



Old Growth/Primary Forest and related habitats

Practical guidelines for definitions and management to support sustainable protection and restoration

Updates 21/08/2017 V1
 27/11/2020 V5

Old growth/primary forest – practical guidelines for definitions and management to support sustainable protection and restoration

1. Context

The 2030 EU Biodiversity Strategy stipulates strict protection of all old growth/primary forest within the EU.

Implementation of this protection should also be promoted actively for non EU countries which contain some of the largest, most pristine and biodiverse forests in Europe.

Achieving the right definitions is of course critical to successful protection and restoration. We are happy to contribute to this, drawing on recommendations from our network and liaison with forestry and other interests.

2. Wild Europe's engagement

We helped secure citation of the need to include “wilderness forest” in management plans – per Objective 3B Action 12 in the 2010 Biodiversity Strategy.

Since 2013 Wild Europe has focused on promoting protection of old growth/primary forest, collating inputs from a range of organisations. In 2016 the European Commission (DG Environment) encouraged our plans on this, linking us to the EU Committee of the Regions in Brussels for a conference, which we organised in 2017¹.

Recommendations from this conference were incorporated into the first comprehensive Old Growth Forest Protection Strategy² that includes definition, mapping, monitoring (a LEAF network and Early Warning System)³, ecosystem services and compensation mechanisms. Over 500,000 EUR was raised for projects to initiate implementation of this strategy.

A second Wild Europe conference in Bratislava in 2019⁴, presided over by President

¹ <https://www.wildeurope.org/old-growth-forest-protection-strategy-old-growth-forest-protection-conference/>

² <https://www.wildeurope.org/wp-content/uploads/2019/10/old-growth-forest-protection-strategy-outline.pdf>

³ <https://www.wildeurope.org/leaf-initiative-to-support-2030-biostrategy-forest-protection-target/#more-2768>

⁴ <https://www.wildeurope.org/a-landmark-for-conservation/#more-2107>

Caputova of Slovakia, assessed progress and produced further recommendations which will be published shortly.

3. Targets for old growth/primary forest

Protection of old growth/primary and near-natural forest is the most effective, and cost-effective, means of addressing the climate change and species extinction crises. Followed by restoration.

It is estimated that old growth/primary forest currently covers around 4% of total forested area in Europe outside Russia.

In order to provide sustainable protection and effective ecological function a further 11-12% immediately adjacent is likely to need strict protection, with restoration to consolidate fragmented areas and provide adequate connectivity. This is crucial for addressing climate change and biodiversity loss. It equates to a total of c 15% of existing forest area.

This target can be more precisely defined on a site by site basis, once relevant areas have been identified and mapped, using the criteria in Section 7.

It equates to 6% of total terrestrial area (ie 15% of forests that in turn cover 40% of Europe), which for such a valuable, biodiversity-rich and fragile ecosystem is an appropriate proportion of the 10% overall EU Biodiversity Strategy strict protection target. It also accords with objectives from the CBD's Post 2020 Global Biodiversity Framework.

On a European scale this represents a small proportion of forest cover, and plans for adequately - ie strictly - protecting it in the EU represent no threat to the timber industry.

Indeed they offer significant opportunity for local communities and landholders to benefit from the ecosystem services it can provide in the form of compensation payments, together with income from carbon storage & sequestration, flood mitigation, water table stabilization, nature tourism and other elements in the Payment for Ecosystem Services (PES) agenda.

Designation of strictly protected areas needs to be linked to adequate provision of such compensation and PES related income.

It should be understood by all parties that there is overwhelming public demand for this strict protection of Europe's most precious natural forest asset, addressing climate change and species decline, through whatever means are necessary including legal. The value of a healthy forestry sector is rightly well recognized, and locally important, but overall it represents 1% of EU Gross Domestic Product (GDP)⁵ and, as argued above, protection itself can bring economic benefit

⁵ European Parliament Factsheet 02/2020 <https://www.europarl.europa.eu/factsheets/en/sheet/105/the-european-union-and-forests>

The remaining 85% of forest cover

For the remaining 85% of forest area not covered by strict protection, there would be a multi-use context. 'Nature friendly' practices should be adopted with a management regime that includes selective restoration, diversification of tree species and ages, and continuous cover forestry where feasible which also promotes higher humidity, drought resilience and fire resistance. There should be particular focus on High Nature Value Forest where some form of anthropocentric intervention may on occasion be required for species conservation.

