forest centre Dealing with wind damage to forest from the perspective of private forest managers.</p> <p>SSSO: Gaëlle Burlot - Union of forest owners Dealing with wind damage after Klaus storm (2009) on private forests: post-crises management feedback and development of a wind risk management plan. Management of post-storm phytosanitary crises.</p> <p>ONF Gironde: Francis Maugard - Public forest managers Dealing with wind damage to forest from the perspective of public forest managers.</p> <p>Groupama: Pascal Mayer - Forest insurances Groupama Forêts Assurances (MISSO) is a specific insurance company for forest owners, specialized in forests risks: fire, wind and civil liability. It has faced and overcome the two major crises of 1999 and 2009 in good complementarity with action by the state.</p>

Experts exchange on wind forest damage risk management

	<p>Exercise (not done)</p> <p>During 30 min, the foresters from each country will meet in two groups (one group per country) and discuss on what and how they would implement the knowledge, the management and the facilities they have learnt in the afternoon to deal with wind damage risk in their forests (a written guidance will be provided). Aquitaine experts will be there to answer specific questions.</p> <p>Afterwards, each country will have 30 min to present (on a whiteboard) their decisions on what they would like to develop in their country regarding wind damage risk management. Aquitaine experts will provide feedback and opinion.</p>
Friday 20 April	FIELD TRIP
Morning	<p>Private: Amélie Castro, CRPF (around Sanguinet) Timber mobilisation and restoration of <u>private</u> forest lots of maritime pine affected by the 2009 Klaus storm.</p> <p>Public: Francis Maugard, ONF (around Sanguinet and Arcachon) Timber mobilisation and restoration of <u>public</u> forest lots of maritime pine affected by the 2009 Klaus storm.</p> <p>REINFFORCE project: Christophe Orazio, EFI (if there is time available) Trail DS27 (in Belin-Beliet). Objective: how broadleaved hedgerows can protect pine plantation from wind damage. Trial DS25 (in Arengosse). Objective: detect which site preparation techniques can improve pine plantations resistance to wind damage.</p>
Afternoon	<p>Round wood stocking area: David Cosme, Alliance Forêts Bois (in Commensacq) Establishment, operation and closure of a blowdown round wood stocking area.</p> <p>Labadie sawmill: Chantal Lalanne, Scierie Labadie (in Roquefort) Guided visit to a sawmill that processed stored round wood after the 2009 storm Klaus: issues, problems and solutions concerning the process of blowdown timber, from supply to sale.</p> <p>Planfor tree nursery (last minute request, short visit, no minutes taken)</p>

Indoor exchanges

Situation in Belarus and in the Basque Country

Belorussia: Storm Damage in 2016

Local summer storm damage often happen in July-August. The 10-13 July 2016 storm was the largest forest catastrophic event in the country. It affected more than 5 million m³, 15,600 ha and more than 5 million trees. This wind disturbance was at a devastating scale without precedents.

A crisis unit was established:

- Engagement of all forestry associations to restore the affected area;
- Belarusian state supported the forestry sector with 160 military personal and special equipment;
- Especial headquarters to deal with the forest disturbance;
- Experience from previous storm events (1996-1997, 2008, 2012) helped, improved equipment was used (previous salvage logging was done manually, nowadays increased rate of mechanisation).

First stage measures (response to the crisis):

- First action: salvage logging for road cleaning. It started 2-3 days after the event, involving 3,000 people. It required 180 harvesters + 260 forwarders, most of the forestry equipment available at the country.
- Difficult task: conditions after the hurricane, enormous scale, tight deadlines.

Second stage measures (limit negative impacts):

- All logging operations, except from sanitation and selective cuttings, were suspended until all storm debris were removed.
- Removal of 20,000 m³/day with harvesters until December, chipwood made on site, transported by train.
- 2.9 million m³ where harvested, od those more than one million m³ only in the Minsk area.
- Difficult access before winter, due to swampy area conditions and muddy roads.
- Daily operations requiring sometimes up to 6,000 people/day and 200 machines/day.

Third stage measures (back to normality):

- By spring 2017, all wood removal operations were completed.
- 16,000 ha affected, 5.3 million m³ of merchantable wood.
- Preparation for planting – with the mobilization of all forestry associations and the help of the army, requiring 19,000 people.
- Fully completed by the end of May.

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- But 70 years will be needed before the forest returns to the state previous to the storm.

Forestry in Bizkaia province, Basque Country, Spain

Carlos Uriagereka, Forest Service of the Diputación Foral de Bizkaia

Bizkaia forests:

- 60% forest area, 76% privately owned
- 130,000 ha

Species:

- radiata pine plantations (60%, 70,000 ha),
- eucalyptus plantations (15%, 17,000 ha),
- mixed Atlantic forest (12%, 15,000 ha)

Management:

- More than 1 million m³ total harvest per year, 75 % of annual growth
- 45,000 ha of public forests managed by the Bizakia Forest Service (100 people, 75 on the ground)
- Forest risk management mainly consist on aerial treatment against pine processionary moth, and fire prevention and suppression with focus on preventive forest management, controlled burning and public awareness in rural areas.

Questions

Q: How is controlled burning managed?

A: With authorizations for private owners to burn.

Q: Reforestation methods? In case of planting, which type of seedling container do you use?

A: Plantation of radiata pine after clearcut or eucalyptus coppice, although there are some experiments about continuous cover forestry in public radiata pine plantations.

Seedlings are grown in barrel root containers to avoid problems with twisted roots from small containers as previously used.

