G3.1b Temperate mountain Abies woodland

Summary

This habitat comprises *Abies alba* forests in the mountain ranges of temperate and moderately continental Europe, at lower altitudes sometimes mixed with *Fagus sylvatica* and, at higher altitudes and where site conditions are harsher, *Picea abies.* It occurs mostly on acidic base-poor soils where there is a heathy character to the field layer but also on more base-rich and less impoverished profiles, where mesophytic trees and herbs appear. Intensive logging, replacement of *Abies* by *Picea*, the impact of ski resorts and climate change are the main threats Conservation measures should include both sustainable forest management and maintenance of a network of unmanaged forests.

Synthesis

There has been a slight decline in quality over the last 50 years affecting 62% of the area of EU28, which results in the Near threatened category, although the habitat still has a large total area with more or less stable trends in quantity over the last 50 years. 90% of the surfaces in France show a slight decline in quality which is due to a lack of deadwood (90% of the area with less than 10 m^3). The pressures from logging and abiotic pressures due to global change are likely to increase in the future and would certainly lead to the Vulnerable category but such a negative trend is not certain yet. Even if the future trend in quality remains Data deficient, the observed and forecasted effects of climate change confirm the choice of the Near threatened category for the overall Red List category.

The overall situation in EU28+ is better because of more favourable trends in Bosnia and Switzerland (but with lacking data for Serbia), which results in category Least Concern.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Near Threatened	C/D1	Least Concern	-

Sub-habitat types that may require further examination

Southern or low-altitude subtypes are likely to be more sensitive to climate change and should be assessed separately in the future, especially Annex 1 types 91BA "Moesian silver fir forests" and 91P0 "Holy Cross fir forest (*Abietetum polonicum*)" as well as southern Italian fir forests and northern Greece fir and beech forests with *Abies borisii-regis*, or Ligurian fir forests in the southern French Alps. Other rare types occur on rocks or peat (corresponding to Annex 1 type 9410) and are more endangered because they are rare and azonal.

Habitat Type

Code and name

G3.1b Temperate mountain Abies woodland

Fir woodland with*Vaccinium myrtillus, Sphagnum quinquefarium* and *Listera cordata* on a north slope of southern Massif central, France (Photo: Benoît Renaux).

Habitat description

Abies alba is a conifer of central and southern Europe where it occupies an intermediate position between *Fagus sylvatica* and *Picea abies*, both geographically favouring climates that are only moderately continental, and altitudinally. In areas where both fir and spruce are present, it rarely dominates in a belt between forests of beech and fir, but more often occurs intermixed with these two trees, here especially with beech towards the sub-montane limits of the occurrence of this woodland type. These fir and fir-beech forests are most extensive in the mountain ranges of western and central France, the Black Forest, the Swiss Alps, Austria and the Carpathians, with outliers in the Pyrenees, Czechia, Slovakia, Poland, the Balkans, occurring on usually base-poor soils but extending also on to more base-rich and mesotrophic profiles where distinctive contingents of associates occur, especially in the field layer. *Abies* temperate moutain woodlands can also be found in Corsica, Italy (mainland) and reaches the north of Greece. Though located in mountain near the mediteranean belt, those fir forests do not correspond to the Mediteranean *Abies* mountain (see G3.1c) type (with *A. Cephalonica*...). The dominant trees here are Fir or mixtures of Fir, Spruce and Beech. Except in the Pyrenees, Massif central and most parts of the Vosges (where it is alien), *Picea abies* can also occur, particularly where site conditions are harsher, and it has been very widely planted in preference to *Abies*. Other broadleaves can occur, notably *Acer pseudoplatanus, A, platanoides Betula pendula, Populus tremula, Sorbus aucuparia, Quercus robur* (towards the sub-montane zone), and, in more Atlantic regions like the Pyrenees, Massif central, the Vosges and the Black Forest, where this kind of woodland is most extensive, *Ilex aquifolium*. In the Balkans and northern Greece, *A. borisii-regis* and *Fagus moesiaca* replace *Abies alba*, and *Acer heldreichii* and *A. obtusatum* occur among the associates in this woodland at its southern limit among xerothermic oak forests. Towards the upper mountain or sub-alpine zone, *Abies alba* dominates, expecially where *Picea abies* is absent. On acidic soils, the flora resembles that of the heathy spruce forests and *Picea abies* can be quite abundant, along with *Pinus sylvestris*. Saplings of the canopy trees are often the most abundant element of the understorey with V*accinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Dryopteris carthusiana, D. dilatatae, Luzula luzuloides, L. nivea, L. sylvatica, Listera cordata, Maianthemum bifolium, Oxalis acetosella, Hieracium murorum* in the field layer, together with bulky mosses such as *Polytrichum formosum, Dicranum scoparium, Hylocomnium splendens* and *Pleurozium schreberi*. At the sub-alpine zone, the flora is very close to the flora of sub-alpine spruce forests, with *Homogyne alpina, Rhododendron ferrugineum, Sphagnum div. sp., Lycopodium annotinum, Bazzania trilobata, Rhytidiadelphus loreus...* On less impoverished and moister soils, *Abies alba* often dominates more substantially with *Fraxinus excelsior* and *Ulmus glabra* figuring among the canopy trees, *Rubus idaeus, R. fruticosus* and *Lonicera nigra* in the understorey. *Galium rotundifolium, Oxalis acetosella, Prenanthes purpurea, Sanicula europaea, Mercurialis perennis, Crepis paludosa, Chaerophyllum hirsutum, Adenostyles glabra, Valeriana tripteris, Carex alba, C. digitata, Cirsium erisithales* can occur in the field layer. Like Spruce mountain forest, fir forests can also be

