

Forest adaptation of climate change

- Office National des Forêts strategy



Climate compatibility analysis and diebacks management

- The baseline warming trajectory
- An approach to the long-term vulnerability of forests ecosystems
- The need of renewal in forests stands
- Everyday management of diebacks and renewal

The baseline warming trajectory

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VILLES

analogues climatiques prenant en compte plusieurs paramètres : température moyenne, température minimale de janvier, température maximale de juillet, précipitations annuelles.

Lille aura le climat de **Bilbao**

Paris aura le climat de **Montpellier**

Brest aura le climat de **Vigo (Espagne)**

Lyon aura le climat de **Rome**

Toulouse aura le climat de **Valence**

Marseille aura le climat de **Séville**

*En 2023, l'augmentation de la température moyenne annuelle en France est de + 1,7 °C par rapport aux années 1850-1900.
En 2050, l'augmentation prévue est de + 2,7 °C.

In the scenario that is studied, the global warming will be of + 3°C in 2100, which will mean + 4°C in France.

The loss of 1/3 of places where oak can grow in France

The loss of 2/3 of places where beech can grow



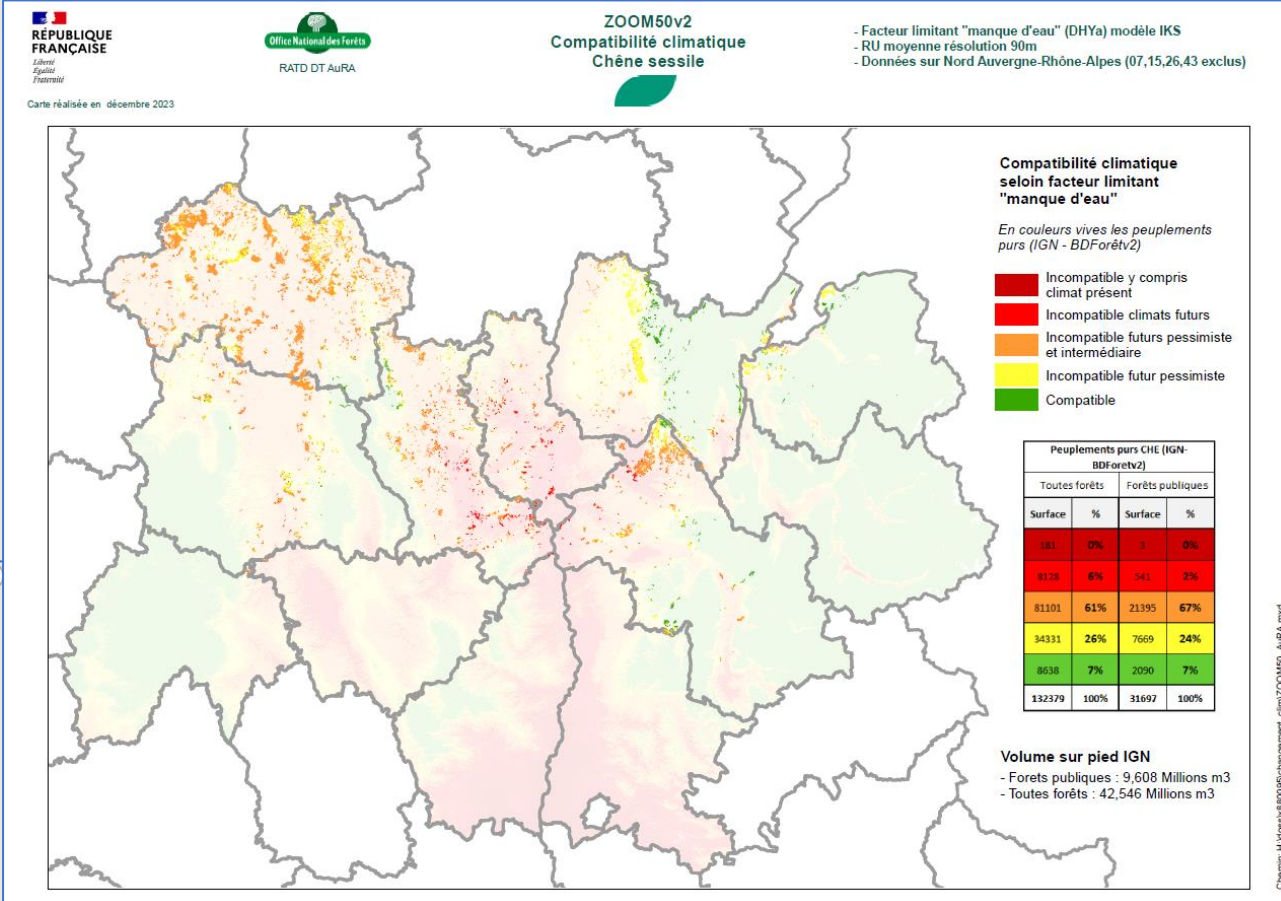
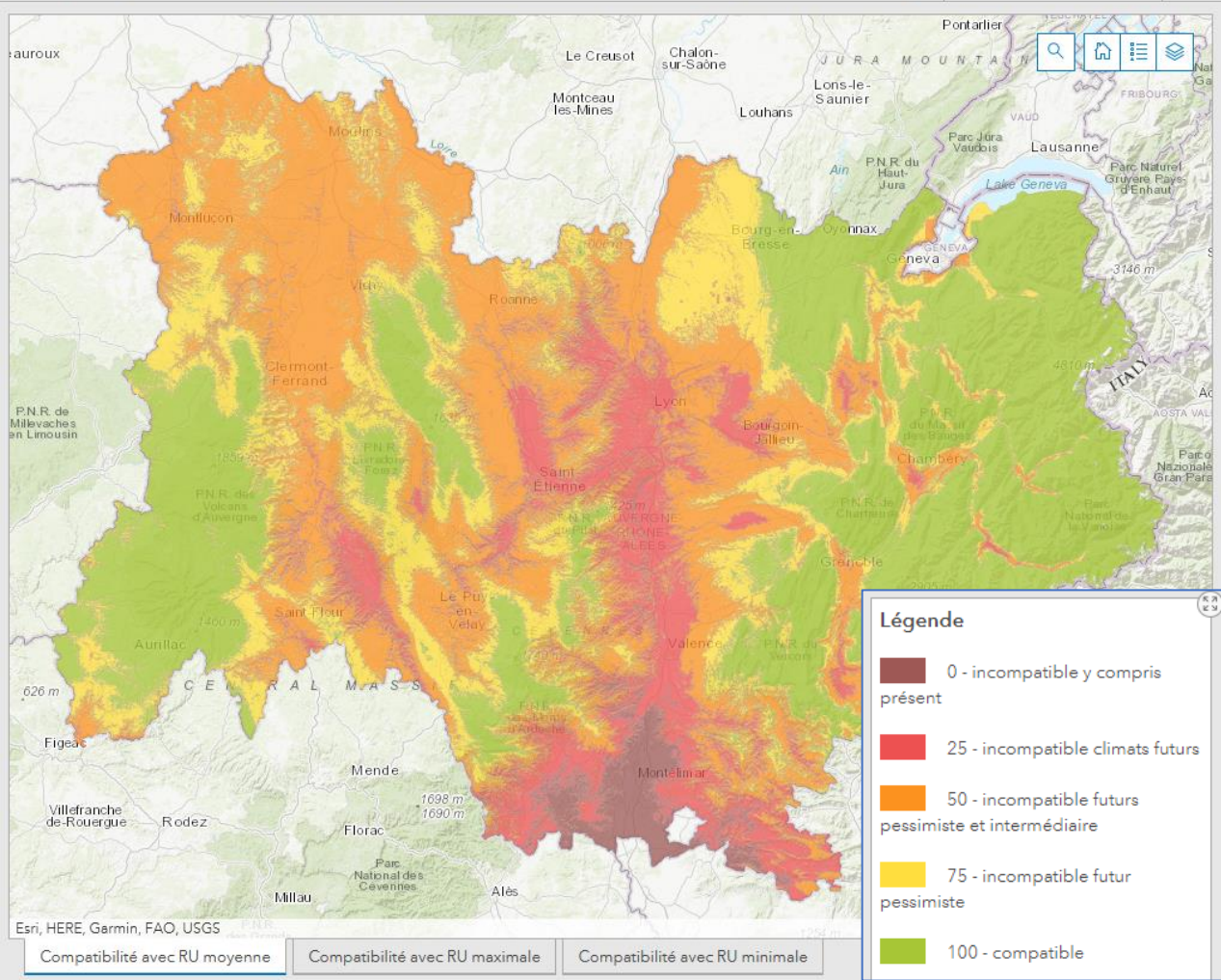
Climate compatibility – exemple of Oak – water deficit factor

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Zoom50v2

Cartes de compatibilité climatique des essences selon le facteur limitant "manque d'eau" (DHYa) avec données de RU à...