Situation in Nouvelle-Aquitaine

Forestry sector in Nouvelle Aquitaine

Gaëlle Burlot, SSSO

Forest of Nouvelle-Aquitaine cover 1.8 million ha, being 1.6 million ha of private property. Forest composition is 64% deciduous (mainly oak) and 36% conifers (mainly maritime pine).

Four differentiated forest areas:

- Landes de Gascogne, dominated by maritime pine plantations, 1.1 million ha, 92% private, 74% are planted forests.
- Dordogne Garonne, dominated by oaks and chestnut, 900,000 ha
- Poplar valley bottoms, dominated by poplar plantations in an agricultural landscape
- Adour-Pyrenees, dominated by oak and beech

In the region, forest property is 92% private (compared with 70% for France). 60% of private lots are larger than 25 ha (compared with 40% for France), and only 20% of private lots are smaller than 10 ha (compared with 40% for France).

Forestry sector:

- Characterized by modern silviculture (since the 60s and the 70s), reforestation, and investment in genetically improved material
- Favoured by the abundance of management plans (10-20 years) and a dynamic industrial network (with regional relevancy comparable to the famous wine sector).

Forest production:

- 83% of the annual production is harvested.
- Annual harvest of 8.5 million m³ of softwood timber, similar production than the total national production of Spain or Norway.

Conclusions:

- Foundation of the landscapes and the regional identity.
- Role in biodiversity, water, carbon sequestration...
- Important region in France for wood production and industry: creates jobs and adds value in territories.
- Strong research capacity for innovation and collaborative work: with great potential: green chemistry, energy...
- Protect against the risks and Facing challenges: Klaus storm (2009), energy sector, economic crisis, environmental issues...

List of main forestry associations:

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DFCI and GIP ATGeRI

Objective: prevention and extinction of forest wildfires, in charge of the infrastructure against wildfires. Economic contribution by forest owners.

CAISSE PHYTO FORET

Objective: compensation for prevention of phytosanitary problems (not covered by insurance companies).

Voluntary membership for forest owners.

ALLIANCE FORETS BOIS

Forest owners cooperative. Provides:

- Seedling production / Forest operations / GIS support
- Third Party Liability Insurance
- Forest cleaning and reforestation
- Since the French state ensures its support only when foresters are insured

PEFC Nouvelle-Aquitaine

Fosters and guides forests owners to forest certification.

SODEF (Company for the Development of the Forestry Economy)

Loans to help owners to finance forest investments.

MISSO

Third party liability insurance and damages insurance

Aquitaine Forest Productivity and action Centre

It groups forest development agencies, coordinates their action programmes in close collaboration with the Aquitaine CRPF and the Chamber of Agriculture and ensures a link with research.

CRPF (Regional Forest Owners Centre)

Regional Forest Owners Centre develops and orientates forest management in private woodlands.

FOGEFOR (Forest Management Training)

It trains forest owners in forest management. This training focuses on managing a forest property (law, tax, land registration, economy and markets), not to mention the technical aspects of forestry (reforestation, forest behaviour, phytosanitary issues, etc.).

Forêt de Gascogne newspaper

This is published by the syndicat des sylviculteurs du sud ouest (SSSO, foresters union) and is a real link between the professional organisation and its members. Through the 10 issues published each year, most information is delivered and analysed.

FOREXPO

Exposition fair for forest trade and logistics. Held every four years.

USSE (Union of Forest Owners of Southern Europe)

International development and interregional cooperation.

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SSSO is the Nouvelle-Aquitaine forest owners union that is member of USSE.

Forest history in Landes de Gascogne and storm damage

Barry Gardiner, EFI

Forest in Landes of Gascogne

Forest characterized by pine plantations with high productivity. Main difference with Belarusian forests – mainly privately owned, with the support of the French state.

Homogeneous forests, 1 million ha of pine – species characterised by its fast growth (+35 years rotation) and adaptation to site conditions (poor sandy soils, dry summer, wet winters and frost resistant).

Importance of the forest industry:

- 22.000 direct jobs
- 3.5 billion €/year (comparable to wine sector)
- 25% of national wood production
- 100% of national Kraft pulp production
- 60% saw timber, 40% industrial wood (panel boards, pulp)

History:

- 1750-1800. Landes covered by heathlands, managed for sheep grazing, Forests only along riversides
- 1859. Napoleon III (nephew of Napoleon Bonaparte) promoted forestry to drain the land with the objective of increasing resin production for turpentine
- Increase of forest area until 1936
- 1947. Reduction of forest area after WW2
- 1949. Large wildfire affecting 50,000 ha and killing 82 people
- Since 1960s. Increase of productivity (from 5 to 11 m³/ha/year)
- Genetic improved material and the work of the GIS Groupe Pine Maritime de Futur (funded in 1995)

Standard silvicultural management:

- Soil preparation: fertilisation + ploughing + planting of improved seedlings (in the past, seed sowing)
- Understorey cleaning (at years 2-7): to reduce water competition and for fire prevention
- For high quality timber: pruning (at year 5-10), but not common
- Commercial thinning (3-5, between years 10-35), with harvester

Management alternatives:

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- High quality timber > 1.5 m³/tree, 60 years rotation, 250 final trees/ha
- Standard classic 1-1.2 m³/tree, 40 years, 300 final trees/ha
- Biomass <1m³/ha, 35 years, 30 t/ha

Windstorms

Storm Martin:

- Dec 1999, 1-2 days after storm Lothar in Germany (Black Forest)
- High damage in all southern France, specially north and east edge of Landes
- Wood removal was manual

Storm Klaus:

- 24th Jan 2009
- High damage in the most southern France, specially the southern half of the Landes
- Wood removal with machine harvesting, requiring the mobilization of machines from other countries (Germany, Sweden)

Between both storms: total of +75 millions m³ affected, 40 people killed (mostly during 1999 storm).