There is potential for multi-purpose projects where such 'sustainable forestry' occurs, combining conservation with improved forestry productivity, involving for example 1) research into seed improvement and optimal species location for climate change, 2) improved value added component in the timber production chain 3) support for product marketing.

Sources of funding for natural forest protection and restoration

Costings can be linked directly to the 2021-27 budget period for Green Deal, Climate, New Generation and other source programmes.

Protection of old growth/primary and near natural forest is the most efficient and cost-effective means of addressing climate change and biodiversity loss, ahead of reforestation or afforestation. With limited conservation resources, this should be borne in mind in decisions on funding allocation.

In addition to institutional grants for conservation, compensation payments and income related to ecosystem services, part of the extra investment required for adequate protection and restoration could come from reallocation of current subsidies for forest bioenergy, a low efficiency high emission use of consumer and taxpayer resource that worsens climate change.

This reallocation, leading to cessation of forest biomass usage for commercial forest bioenergy, will not only conserve forest with high carbon sequestration and storage capacity, it can also replenish any shortfall in timber production resulting from implementation of the strict protection target above.

There is a highly cost-effective case to be made for such protection to be funded, among other sources, by securing a significant element of the 25% EU budget committed to addressing climate change, as cited in correspondence with Environment Commissioner Virginijus Sinkevicius⁶.

4. Principles for definition of old growth/primary forest

These should involve the following elements:

⁶ See Commissioner Sinkevicius letter 04/08/2020, particularly page 2:
<https://www.wildeurope.org/wp-content/uploads/2020/10/reply-to-wild-europe-initiative.pdf>

- Not overly ‘purist’ or narrow in stipulating lack of human impact as a criterion for designation where other appropriate characteristics defining old growth/primary status are present, otherwise there will be inadequate protective coverage of remaining areas
- Avoidance of unintended consequences – eg removal of trees by landholders in an attempt to avoid designation of protected status; this is more likely to be attempted with overly strict definition
- Seek consensus on definition between conservation and forestry interests in particular so far as possible. Hence the need for strong compensation mechanisms and PES arrangements
- Resolution of misunderstanding, or overlap, eg between end-of-cycle commercial crop in managed forests and old growth forest in conservationist terms – agreeing differentiation or incorporation of the former into the latter
- Support with scientific evidence – eg on the high carbon storage content and ongoing high levels of sequestration from old growth/primary forest
- Aiming to influence rather than replace national definitions in the first instance at least, except where these could result in degradation or destruction of old growth/primary forest

5. The definition structure

There is no single phrase or definition that could embrace the diversity of primary/old growth forest in Europe.

Instead it is recommended that a definition structure is adopted, incorporating key elements from the different approaches below, based on sets of identifiable criteria. This should be underpinned by a gradient of naturalness.

5.1 Primary Forest

Primary forest is generally regarded as the overall category of forests, with high conservation value. It is described as primeval, virgin, near virgin, ancient, old growth, intact, undisturbed, long untouched, climax, even over-mature or senescent (the latter two being a viewpoint for many in the timber sector).

This equates to the classification framework proposed by Buchwald (2005)⁷ incorporating classes N7 – N5, which has been adopted by Francesco Sabatini et al, in their initial mapping exercise. For Europe including Russia to the Urals this includes 1.4 million hectares published in May 2018⁸. It was expanded by a further 700,000 in 2018 with funding from the Brussels conference, results to be published shortly. Total thus mapped equates to 25% of remaining areas.

It is recommended that the Sabatini mapping initiative be adopted by the 2030 Biodiversity Strategy for undertaking the remainder of the mapping exercise, attaching an interactive platform for further updates.