Sélectionner une...
Chêne sessile



Chemix: H:\des\8650\changement_clim\ZOOM50_AuRA.mxd

Volumes of trees and situation of climate vulnerability in Auvergne – Rhône Alpes

Peuplements purs S.P et/ou EPC (IGN-BDForetv2)			
Toutes forêts		Forêts publiques	
Surface	%	Surface	%
808	0%	137	0%
29579	7%	3630	2%
92470	23%	22415	13%
80414	20%	36835	22%
201137	50%	105285	63%
404408	100%	168302	100%

Volume sur pied IGN

- Forêts publiques : 25,847 Millions m3
- Toutes forêts : 92,733 Millions m3

Fir

Peuplements purs S.P et/ou EPC (IGN-BDForetv2)			
Toutes forêts		Forêts publiques	
Surface	%	Surface	%
1461	0%	217	0%
42700	11%	5476	3%
92954	23%	25940	15%
79744	20%	37521	22%
187549	46%	99148	59%
404408	100%	168302	100%

Volume sur pied IGN

- Forêts publiques : 32,685 Millions m3
- Toutes forêts : 90,856 Millions m3

Spruce

Peuplements purs HET (IGN-BDForetv2)			
Toutes forêts		Forêts publiques	
Surface	%	Surface	%
682	1%	265	1%
6451	5%	1419	3%
19711	15%	5210	12%
33348	25%	9603	22%
73264	55%	27399	62%
133455	100%	43898	100%

Volume sur pied IGN

- Forêts publiques : 17,117 Millions m3
- Toutes forêts : 62,716 Millions m3

Beech

Peuplements purs DOU (IGN-BDForetv2)			
Toutes forêts		Forêts publiques	
Surface	%	Surface	%
1047	1%	276	4%
16083	19%	1518	19%
40820	48%	3041	39%
21115	25%	2275	29%
6697	8%	765	10%
85762	100%	7875	100%

Volume sur pied IGN

- Forêts publiques : données non significatives
- Toutes forêts : 40,140 Millions m3

Douglas fir

The need of renewal in forests

- 9 % of the actuals areas are incompatible even with an optimistic climate scenario (RCP 2,6)
- 37 % of the actuals areas are incompatible with intermediate scenario (RCP 7,0)
- 59 % of the actuals areas are incompatible with « pessimistic » scenario (RCP 8,5)

- 35 % of our forest will probably need a renewal in the next 35 years. Which would mean 1 %/ year
- 350 000 ha are managed (only areas where we can go) → 3500 ha /year to renew (planting or else)
- Multiplication of violent climatic phenomena (storms, winds, heat waves...)



CANICULE. « LA FORÊT MEURT EN SILENCE »