Damage mainly by uprooting (due to highly wet soil conditions), followed by increased risk of bark beetle pest.

Post-storm wood storage:

- Timber needed to be sent to other countries, or underwater storage still until 2018

Extreme price impact:

- Reduction from 40 €/m³ to 1 €/m³ only one day after the storm (price of harvested wood at roadside)
- Slow price recover, still increasing
- Effect in the European forest markets (i.e. Spanish sawmills buying cheap wood from Aquitaine)

Tools and Contingency/Emergency response plans:

- Developed to help forest managers and planners, and civil authorities to plan and manage future events.
- i.e. French Government + EU funding supporting storm crisis (previously to all owners, but now only for insured owners).

Wind risk tools: Model ForêtTempête 1.1

- Risk model parameterised with tree pulling experiments.
- Using stand information from forest inventory to calculate the forest wind vulnerability (critical wind speed depending on the stand characteristics).

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- And the use of local wind data to model a wind climate map for the risk probability of a certain critical wind speed. I.e., critical Wind Speed (CWS) for uprooting is lower (higher risk) than for breaking, CWS decrease with time along rotation and after thinning interventions.

Questions

Q: Is natural regeneration possible in France?

A: Yes, but with increasing difficulties due to deer browsing.

Q: Who supported the organization of post-storm operations?

A: Supported by French government and forest associations.

Q: Annual harvest in Landes?

A: 8.5 million m³, including final cuts and thinnings.

Q: Indirect effects in road damage, damage to water sources, timber, etc.?

A: Primary (storm salvage logging), secondary (pests) and tertiary damage (infrastructures, biodiversity).

Effects reported in a report send to European Commission in 2010. More information can be found in What Science Can Tell Us “Living with Storm Damage to Forests”, from EFI.

Q: Time to clear the damage?

A: Mostly within one year, but effects still affecting today 10 years after (i.e. wood storage).

Q: Seedling production management?

A: Carried on in nurseries by private companies. [Belarussians commented their interest to visit a nursery, not previously reported.]

Q: Average production costs per m³?

A: Around 10 €/m³. But costs for wood removal and sanitary harvest to reduce risk of forest fires and bark beetle outbreak were funded by the French government.

Q: Measures to reduce the risk of windthrown?

A: There is increased evidences of higher stability in mixed forests (i.e. Norway spruce + beech in Germany and in France). However, there are no economic arguments to implement this at stand level in Nouvelle-Aquitaine for wind risk. Nevertheless, there exist reasons to diversify stand species for concerns about the introduction of new pests to maritime pine (i.e nematode risk from Portugal). Although it is difficult to implement at landscape level due to the numerous forest owners.

Q: In comparison with the Close to Nature approach in Germany, what would be the natural forest composition in the Landes?

A: Pine on the sandy plateaus, oaks along the riversides

Q: Fire organisation in Nouvelle-Aquitaine: in addition to detection and extinction infrastructures, are there prevention measures (i.e. prescribed burning)?

A: Increasing wildfire risk (i.e. 2017 fire in Medoc, affecting 3,000 ha, after a dry and windy spring)

Burlot: DFCI has an efficient system of fire detection (based on video cameras on top of towers) and extinction (based on the maintenance of the road network and firebreaks), financed by private owners and supported by public authorities.

Mayer: In addition, forest owners have the option to contract fire insurance. Although a low proportion of forest owners have it, the proportion is higher in the Landes than in the rest of France.

Q: Are there natural pine forests left in the Landes? How is their silvicultural management?

A: Natural pine forests mainly located along the littoral dunes, mainly in public forests managed by the ONF, with higher focus on soil protection (to prevent dune advancing) and high importance of biodiversity protection and recreation.

Q: How is forest certification complied in the plantation forestry in the Landes, since some schemes like PEFC favoured close to nature forestry?

A: Certification schemes are voluntary, although they give a competitive position in the timber market.

Wind risk management in Nouvelle-Aquitaine: presentations by main regional forest actors

Storm risk management in Nouvelle-Aquitaine: the governmental solidarity plan

Marion Grua, DRAAF

Storm 1999 Martin: 102.600 ha with more than 40% damage

Storm 2009 Klaus: 223.000 ha with more than 40% damage

Change in standing wood availability: from 140 million m³ to 80 million m³ after both storms (source: IFN 2011). Of those, 42.9 million m³ were damaged by storm Klaus (of which 41.7 million m³ of maritime pine).

Table 1. Wind damaged volumes mobilised since storm Klaus (January 2009 until December 2010).

		millions of m ³
Volume harvested	subsidised	16.0
	no subsidised	13.5
Volume stocked	–	9.8
Volume exported	subsidised	4.2
	no subsidised	0.9
Volume processed in France	subsidised	2.0
	no subsidised	12.6

Experts exchange on wind forest damage risk management

After 2009 storm, the French government put in place the Solidarity Plan (*Plan de Solidarité Gouvernementale*): a crisis unit with a quick response (from 25 January to 3 June) despite the non-favourable economic context (financial crisis). The reason for Nouvelle-Aquitaine to have risk management plan is due to the economic importance of the sector in the region.