found at lower altitudes (among beech forests) on rocks or peat.

Indicators of quality:

Spruce forestry is very widely practiced in the zone where this kind of woodland is the natural dominant, so signs of quality are:

- Natural dominance of fir and/or mixed dominance of fir, spruce and beech with canopy and understorey associates appropriate to the soil conditions and region
- Mixed age structure of canopy with natural regeneration of the dominant trees -
- Presence of old trees, a variety of dead wood (lying and standing) and trees with microhabitats (hollows, cracks, broken tops...), and the associated flora, fauna and fungi
- Presence of natural disturbance such as windfall openings with natural regeneration -
- Sufficient proportion of historically old (ancient) woodland with high species diversity
- Absence of anthropogenic invaders with disturbance of forestry operations
- Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora)
- No signs of eutrophication or pollution with e.g. pronounced invasion on nutrient-demanding herbs

Characteristic species:

Flora:

Vascular Plants:

Tree canopy: *Abies alba, Fagus sylvatica, Picea abies*.

Field layer: *Vaccinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Luzula luzuloides, L. nivea, L. sylvatica, Maianthemum bifolium, Oxalis acetosella, Hieracium murorum, Hieracium lachenalii.*

Bryophytes:

Polytrichum formosum, Dicranum scoparium, Pleurozium schreberi, Hylocomnium splendens.

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

G3.1 Fir and spruce woodland

EuroVegChecklist:

Geranio striati-Fagion Gentile 1970

Fagion moesiacae Blecic et Lakušic 1970

Symphyto cordati-Fagion (Vida 1963) Täuber 1982

Fagion sylvaticae Luquet 1926

Lonicero alpigenae-Fagion (Borhidi ex Soó 1964) Dierschke

Aremonio-Fagion Török et al. ex Marincek et al. 1993

Fagion orientalis Soó 1964

Luzulo-Fagion sylvaticae Lohmeyer et Tx. In Tx. 1954

Vaccinio-Fagion orientalis Passarge 1981

Piceion excelsae Pawlowski in Pawlowski et al. 1928 (Bulgarian *Abies* forests - Rhodopi)

Annex 1:

91BA Moesian silver fir forests

91P0 Holy Cross fir forests (*Abietum polonicum*)

Emerald:

G3.134 Holy Cross fir forests

G3.16 Moesian Abies alba forests

G3.17 Balkano-Pontic Abies forests

MAES-2:

Woodland and forest

IUCN:

1.4 Temperate Forest

EFT:

3.2 Subalpine and mountainous spruce and mountainous mixed spruce-silver fir forest

2.8 Nemoral Silver fir forest

7.9 Mountainous Silver fir forest

VME:

D4.1 Montane, partly sub-montane fir and mixed fir forests

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?