Augmentation des attaques de scolytes en pessières

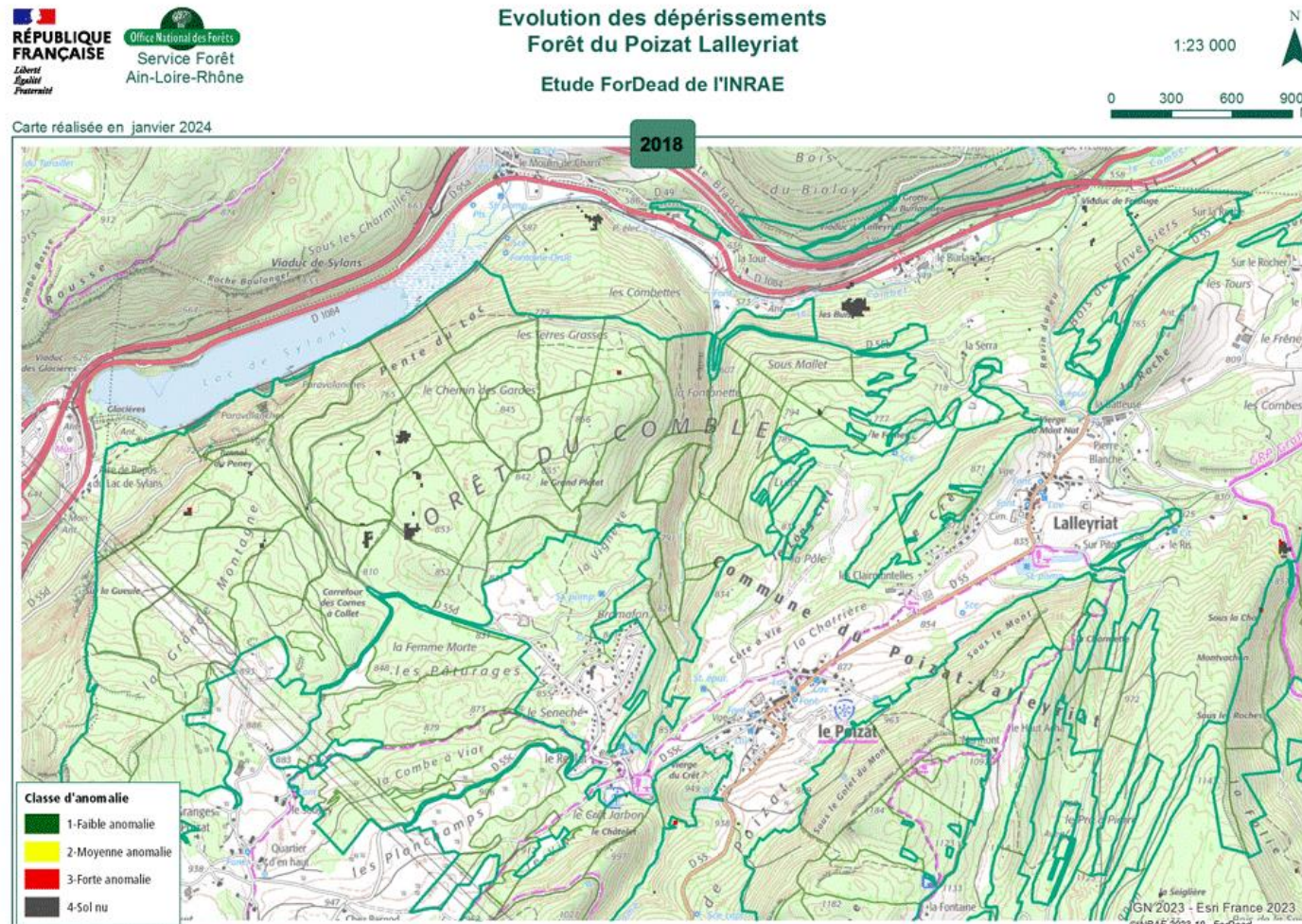
03/10/2018 | SANTÉ DES FORÊTS | SANTÉ ET PROTECTION DES VÉGÉTAUX



En ce début d'automne 2018, les dommages de scolytes prennent des proportions inquiétantes dans bon nombre de pessières françaises. Le scolyte typographe (*Ips typographus*) est largement présent, le chalcographe (*Pityogenes chalcographus*) est fréquent sur les cimes ou les plus petits diamètres.

Management of diebacks - Detection of loss of forest cover : satellite pictures – FORDEAD method