Six phases with different subsidies:

1. **Access** (2009-2010): opening of closed roads, 31,000 km – **5.5 million €**
2. **Transport** (2009-2010): 5,1 million m³ of timber transported – **62 million €**
3. **Storage** (2009-2014+): opening of 44 storage areas, most of them with irrigation, occupying 650 ha, storage capacity of 8.1 million m³ (on 31 December 2017 there were still 10 storage area open, with 290,000 tons of timber) – **29 million € for creation and 40 million € for closure**

Total subsidies: 136 million €

4. **Removal** (mid-2009-2014): cleaning of 195,000 ha affected
5. **Salvage logging against bark beetles** (2010-2011): 30,000 ha of forest affected, 2.4 million apparent m³ treated
6. **Reforestation** (2010-2014): 164,000 ha reforested (planned for 204,000 ha), progress monitored by the GIP ATGeRI

Total subsidies: 525 million € (60 mill. € from FEADER funding), planned for 200.000 ha

Lessons learnt:

- If the damaged volume is more than 3 or 4 times the annual harvest, the imbalance in the timber market is so deep that a governmental help plan is justified.
- However, small impact of the plan on forest owners economy, who suffered mostly due to the decrease of wood market prices, which stayed unbalanced for 3-4 years afterwards.
- The whole crisis management made necessary a continuous information system: an observatory of wood market prices.
- Timber storages is seen as the most efficient tool, timber transport must be subsidised, subsidised loans to companies are seen as a complementary tool.
- Depending on the economic context, governmental warranties can be considered.

Questions:

Q: What was the reforestation approach?

A: Early reforestation as soon as possible, focused on private properties with production objective, despite unbalanced age structure.

Public risk management coordination

Sarah Fermet-Quinet, GIP ATGeRI

Observatory for diagnosis of forest damage, to track forest cleaning and reconstitution after the storm events.

Managed by a public group with 15 members: French State, Ministry of Agriculture, Ministry of Environment, Ministry of Interior, National Forest Office (ONF), National Geographic Institute (IGN), Regional Government of Nouvelle-Aquitaine, Regional Forest Organisation against Forest Fires (ARDFCI) and departmental governments.

Origin in 1995 for forest cartography purposes, still used to support fire extinction. Created in 2005 as GIP (Group of Public Interest), with subsidies for the diagnosis of storm damage until 2016, its work continues despite no current subsidies.

Objectives: collection of forest data to provide information to public decision-makers.

Tools:

- Cartography
- Observatories (forest / livestock / vineyard)
- PIGMA: online tool for data (mainly spatial data) sharing and exchange

Different tools:

- **Forest damage diagnosis:** helicopter flights over train railroad network to determine the portion of damage impact, updated every 14 days, reducing the amount of people on the field. Methodology tested in areas with and without damage.
- **Forest roads clearing:** field assessment of closed/reopened roads with information sharing on database. Set up in January, juts after storm, as roads needed to be cleared before fire season starting in April. It allows to give different priority levels for resource allocation (i.e. after all priority 1 roads in one municipality were reopen, reallocation of resources to the next priority municipality).
- **Observatory of cleaning and reconstitution:** put in place after the 2009 storm to monitor the reconstitution efforts after the large state investment from the State (525 million €). This need was realised of the importance after the 1999 event, when reported reforested area differed in 25,000 ha from the actual reforested area measured with satellite images. Data was provided by 50 operators and shared among all.
- **FORET DATA project:** it continues with the observation after national subsidies, finding new financial funding. It collects and analyses data for the Observatory while providing services for forest offices

Questions:

Q: Does GIP ATGeRI provide services to forest owners on a pay basis?

Experts exchange on wind forest damage risk management

A: Payment as a membership of the GIP Forest association, which develops tools not just for forest managers but also for any interested public or private forest association.

Effects of the 2009 storm in regional private forestry

Amélie Castro, CRPF Nouvelle-Aquitaine

The 2009 storm Klaus had a great impact on private owners, for which forest maintenance already implied a high individual investment and were still suffering from the strong impact of the 1999 storm. Klaus Storm, on January 2009, reached wind speeds 100-140 km/h.

On an already unfavorable economic context for the wood market (crisis of building sector, decrease of consumption and financial crisis), storm Klaus posed a global shock for the industrial activity associated to maritime pine wood. For maritime pine:

- Affected an area of 494,000 ha, of which 202,000 ha were damaged >40%
- It affected 37 million m³, equivalent to the total harvest of 5 years.

This disaster implied a huge effort in wood mobilization that exceeded the mobilization capacity of the local sector and required the contribution of harvesting companies from all Europe. It caused high impact on the maritime pine industry due to its concentration in the Nouvelle-Aquitaine region at national and international scale (closest areas of maritime pine plantations are in Galicia and Portugal), unlike other storm disasters in Europe where wood could be sent to sawmills in other countries (i.e. Gudrun 2005 in Sweden, able to mobilize spruce wood to sawmills along the country).

Financial estimation of damages to forests were estimated between 1,500 and 2,000 million € according to CRPF (including loss of present value of forests, loss of future value of forests, over-costs of reconstruction, induced damages). The scale of economic damage justified the need of national and EU funding for reconstitution fund. The national measures for windthrown wood mobilization consisted in a set of measures to promote reforestation for the revalorization of the forest. However, they did not consider indemnification for forest owners to compensate the high proportion of affected forest area to many owners and the drastic reduction of wood value (reduction of 95% price).

As a second impact for many owners (i.e. Médoc area suffered 1999 and 2009 storms), it raised awareness on the risk of recurrent storm disaster and concerns in the forest owners about the need of adapting silviculture:

- for risk reduction (by increasing root anchorage, reducing rotation length),
- for diversification (regeneration system, alternative species and silviculture), and
- adaptation to market (silviculture dedicated to fuelwood production).