Yes

Regions

Atlantic

Continental

Justification

The worldwide centre of distribution of *Abies* forests is Europe, where it represents the vegetation climax of the upper mountain belt in many atlantic and continental mountain ranges, especially outside the natural range of Spruce (Pyrennees and mid-altitude mountain areas of western to central Europe). This forest is the natural habitat of many typical animal species, including birds such as Tengmalm's owl and black grouse as well as large mammals.

Geographic occurrence and trends

EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Austria	Present	500 Km^2	Decreasing	Decreasing
Bulgaria	Present	276 Km^2	Decreasing	Decreasing
Croatia	Present	3,161 Km^2	Increasing	Unknown
Czech Republic	Present	50 Km^2	Decreasing	Decreasing

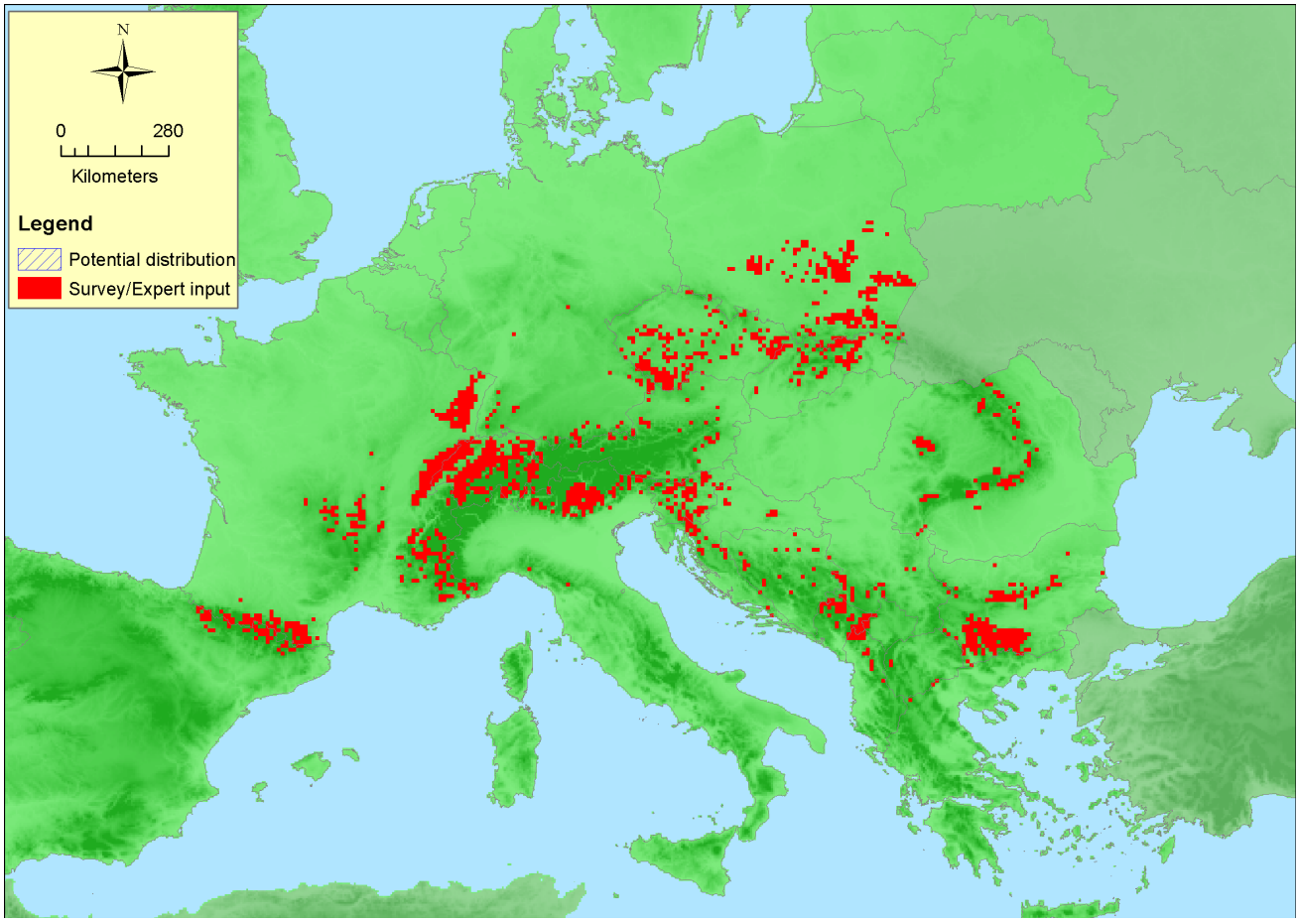
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
France	Corsica: Present France mainland: Present	5,671 Km^2	Increasing	Decreasing
Germany	Present	50 Km^2	Stable	Decreasing
Greece	Greece (mainland and other islands): Present	1.2 Km^2	Increasing	Stable
Italy	Italy mainland: Present	1,962 Km^2	Stable	Decreasing
Poland	Present	Unknown Km^2	Unknown	Unknown
Romania	Present	1,070 Km^2	Decreasing	Decreasing
Slovakia	Present	100 Km^2	Decreasing	Unknown
Slovenia	Present	95 Km^2	Increasing	Decreasing
Spain	Spain mainland: Present	79 Km^2	Increasing	Decreasing