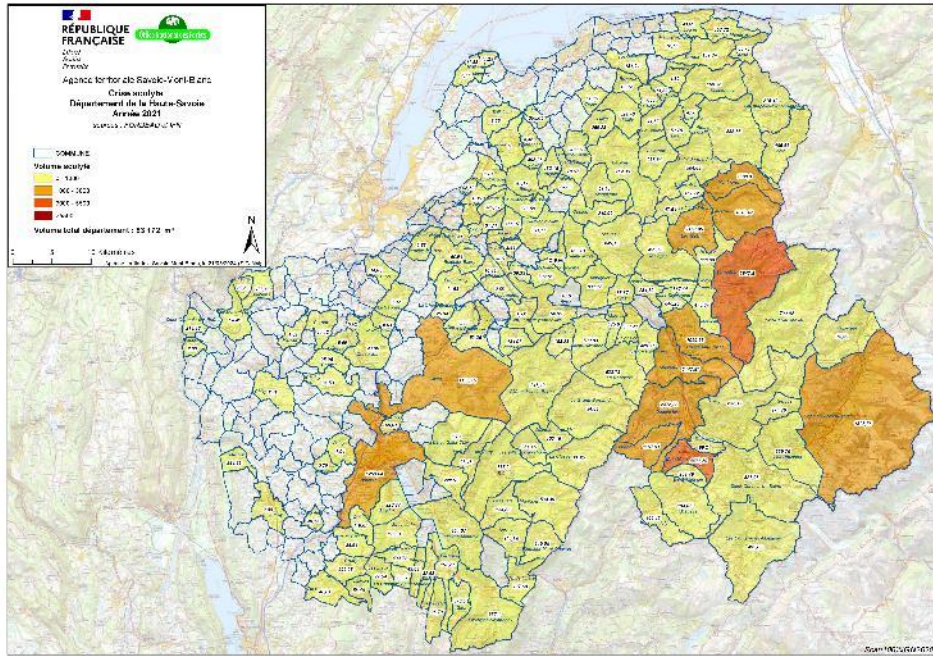
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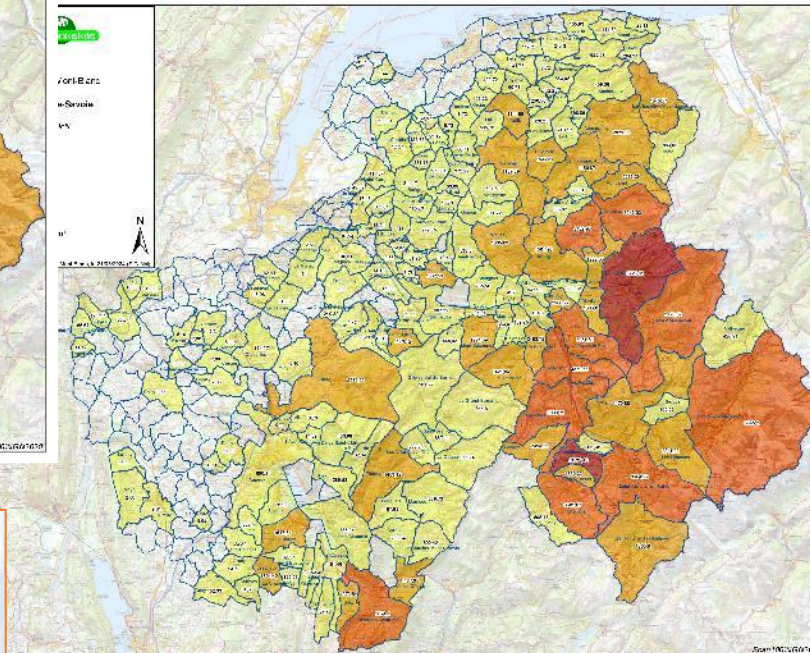
Poizat Lalleyriat
Communal Forest (01)