Overview of national measures for mobilizing windthrows

No indemnification for forest owners, but a set of measures for promoting “Valorisation by harvesting”.

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Loans for:

- buying windthrows
- harvesting
- storage (roundwood storage waiting to be sawn)

Subsidies for:

- transport of roundwood (within an outside the region)
- transloading (in storage sites and in transport outside the region)
- storage sites setting

Conclusion on windthrows management

Several locking points in the national mechanism:

- Timing:
 - Complexity of the mechanism
 - Wood deterioration
 - Increase of risks
 - Deterioration of sale conditions
 - Lack of roundwood storage
 - Incompatibility between administrative time and crisis time
- Inefficiency of loans mechanism:
 - Role of State guarantee
 - Access to bank loans
- Inefficiency of target price
- Side effects of carriage subsidy?

Forest reconstruction

Three main questions:

- Was it relevant to keep woodland on the whole damaged area?
- What were the preconditions before reforestation?
- Do we need to consider adapting or changing silvicultural regimes?

Post-storm reforestation was considered an obvious choice and a necessity. However, foresters had to face many critics (monoculture, plantations, intensive management). After two major storms in less than 10 years, forest owners motivation was and still is a critical factor.

Post-storm silvicultural regimes have to fulfil four conditions (collective reflection):

- To be economically attractive for forest owners
- To be reversible
- To reduce risks and to be integrated in an adapted insurance system
- To conserve or to enhance biodiversity

Many strategies as an alternative to “business as usual”, with three different objectives:

Table 2. Strategies as an alternative to “business as usual” and possible objectives.

Alternative strategies	Diversification	Risk reduction	Adaptation to market demand
Variable rotation length			X
Foster natural regeneration	X		
Silviculture dedicate to fuelwood			X
Reduction of rotation		X	X
Techniques favouring a good anchorage		X	
Use of “biodiversity clause” (subsidies for forest restoration)	X	X	
In few cases, alternative species / regimes	X	X	

Questions:

Q: Approaches for climate change adaptation have already been taken?

A: Mainly just monitoring of emergent risks. Change of species is not generally considered as the species is considered the best adapted at the northernmost part of its potential distribution, although there are efforts to produce genetically improved material breeding with southern provenances more resistant to droughts.

Storm crisis management and the role of the forest owners union

Gaëlle Burlot, SSSO

The Syndicat des silviculteurs du sud-oues (SSSO) is a forest owners union that represents forest owners in front of the government, state administrations or communities (municipalities, departments, regions), companies or public Institutions, and in front of the economic sectors (forestry operators, sawmills, etc.).

SSSO:

- groups 6,000 forest owners on 3 departments (Gironde, Landes and Lot-et-Garonne) representing more than 65 % of the private forest.
- defends the interests of the forest owners on the economic, fiscal and social subjects and, more and more today, on environmental issues.
- proposes orientations and reforms tending to favour the independence in the management and the dynamism in the forest economy, with the local authorities but also the national and European authorities.
- develops the concept of the cultivated forest to guarantee the profitability of the silvicultural economy, considering the forest property as a silvicultural company.

Involvement in the storm risk management

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Economic and fiscal issues:

- Recommendations about the management: removal of trees as soon as possible and sprayed against bark beetles
- Recommendation and monitoring about wood prices
- Question the government (about cleaning and reforestation)
- Ask for financial supports (subsidised loans, grants, etc.) based on GIP ATGeRI data
- Development of insurance and negotiation of contracts

Social issues:

- Communication for forest owners (prices, timber market, recovery plan, sanitary issues, etc.)
- Legal advice
- Support on procedures (administrative, insurance, etc.)
- Monitoring of the legislation and its application in the interest of the forest owners

Environmental issues:

- Defence of the interest of the regional association of protection of forests against fires (AR DFCI)

After the storm of 1999, and then after the one of 2009, the union asked for it and made suggestions about the wind risk management plan that the national and regional governments should develop and implement. It provided feedbacks on all subjects. It participates, reads and corrects the national project of risk management plan.

Management of post-storm phytosanitary crises

An exceptional attack of bark beetles caused the death of trees after the storm, even in forest stands not affected by wind damage. The volume affected was considerable. SSSO implemented the obligation to:

- report bark beetles damages
- quickly harvest the wood and clean systematically the area
- treat the wood piles against bark beetles or stock quickly under sprinkling
- treat against the processionary moth and the *Hylobius*

Remote sensing to monitor tree mortality:

- using spatial imaging, detection of the trees (pine) decay in coniferous stands due to bark beetles attacks in Aquitaine.

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Management of wind risk in public forests

Francis Maugard, ONF Gironde department

In 2011, two years after the Klaus storm, the ONF published the good practices guidelines “Recovery of public forests of the Landes plateau after the Klaus storm”. It was issued after a global consultation with the main regional partners.

Preparing the recovery

The implementation of the recovery is the culmination of a process that stems from:

- mapping and diagnosis of damage;
- analysis of the site's potential and risks;
- the will of the owner who decides the direction to take;
- the availability of technical, financial and human resources;
- updating forest management or management plans.

Three strategic axes

A stable forest:

- By searching for an optimum anchorage from the reconstitution phase onwards
- By a better spatial distribution of the stands (edges, direction of lines...)

A more diversified forest:

- Regeneration mode
- Choice of species
- Environmental protection (wetlands, gallery forests, clearings, etc.)
- Preservation of hardwood islets

A protected recovery:

- from sanitary and game risks

Recommendations

A recovery adapted to the issues

- Well-defined objectives:
 - Production of quality timber with intermediate production of industrial timber
 - Semi-dedicated wood energy and timber silvicultural regimes
- Systematic non-reconstruction is an act of management:
 - Preserve standing trees, edges, seed trees, wildlife sanctuaries
 - Maintain a hardwood undergrowth and good landscape diversity
- No recovery in affected stands at less than 40 % and in small areas (< 1 ha):

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- Identify areas without timber production uses (too shallow soils, remarkable natural environments, etc.).