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Albania	Present	Unknown Km^2	Unknown	Unknown
Bosnia and Herzegovina	Present	5,000 Km^2	Stable	Decreasing
Former Yugoslavian Republic of Macedonia (FYROM)	Present	276 Km^2	Increasing	Unknown
Kosovo	Present	Unknown Km^2	Unknown	Unknown
Montenegro	Present	744 Km^2	Decreasing	Unknown
Serbia	Present	Unknown Km^2	Unknown	Unknown
Switzerland	Present	1,600 Km^2	Increasing	Decreasing
Vatican City	Uncertain	Unknown Km^2	Unknown	Unknown

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	1885250 Km^2	1309	14,250 Km^2	Poland is missing but the area for 91P0 Holy Cross fir forest (Abietetum polonicum) is 65 km² and for 9410 more than 6,000 (containing probably 1/4 to 1/10 fir forests) according to Annex 1 article 17
EU 28+	1885250 Km^2	1623	about 21,000 (+/- 2,000) Km^2	Data for Poland (see above) and Serbia are missing.

Distribution map



The map is rather complete, with possible data gaps in the Balkan countries. Data sources: EVA, Art17, ETS.

How much of the current distribution of the habitat type lies within the EU 28?

Between 60 to 75% of the area might lie within the EU28, the rest in EU28 + (the result depends on the area in Serbia and Poland, which has not been reported).

Trends in quantity

The trend in quantity for the last 50 years is close to stable. It varies between -1.8% in EU28+ and -0.1% in EU28 though data are missing for relatively large surfaces, especially in Serbia. The average current trend is an increase.

These calculated average trends mask very different situations across Europe. In western Europe, (e.g. France, Germany, Switzerland, Spain, Italy) the area of fir woodlands has been increasing over the last 150 years because of agricultural decline. The current trend is now close to stable but the area is still slightly increasing. In contrast, the surface in central Europe (Czech Republic, Austria, Romania, Slovakia, Bulgaria) has been decreasing for at least 150 years and the present and estimated future trend are still negative.

On a longer period, the initial area of the habitat has decreased a lot because of agricultural settlement. Most of the lost surfaces were clear-cut during the last 2000 years.

- Average current trend in quantity (extent)
  EU 28: Increasing
  EU 28+: Increasing
- Does the habitat type have a small natural range following regression?
  No
  Justification

The EOO is > 50000 km².

- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  The occurrence of the habitat is neither restricted to small spots, nor does it have a small total area. The distribution range is not naturally restricted.

Trends in quality

A slight decrease in quality has been observed in most countries over the last 50 years, which affects a large part of the total area (62%). The current trend is better (still decreasing in France, Czech Republic, Romania, Bosnia and Herzegovina and Bulgaria; increasing in Switzerland, stable in the rest of the countries). In general, there is a lack of dead wood and spruce has been replacing fir on many former fir stands (the seeds are coming from plantations in the surrounding areas).

There are not enough territorial data to report on historical trends. Concerning future trends, an impact of climate change on mountain forests can be expected, according to national studies and models (e.g. Marage & Gégout 2011; Van der Veken et al. 2004; Lenoir et al. 2008; Lenoir 2009; Grabherr et al. 1994; Klanderud & Birks 2003). The increase of drought and temperature can lead to forest dieback in fir mountain forest at lower altitudes, with a replacement of fir by beech or Scots pine, and a degradation in quality (before a complete loss of the habitat occurs).

- Average current trend in quality
  EU 28: Decreasing
  EU 28+: Decreasing

Pressures and threats

The major pressures are related to forestry: reforestation (especially with spruce) or forestry favouring other species than fir, forest exploitation without reforestation or natural regrowth or logging are mentioned, but other pressures such as removal of forest undergrowth or removal of dead and dying trees may be included. Deforestation due to construction of roads and illegal logging have been reported as pressures in Romania and Montenegro and certainly occur in other countries where surfaces are decreasing (Slovakia, Czech Republic, Bulgaria), as well. To a lesser extent, deforestation and quality degradation occur due to outdoor activities, such as skiing or activities during the vegetation period. Further threats are due to pollution (especially air pollution), global change (global warming, droughts)and eutrophication, which is probably linked to nitrogen deposition. Eutrophication causes a replacement of fir by other species at lower altitudes for example in Bulgaria but probably also in other countries. Phytopathogens and bark-beetle are natural phenomenona but can cause problems if they occur too frequently and on vast surfaces. Other threats are due to damage by herbivores (e.g. Austria) and due to fire (e.g. Montenegro).

List of pressures and threats

Agriculture

Grazing

Sylviculture, forestry

Forest and Plantation management & use
  Forest replanting
  Forestry clearance
Forest exploitation without replanting or natural regrowth

Human intrusions and disturbances

Outdoor sports and leisure activities, recreational activities
Sport and leisure structures
Skiing complex

Pollution

Air pollution, air-borne pollutants
Acid rain
Nitrogen-input
Soil pollution and solid waste (excluding discharges)

Natural biotic and abiotic processes (without catastrophes)

Interspecific floral relations
Parasitism
Introduction of disease (microbial pathogens)
Damage by herbivores (including game species)

Climate change

Changes in abiotic conditions
Temperature changes (e.g. rise of temperature & extremes)
Droughts and less precipitations
pH-changes

Conservation and management

The conservation of temperate mountain fir woodlands requires both integrative and segregative approaches. On most surfaces, the development of sustainable forest management measures plays a key role in the conservation of the characteristic structures and functions and characteristic species. Especially the conservation of deadwood, veteran trees and trees offering microhabitats (e.g. broken tops, cracks or scars, hollow chambers, stem cavities, bark bowls and pockets, burls) is crucial for maintaining not only forest biodiversity but also social and economic functions (forest productivity, protection against erosion or avalanches etc.). Large clear-cuttings and the planting of exotic tree species must be avoided and it is necessary to carry out appropriate management measures in regard to introduced alien species. Sustainable forest management can be promoted by forest certification, in the Natura 2000 network, in public forests and in category V and VI of IUCN protected areas. Even in the most sustainably managed forests, logging cuts the end of the forest cycle: the mature and veteran stands are rare and deadwood volumes can never be the same as in unmanaged forests. Therefore, the appropriate protection of this habitat type stresses the need for a network of vast (more than 100 ha each) unmanaged forests, where the whole forest cycle can be fully accomplished. Those strictly protected areas should be mainly located in category I and II IUCN protected areas, and should also protect the most remarkable forests (rare habitats, virgin or quasi-virgin forests, semi-natural forests unmanaged for a long time etc.).
For variants on peat, the restoration of the hydrological regime is crucial if it has been perturbated.