Evolution of bark beetle (*ips typographus*) in Haute-Savoie

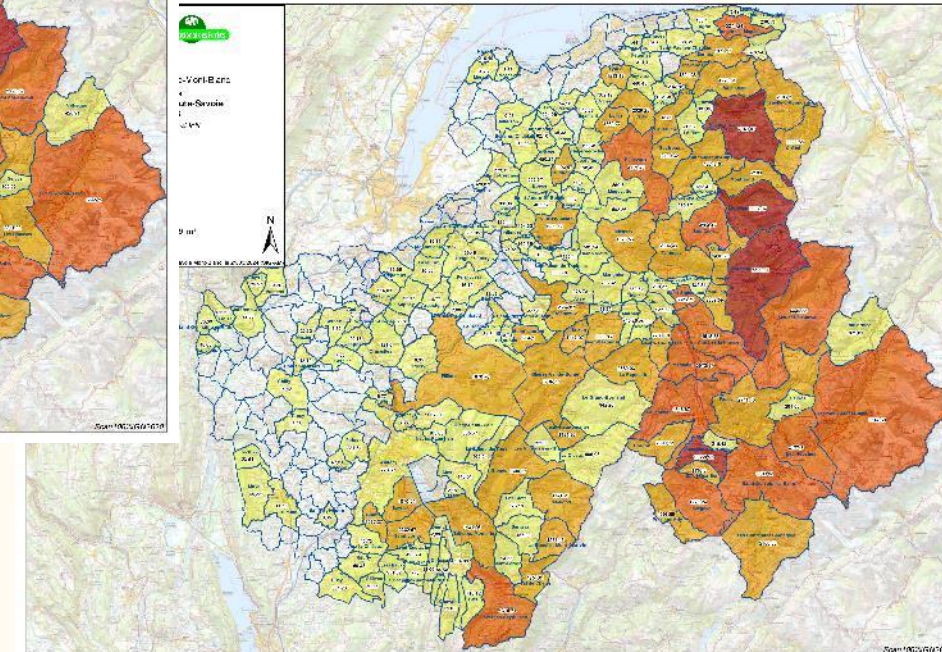
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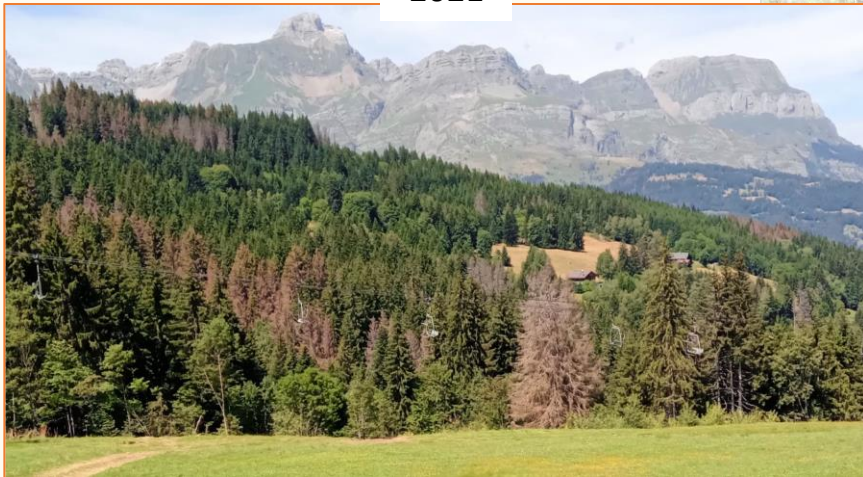
2021