Here, primary forests are defined as:

⁷https://forestsandco.files.wordpress.com/2015/11/buchwald_2002_definitions.pdf
https://www.researchgate.net/publication/309428667_A_hierarchical_terminology_for_more_or_less_natural_forests_in_relation_to_sustainable_management_and_biodiversity_conservation

⁸ <https://onlinelibrary.wiley.com/doi/full/10.1111/ddi.12778>

“Relatively intact forest areas that have always or at least for the past sixty to eighty years been essentially unmodified by human activity. Human impacts in such forest areas have normally been limited to low levels of hunting, fishing and harvesting of forest products, and, in some cases, to historical or pre-historical low intensity agriculture.”

The classification framework used from Buchwald includes the following classes⁹:

N7 Very high degree of naturalness – Near-virgin forest – “Forest ecosystems (forest scale) untouched long enough to have attained structures, dynamics and species composition similar to virgin forest, even though they may have been significantly modified, e.g. by clearcutting or agriculture at some time in the past. They are distinguished by a mixture in time and space between different seral stages, e.g. between old-growth stages and younger stages.

Human impact on the forest structures is not obvious to see. The time necessary in untouched development before this level can be reached depends on how modified the situation was at the start. It is at least several hundred years if the starting point is a plantation-like forest [ie much less if the starting point was near natural].”

N6 High degree of naturalness – Old-growth forest – “Ecosystems (stand scale) distinguished by old trees and related structural attributes. Old-growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function.”

“The age at which old growth develops and the specific structural attributes that characterise old-growth will vary widely according to forest type, climate, site conditions, and disturbance regime. However, old growth is typically distinguished from younger growth by several of the following attributes: 1) large trees for species and site; 2) wide variation in tree sizes and spacing; 3) accumulations of large-size dead standing and fallen trees that are high relative to earlier stages; 4) decadence in the form of broken or deformed tops or bole and root decay; 5) multiple canopy layers, and 6) canopy gaps and understory patchiness. Old-growth is not necessarily “virgin” or “primeval.” Old-growth can develop following human disturbance.”

N5 Quite high degree of naturalness – Long untouched forest “Relatively intact forest (stand level) that has been essentially unmodified by human activity for the past sixty to eighty years or for an unknown, but relatively long time. Signs of former human impacts may still be visible, but strongly blurred due to the decades without forestry operations. The time limit depends on how modified the forest was at the starting point.”

⁹ In the classification framework developed by Buchwald, the concept of primary forests includes all forests having a high naturalness levels N5-N10. We are here only reporting the definitions of those naturalness classes most likely to occur in the European landscapes, which are N5-N7. We cannot exclude, though, that forest tracts of higher naturalness (N8-N10) might exist in remote areas of eg Fennoscandia or European Russia. Such tracts would obviously also fall within the scopes of this document

A corresponding definition for primary forest equates to that outlined by FAO (FRA 2015 Forest Resources Assessment Working Paper 180¹⁰) and used in the Natura 2000 network.

This definition is close to Buchwald's definition of primary forest, but includes the issue of size – relating to the significant restoration required around remaining fragments of primary/old growth forest to secure their long-term function and sustainability on a landscape scale. It has the following key characteristics:

- naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed
- natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure and natural regeneration processes
- the area is large enough to maintain its natural characteristics
- there is no known significant human intervention or the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established

5.2 Old growth forest: supplementary notes

As outlined above, old growth forest is a key element of primary forest, equating to Buchwald class N6. It generally represents a late successional stage.

The following further characteristics are worth noting:

- It often occurs in relatively small and fragmented patches, although individual areas can be large. Generally a late successional stage, it is often located in isolated and less accessible areas which has deterred logging.
- Tree size and forest age do not necessarily correlate: location factors (altitude, climate, soils, aspect) may result in small trees of substantial age; and disturbance eg by wind, fire, beetle may create significant patches of young trees.
- As with virgin forests, the amount of deadwood can vary according to biogeographic circumstance, species involved and localized human impact
- There can be a high number of late successional and shade tolerant species, with epiphytes, substantial ground cover vegetation and forest floor litter – and of course high carbon storage and moisture retention capacity.
- Pit and mound surface relief is often in evidence, as a result of windthrow of large trees that subsequently disintegrate over multiple generations.