List of conservation and management needs

Measures related to forests and wooded habitats

Restoring/Improving forest habitats
Adapt forest management

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving the hydrological regime

Measures related to spatial planning

Establish protected areas/sites
Establishing wilderness areas/allowing succession
Legal protection of habitats and species

Conservation status

Annex 1 types:

91BA: ALP U1, CON U1

91P0: CON U1

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

If the habitat has been severely damaged by intensive logging (with removal of all deadwood and large trees), it takes more than 50 years to recover large enough trees and enough deadwood for the specific fauna, fungi and flora. The first positive effects of an abandonment of exploitation can be seen after 30 years of free evolution (Paillet et al. 2010). A clear-cutting followed by agricultural use would make all characteristic species disappear, and the forest soil would turn to agricultural one, and it would take centuries to recover the typical flora (Dupouey et al. 2002). Plantation can quicken the habitat recovery a bit but most of the recovery process would have to occur naturally.

Effort required

50+ years	200+ years
Naturally	Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-1.8 %	unknown %	unknown %	unknown %
EU 28+	-0.1 %	unknown %	unknown %	unknown %

The figures for A1 have been calculated by using the territorial data sheets. The average trend over the last 50 years is more or less stable in EU28+ and close to stable in EU28. The calculated values result in category Least concern.

This average trend masks very different situations in Western and Central/Eastern Europe. Though the area has been increasing in western Europe (10% increase in average for Spain, Switzerland, France, Germany, and Italy), the average past-present trend for the Czech Republic, Romania, Slovakia, and Bulgaria, which represents the eastern limit of the habitat, is a decrease of -39%. Therefore, the habitat type would qualify for the Vulnerable category in these countries.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km^2	No	Unknown	No	>50	No	Unknown	No	No
EU 28+	>50000 Km^2	No	Unknown	No	>50	No	Unknown	No	No

Both EOO and AOO are relatively large and are well above the thresholds to qualify for a Red List category.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	62 %	31.5 %	unknown %	unknown %	unknown %	unknown %
EU 28+	40 %	31.8 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%
EU 28+	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%

The figures for C/D1 have been calculated from the territorial data sheets. The reduction in quality over the last 50 years affects 62% (EU28) and 40% (EU28+), respectively. The severity of degradation ist slight. The calculated figures result in category Near threatened (NT) in EU28. The situation seems to be better in EU28+: the calculated figures result in category Least concern (LC), despite deficient data from Serbia.

The future trend uality in can't be assessed but an impact of climate change on mountain fir forests has to be expected, according to national studies and models (e.g. Marage & Gégout 2011; Van der Veken et al. 2004; Lenoir et al. 2008; Lenoir 2009; Grabherr et al. 1994; Klanderud & Birks 2003). The territorial experts have already reported on changes in species composition due to climate change (e. g. replacement of fir by beech). Climate change threatens *Abies alba* by favouring fir competitors and the increase of droughts. This could lead to a degradation of most of the surfaces, especially at lower altitudes or in southern Europe. The response of fir is not absolutely certain within the next 50 years all over Europe, but such a trend would lead to a decrease in surfaces and habitat quality. The demand of conifer wood is probably increasing in the next years, and will affect the conservation of fir forests with intensive management and the plantation of more productive species (e.g. spruce, douglas fir at lower altitudes). Such a bad future trend would lead to a threatened category (VU or EN), but can't be supported by facts. Therefore, future trends in quality have to be evaluated as Data deficient (DD).

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat type.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	LC	DD	DD	DD	LC	LC	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	DD	LC	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Near Threatened	C/D1	Least Concern	-

Confidence in the assessment
Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

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