2022



2023



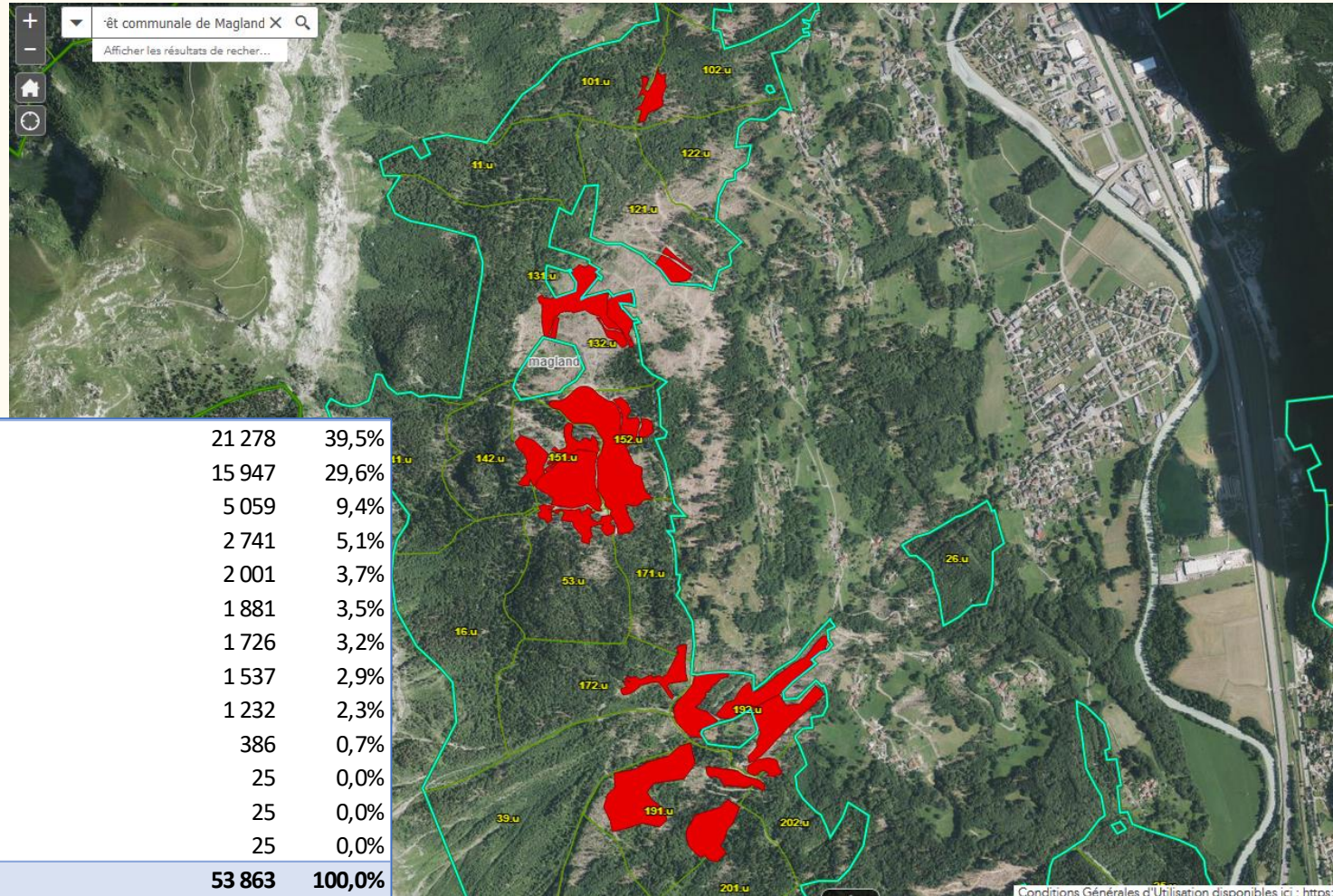
How to renew

- Natural renewal – selection of forest species that are there more adapted
- Mix of forest species
- Planting new forest species
 - Same forest species but coming from a more southern place : exemple fir tree coming from Pyrenees
 - Other forest species

Exemple of forest species that could be planted in Chartreuse

		Résistance adulte aux fortes sécheresses	Adaptation aux climats déficitaires en eau	Résistance aux fortes chaleurs (canicules)	Résistance aux grands froids	Résistance aux gels tardifs
Essences d'accompagnement ou à envisager à la plantation	Alisier blanc	B	B	A	B	I
	Alisier torminal	B	B	A	B	B
	Cèdre de l'Atlas	A	A	A	B	D
	Chêne pédonculé	C	C	C	A	C
	Chêne pubescent	B	B	A	C	D
	Chêne sessile	C	C	C	B	C
	Douglas vert	D	C	C	A	D
	Epicéa de Serbie	B	B	A	A	A
	Erable champêtre	B	B	A	B	B
	Erable plane	C	C	B	B	B
	Mélèze d'Europe	D	C	B	A	D
	Merisier	C	C	B	A	B
	Pin à crochets	B	I	B	A	B
	Pin de Salzman	A	A	A	B	B
	Pin noir d'Autriche	B	A	C	B	A
	Pin sylvestre	B	B	C	A	A
	Pommier sauvage	C	C	B	B	B
	Sapin de Bornmuller	B	A	A	A	B
	Sapin de Céphonie	A	A	A	C	D
	Sorbier domestique	B	A	A	B	B
Tilleul à grandes feuilles	B	B	A	B	C	
Tilleul à petites feuilles	B	B	A	A	B	