A stable forest

- Preserve and strengthen forest edges
- Reasoning fertilization
- Ensure adequate sanitation and soil preparation
- Limit tillage during stand treatments
- Do not reconstitute forest stands on soils that are too shallow
- Improve planting technique:
 - Plant the seedlings straight, compact the stump area evenly, use quality seedlings with a good balance stem-root
- Introduce the hybrid maritime pine Landes x Corse that is in in pre-development
- Consider the pre-development of the taeda pine tree
- Manage stands in dynamic thinnings:
 - Stand management scenarios based more on threshold heights, which allow storm risk to be better taken into account, thinned more strongly at an early age.

A more diversified forest

- Species and stand diversification:
 - Cultural mixture to educate the stems of the objective species (natural pruning)
 - Maintenance or improvement of humus and soil biological activity
 - Increase in floral and faunal biodiversity
 - Differentiated resistance to climatic stresses and pests
 - Differentiated wind resistance, depending on root systems, type of foliage and stem architecture
 - Aesthetic and landscape interest
 - Sometimes, economic interest
- Species and stand diversification:
 - Promoting species diversity
 - Conserve, enhance and strengthen hardwoods
 - Preserve clearings and gaps
 - Protect remarkable natural environments and spaces (lagoons, peat bogs, moors, etc.)
 - Preserve isolated trees
 - Promote the natural regeneration of species in close to nature sites
 - Integrating landscape management into recovery

A protected recovery

- Preserve regeneration:
 - Anticipate *Hylobius* damage (delay recovery for 2 years, destem and destroy stumps, treat plants preventively)

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- Prevent fomes (preventive treatment of stumps, localized tillage, species substitution, strip and destroy stumps, defer recovery after tree exploitation (5 to 8 years))
- Monitoring the pinewood nematode and its insect vector
- Control ungulates and protect regeneration:
 - When the balance broken, it has consequences that can threaten the quality of stands and the biodiversity of the forest, by:
 - the strong browsing of seedlings and plants
 - smears and barking of young trees
 - a blockage of natural plant dynamics
 - a rarefaction of species and a trivialization of the environment
- Tend towards sustainable hunting management:
 - promote dialogue between foresters and hunters
 - ensure sufficient capacity to accommodate large wildlife
 - systematically favour accompanying vegetation
- Effective population regulation:
 - increase and total realization of hunting plans

Forest insurances: creation of specific insurances for forest owners and their particularities

Pascal Mayer, Groupama

MISSO Insurance (*Mutuelle Initiée per les Sylviculteurs du Sud Ouest*, Mutual insurance initiated by the forest owners of south-west France) is a pioneer insurance initiated by private forest owners in 1947 after the large wildfires affecting the Landes de Gascogne forest. It is managed by Groupama Forêts Assurances and ruled by forest owners.

Initially it only covered forest fires, it expanded in the 80's to cover all France and to include wind risk. It is a specific insurance company for forest owners, specialized in forests risks of damages caused by: fire, wind, snow, frost, landslides and civil liability.

It has experience facing and overcoming the two major crises of 1999 and 2009 in good complementarity with action by the state. The MISSO insurance is a compensation for each lot with a fixed price predefined by the insured owner.

Compensations

They vary between 500 and 5,000 €/ha (considering that average reforestation cost is around 1,000 €/ha and the value for a 20 years-old stand is 4,000-5,000 €/ha). There is no deductible. The residual value of the damaged timber remains the property of the insured forest owner.

There are thresholds to receive the compensation: the minimum is 1 ha affected with more than 40% of damage, or 0.4ha with 100% damage. Above this threshold, compensation is in proportion to the damage. With a damage >80%, affected owners receive total compensation.

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Insurance contributions

They vary depending on the species, forest type and region.

Pine in Landes de Gascogne:

- 2 €/ha/year for compensation against fire of 1,000 €/ha (covering only reforestation costs)
- 12 €/ha/year against fire and wind

Oak in Central France:

- 0.5 €/ha/year for compensation against fire of 1,000 €/ha
- 2.8 €/ha/year against fire and wind

Douglas fir in Massif Central:

- 1 €/ha/year for compensation against fire of 1,000 €/ha
- 8 €/ha/year against fire and wind

Storm events 1999 and 2009 from the MISSO perspective

1999: Lothar (26 Dec, N France) + Martin (27 Dec, SW France) with a total 140 million m³ damaged. Both events happened within a 2-days period, even though windstorms of this magnitude are considered with a turnover of 100 years.

No compensation from the compensation Fund for natural disasters (since 1990, French state refuses to consider storms damages in Forest as a natural disaster) but grants to reforest have been carried out.

Both events costed 65 million € for MISSO, equivalent to 100 year of contributions cover for 350,000 ha insured against fire and wind, representing that 2/3 of the company assets needed to be sold. This resulted in an adjustment of the MISSO model: increase contributions and reduce guarantees, negotiate a new reinsurance commitment and downsize temporarily its activity.

The new model was tested in the 2009 Klaus storm event, which affected 40 million m³ concentrated in the Landes department. Once again, special grants were distributed to reforest. This costed 16 million € for MISSO, equivalent to 20 years of contributions for 225,000 ha insured against fire and wind. The reduction of the affected costs prove an improvement of the MISSO business model. therefore, recurrent storms are no longer considered unexpected events.