5.3 Virgin Forest: supplementary notes

¹⁰ <http://www.fao.org/3/ap862e/ap862e00.pdf>

Virgin forest is defined by the Carpathian Convention (Article 7)¹¹ as natural forests which have not been influenced directly by human activities in their development. In effect it approximates to the most natural examples of class N7 on the Buchwald scale.

It is only found in a few locations: large areas in the boreal region (Lapland, North Sweden, North Norway), in the Carpathians of Central Europe - including for example Romania and Bulgaria - and small pockets in the Alps.

For obvious reasons it is most often located in inaccessible areas with poor soil and aspect where the forest may not typify 'normal' characterization, eg with small trees often of considerable age.

Virgin forest is defined by the following characteristics:

- composed of tree species indigenous to the area
- having ecosystem cycles with complex structures, and with age structure proven by biometric characteristics
- occurrence of individual trees with exceptional dimensions according to site and species, and signs of physiological decline
- presence of deadwood, vertical and lying, at all stages of degradation and all over the forest surface [NB in practice this also dependent on species and biogeographic location which impacts on rate of decay, as well as disturbance, eg by fire, that may remove deadwood]
- no documented evidence or visible traces of forest exploitation infrastructure (eg absence of remnants of water transport or regulation activities, roads, trails, dams, cable systems); any footpaths are no wider than 1m
- no documentary evidence or visible traces of felling in the past
- no visible traces of gathering of forest litter or non-wood forest products (mushrooms, fruits, herbs), though previous light extraction is allowable in the definition
- no grazing/erosion other than by passing livestock with no impact
- size of qualifying area not less than 20 ha, with distance between boundaries no less than 200m except for rare ecosystems of relic stands

There are concerns that this definition is overly focused on presence of large trees, makes insufficient allowance for anthropogenic impact - which is regarded as unrealistic - and imposes a minimum limit to size of area which restricts potential to protect and consolidate smaller fragments of natural forest.

Furthermore in practice whilst "The majority of virgin forest is old growth virgin forest is not limited only to the climax stage, often because of disturbance: fire, wind-throw, disease or other factor. The majority of virgin forest is however old growth." [Parviainen COST action. E4, 'Forest Research Network', 1995-1999]¹².

¹¹http://www.carpathianconvention.org/tl_files/carpathiancon/Downloads/03%20Meetings%20and%20Events/COP/2014_COP4_Mikulov/Follow%20Up/DOC13_Criteria_Indicators_virginforests_FINAL_26SEP.pdf

¹² <https://www.yumpu.com/en/document/view/17084750/cost-action-e4-forest-reserves-research-bfw>

These factors need to be taken into account when developing registers of virgin forest for their protection.

6. Key considerations for identification and management of old growth/primary forest

These considerations are all important in design of protection and restoration plans within the Biodiversity Strategy for 2030 and the UN Decade for Restoration.

- 1) Definition of 'strict protection'. A critical element for future management of natural forest areas is that there should be a current or intended regime of complete non-extraction and non-intervention. No logging, salvage logging, livestock grazing or other impact activities likely to disturb what is generally a fragile and highly complex ecosystem.
- 2) Such non-intervention with natural forest can also significantly improve ecosystem service values in:
 - addressing climate change (eg higher carbon storage and flood water retention - and often greater humidity, drought resilience and fire resistance)
 - supporting dependent often rare species that benefit from non-disturbance, dead wood, availability of nesting sites etc
 - encouraging local income & employment through the Payment for Ecosystem Services agenda including higher nature tourism potential and scale economies that can maximise funding from the PES agenda
 - involving very low management costs - albeit still providing employment through protection, research, monitoring, guidance and all related activities
- 3) Near natural - the practicalities of definition. In some areas there has been a reluctance by conservation authorities to register old growth forest where a few key trees have been felled [5 being the maximum in Romania]. However the overall impact from previous long-term lack of disturbance may well have left the forest ecosystem and its processes relatively intact despite the felling – in which case the area should qualify. Applying this realistic but more flexible approach will discourage the perverse impact of logging to avoid designation.
- 4) Exact identification is not necessary, indeed it can be inappropriate. Old growth/primary forest by definition needs to be protected - and restored - on a very long-term timescale. Any relatively minor and/or long past human impacts are likely to effaced.
- 5) Hence the need for emphasis on appropriate provision of a long-term legal protection structure¹³ and compensation for the private sector.