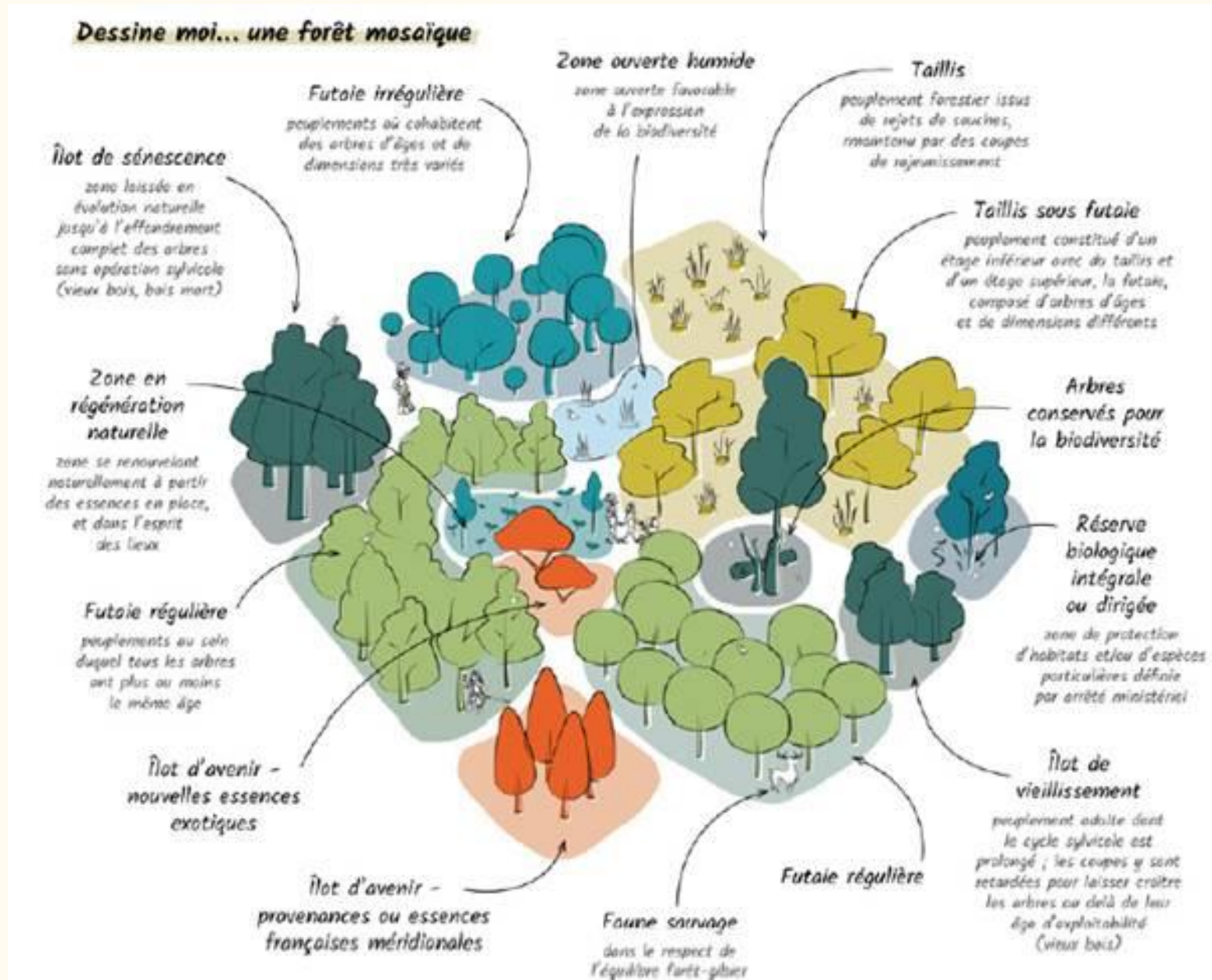
Renewal – planting in destroyed areas – exemple of Magland communal forest after a storm



Larix decidua (Mélèze d'Europe)	21 278	39,5%
Pseudotsuga menziesii (Douglas vert)	15 947	29,6%
Picea abies (Épicéa commun)	5 059	9,4%
Pinus sylvestris (Pin sylvestre)	2 741	5,1%
Cedrus atlantica (Cèdre de l'Atlas)	2 001	3,7%
Quercus petraea (Chêne sessile)	1 881	3,5%
Acer platanoides (Érable plane)	1 726	3,2%
Acer pseudoplatanus (Érable sycomore)	1 537	2,9%
Abies bornmuelleriana (Sapin de bornmuller)	1 232	2,3%
Robinia pseudoacacia (Robinier faux-acacia)	386	0,7%
Sorbus torminalis (Alisier torminal)	25	0,0%
Castanea sativa (Châtaignier)	25	0,0%
Malus sylvestris (Pommier sauvage)	25	0,0%
Total général	53 863	100,0%

After storms the challenge is to harvest the woods as quickly as possible and then renew the forest , naturally or by planting

For a more resilient forest – a mosaic forest



About fire risks

In France state gives this general interest mission to ONF

- 3 mains interventions
 - Arrange and maintain equipments of protection
 - Detect fire outbreaks
 - Fire prevention with information and awareness
- In Isere – since 2 years the Office National des Forêts has a protective strategy for the forests against fires. This strategy was before just in South of France
 - Fire forbidden in forests all year round
 - General public awareness
 - Surveillance tours during summer
 - Fire prevention patrols
 - Control of legal clearance obligations – around houses and roads
 - Drought tests of vegetation
- In the Departemental Plan for Forest Protection Against Fire in Isere, production forest and protective forests are identify as important



Conclusion

- To short term : the management of diebacks show and immediate vulnerability of our forests
 - Those are multi-factorials and hard to predict
 - Management where diebacks are
 - Estimation of planting need is around 1 500 ha/year for next years in AURA
- To medium term : climate compatibility is a major index of maintain or disappearance of a specie
 - Allow to estimate the need of planting or natural renewal of the forest
 - The global estimation of renewal is 3500 ha/year in AURA