Current situation of wind insurance

Three forest insurance companies operate in France. Only 600,000 ha of private forests are insured, from a total of 16 million ha. The company aims that 2 million ha (5%) would be insured as minimum.

French government supports to motivate insurance contract with tax reduction on contributions and a reduction of the inheritance taxes on the amount invested. Since 2010, the French state does not grant subsidies for reforestation in the case of storm anymore. Nevertheless, most forest owners are still not motivated to contract an insurance, as they generally believe the state will guarantee financial aid anyway.

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Considering an average income of 50 €/ha/year for a forest owner, an annual insurance costs of 5 €/ha/year is still high.

There are several options that could be considered in order to reduce insurance contributions:

- sharing the risk between large areas and various stand types,
- reduction to those forest owners with management taking into consideration the lessons learnt for wind damage risk reduction,
- new win-win contracts for forest owners-state-insurance companies, i.e. with a state fund reserved for forest owners with insurance.

Field trip

Replanted maritime pine stands damaged in 2009

Public lots

Francis Maugard, ONF Gironde department

First site: example of particular silvicultural regime: seed sowing with unimproved material (not bred) collected from selected stands

Representative management as it was 20 years ago, before scarcity of seeding material motivate a change towards seedling planting.

From 100% sowing in 1980s → 50% sowing / 50% planting in 2000s → Now 85% planting in ONF public forests.

Management:

- Soil preparation: ploughing on stripes + soil smashing.
- Reforestation: direct sowing with 6 kg/ha on lines.
- Weed control.
- Two pre-commercial thinning:
 - first at 4-5 years (1 m height), reduction to 2,500 trees/ha
 - second at 7-10 years, reduction to 1,250 trees/ha, standard density for plantations

Classical management cycle: 40-45 years rotation with four thinnings, for objective trees of 1.2-1.3 m³/ha.

Questions:

Q: What is the selection criteria in the pre-commercial thinning (selective by quality or systematic)?

A: 1st thinning selection by plant quality, 2nd thinning selection to adjust spacing

Q: How was it possible the increasing in productivity from 4-5 m³/ha/year to 10 m³/ha/year?

A: Mainly due to genetic selection of best trees and tree breeding, with growth increases of 10% between breeding generations, currently in its 4th generation.

Also due to more intensive silviculture:

- site preparation with ploughing to improve nutrient availability,
- fertilization before planting to increase the P fertility of the poor sandy soils (60-80 kg/ha superphosphate)
- mechanical cleaning to reduce competition and facilitate access before thinnings.

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Similar improvement results in experiences of increased silvicultural intensity in the boreal context of Russian forests.

Q: What was the process of selection of the breeding program?

A: Initiated in the 1960s with the selection of 300 mother plus-trees, followed by the crossing between the best individuals, to provide top material seeds for seedling production. Seedlings are produced in seed orchards, stands with plus-trees for crossings to produce improved material for nurseries.

Q: Which is property of seed orchards?

A: Seed orchard have been designed by researchers and managed by private companies (nurseries) or public forest institutions (ONF is responsible of the management of some seed orchards).

(Interest of Belarussian group about the breeding selection process and the maintenance of seed orchards. Limited time to within the field event focused on the forest restoration after storm crises, but special visits could be organised on a future expert exchange.)

Q: Is there pressure from environmental / ecologist associations against monospecific plantations (in comparison with exotic monospecific plantations like radiate pine in Basque Country)?

A: Not a big problem about the species selection, as there is consensus about the consideration of maritime pine as the best choice, being a native species adapted to the Landes conditions.

Nevertheless, there are raising concerns to diversify silviculture in order enhance biodiversity and the provision of ecosystem services (i.e. mushroom picking associated with oaks, important for recreation) and to increase stand stability.

Alternatives to monocultures include the conservation of all deciduous trees in the stand (standard management since 2nd storm, promoted by forest certification) and the enrichment in lines with deciduous species (oak, birch and rowan trees).

Experiments in mixed forests carried on by Hervé Jactel (INRA) showed how species mixing contributes to improve stand health by protecting against bark beetle and processionary moth attacks. They propose to include lines of broadleaves in the monospecific landscape, what would reduce processionary ability to detect host trees and spread.

Q: How do you clean to reduce understory competition?

A: Carried on with a mower on interlines spaced 2 m. Interlines width has increased from 2.5 to 3m in order to give more space for machinery. Therefore, the number of trees per line has increased to maintain the tree density.

Second site: plantation of the third breeding generation material VF3

Evident problems of game damage (deer, roe deer, hare and wild boar) caused by browsing of apical and lateral shoots that induces growth of lateral shoots from below.

Different tools for management decisions required to negotiate the hunting quotes with the hunting associations:

- fenced experiments to control the game impact on regeneration and vegetation (network of fences with 1 experiment every 120 ha, surveyed 2 times per year),

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- monitoring of game populations (i.e. 10-fold increase of deer population in France in the last 20-30 years).

Questions:

Q: How are hunting authorisations organised?

A: In state forests, the ONF holds all responsibilities; while in municipal and private forests, the hunting authorizations are negotiated with the hunters federation at different levels (departmental, regional, national federations).

Q: Stump removal after clear-cut is a standard management?

A: Stump removal is only carried out on 10-20% of stands. Sometimes stumps are smashed on the stand, but usually soil preparation just requires full ploughing.

Q: Interval between clear-cut and plantation?

A: Delay of 2 years before planting to reduce the impact of *Hylobius* beetle attack on seedlings, with stumps almost decayed after 2-3 years.

Q: Which kind of ploughing machine is used?

A: Nowadays, the conventional technique includes the use of non-stop ploughing system with a blade that automatically jumps over the stump. This increases productivity as it reduces operation time in comparison with the previous system that required stopping when hitting a stump.

Q: Which are the characteristics of planted seedlings?

A: 9 months seedlings with 200cm³ of compacted mulch without plastic containers. Seedlings in nursery are planted without separation within mulch smashed by compression that is lately sliced to separate seedlings.

Private lots

Amélie Castro, CRPF Nouvelle-Aquitaine

Strip ploughing in lines oriented on the direction of main winds (WE). Recommended in sites with high water table problem and iron pan, where complete ploughing is not recommended as seedlings roots get drown by water table. Despite disadvantages against wind as it produces asymmetric root system (deeper root on the ploughed side, shallow root on the non-ploughed side). To get a balanced root system, complete ploughing would be needed, but this increases drowning risk of the roots if the water table is close to the soil surface. In sites with high water table and iron pan, forest managers recommend to do shorter rotations. Nevertheless, main wind risk is at the clear-cut hedges, which is difficult to plan due to the different ownership of neighbor stands. There are no chemical treatments against competition vegetation (the last ones were in the 90s, against grasses).

Questions:

Q: Is there any restrictions for clear-cut maximum area?

A: No restrictions of maximum area. Average clear-cut area is 6 ha (median 10 ha).

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Q: Is there a diversity of soil conditions?

A: At a landscape level, with multiple wet sites with high water table and poor soil fertility that limits the possibility for hardwood species.

Q: Which are the requirements for forest certification?

A: Main obligatory commitment for a certification scheme is to have a management plan. Additional commitments include maintaining the hardwood trees existing in the stand. If there are none, the owner is not obliged to plant them.

Q: System for fire detection?

A: It is a collective detection system for private and public forests coordinated by the fire service. Prevention and extinction infrastructures (detection with tower cameras, road network maintenance, water storage) and extinction costs financed with tax payments.

Q: Which is the property surface and land price?

A: Average ownership is 47 ha. Ownership needs to be over 500 ha in order to get enough income to sustain a family. The average land price 1,500 €/ha (increasing to 3,000 €/ha with permission to build properties).

Facilities to store and process blowdown timber

Commensacq Timber storage area

David Cosme, Alliance Forêts Bois

Establishment, operation and closure of a round wood stocking area constructed after the 2009 storm

For the 2009 storm, up to 20 new stocking places were built. The investment was proved viable after the experience of the 1999 storm, when only two stocking areas were available, given the proved possibility to store wood up to 8-10 years. The investment is payed off as stocking places continue operative.

Stocking area offered to the cooperative clients (Alliance Forêts Bois) to store the wood already sold by the owners. Previous forest area was changed to semi-industrial status.

Site requirements for a wood storage site:

- geological studies,
- analysis of water table,
- flat area feasible for a closed water circuit,
- access to road and electricity,
- close to damaged area and wood industry.

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Quick establishment with construction works starting in January right after storm and already operative storing wood by March.

Quick reaction for wood storage with water spraying before spring in order to avoid wood stain in quality wood for rotatory peeling.

The total storage capacity of 350,000 tons was filled in just four months, with an average storage of 60-100 trucks/day. Storage was organised in 10 blocks of 30,000-35,000 tons/block, being each wood pile equivalent to 1,000 tons. Logs length depended on the transformation process (usually 2-3 m).

In order to minimize road construction on site, temporal tracks with wood logs in front of the wood piles were moved as the pile got filled.

Water spraying lasted for 5-6 years summing up a total cost of 2 million €, or 400,000 €/year for maintenance and labour work.

Water sprinklers required a power transformer of 1,000 kWh for a minimum extraction of 20 m³/ha from the dwells located in the middle of each block. Spraying was done in two directions: lateral spraying in horizontal parallel to the fibre in order to have quick saturation for high quality wood, in addition to spray from above.

Most of wet storage has already been sold, since in sawmill wood can be stored up to 5-7 years depending on the arrival wood quality (without stain) while industrial quality timber and pulpwood can be stored up to 8-9 years. Nowadays, it remains only as dried storage for 30,000 tons of new wood.

In addition to the wood storage area, the stocking site contained a short-term intermediary seedling storage for material from the Forelite nursery owned by Alliance Forêt Bois cooperative. The nursery material included seedlings of maritime pine (3 months, 0.20 €/ha) and eucalyptus (hybrid of *Eucalyptus gundal* resistant to frost, main problem of eucalyptus plantations in the area in addition to the nutrient export, 0.80 €/ha).

Labadie Sawmill processing salvaged timber

Chantal Lalanne, Scierie Labadie

Guided visit to a sawmill that processed stored round wood after the 2009 storm Klaus: issues, problems and solutions concerning the process of blowdown timber, from supply to sale

The family company counts with 40 employees and works exclusively on maritime pine timber.

It buys trees on stand and uses the whole tree for multiple construction products, from palettes to full equipped wooden houses (sold at 150,000 €).

Timber products are pressure treated to have a deeper penetration of preservative treatment. In addition, by-products from wood production are also sold (i.e. high quality bark for gardens at 50

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€/ton, low quality bark for biomass at 7 €/ton, sawdust for boards at 38 €/ton and woodchip at 52 €/ton).

After the 2009 storm event, the sawmill stored a total of 130,000 tons of whole stem logs (13-15 m length). That allowed the company flexibility in production without requiring anticipating the product demand. This wood was wet stored all along the year, except for winter days with frost temperatures (<5°C).