¹³ <https://www.wildeurope.org/new-legal-structure-for-long-term-protection/#more-2640>

- 6) A strong system for monitoring and enforcement will be essential. Adoption is proposed of LEAF (Last European Ancient Forest)¹⁴, a network of local NGOs and individuals to monitor forest condition and provide an Early Warning System of threats. This could play a particularly role in regions where official surveillance may offer insufficient protection.
- 7) While this document focuses on conservation related issues, the context needs to be recognized and addressed of how old growth/primary forest together with other habitats fits into a wider land-use pattern – adjacent to low impact and fully productive areas of forestry and other commercial uses. Zonation is needed for practical management.

7. Spatial context: size and linkage – why the ‘15%’ strict protection target is important

A significant area around old growth/primary forests, particularly where remnants are relatively small and fragmented, should wherever feasible also be strictly protected to ensure maximum feasible ecological function and long-term sustainability:

- 1) to provide adequate buffering from external impacts, such as ‘edge effect’ of temperature, humidity, general disturbance, conferred by having significant adjacent areas of non-extraction and non-intervention
- 2) for the most immediate and cost-effective mitigation of climate change. Natural forests provide a much higher level of carbon storage than managed forests, and retain a high sequestration capacity well past ‘maturity’ in forestry terms. They play a key role in retention of carbon sinks.
- 3) to ensure full benefit from all ecosystem characteristics; these include “overspill effect” of species, economies of scale in the PES agenda for carbon sequestration and storage, river basin scale planning for effective flood mitigation, water-table stabilization, water and air purification
- 4) Large scale delivery of high quality ecosystem services could secure a premium price from VCO and flood mitigation schemes with private sector funding
- 5) to facilitate sustainable recovery for a wide range of dependent species (eg capercaillie as one indicator species), with scale being adequate for gene pool and territorial requirements
- 6) to enable adaptation, migration or transhumance and resilience to climate change, for forests and their dependent fauna & flora

¹⁴ <https://www.wildeurope.org/leaf-initiative-to-support-2030-biostrategy-forest-protection-target/#more-2768>

- 7) to cover a range of forest types and biogeographic locations, from high altitude slow growth upland and montane to rich alluvial lowland to allow space for all stages in the natural cycles appropriate to the tree species and location, including the impact of natural disturbances

With the above in mind, appropriate consolidation of smaller fragments also be secured wherever possible.

This linkage should extend to connectivity in general: both “green” and “blue” – between patches of old growth/primary forest and to ensure full interaction with other habitats: wetland, heathland, natural grassland etc. The ecological benefits of ecotones, which often host very high biodiversity, should be fully enabled.

The above requirements should be taken full account of in restoration as well as protection plans, and reflected in mapping exercises.

8. Restoration of old growth/primary forest

This term is generally used to cover repair of existing forests, reforestation and afforestation

- *Restoration schemes, and the 3 billion tree target in the EU Biodiversity Strategy, should focus on creating natural forest, for ecological enrichment not commercial production.*
- *Non-intervention, and non-extraction* should be the prioritised form of management to maximise ecosystem benefits.
- This is more effective in provision of ecosystem services: addressing climate change (carbon storage, flood mitigation etc), species loss and even higher economic impact for local communities (PES) in many areas than commercial forestry (see Section 9).
 - a) because natural forest can store more carbon and soil carbon and go on accumulating this at higher levels for longer than commercial forest, which has thinnings, extractions and associated soil disturbance and trees that are grown for timber and store less carbon
 - b) because the species type, variety of species (including important emphasis on food plants to accelerate building of food chains) and age class facilitates greater biodiversity richness
 - c) because uncompacted soil with deep litter is more absorbent and retains more run-off for flood mitigation, water purification and water table stabilisation
 - d) because of species richness and aesthetic qualities, natural forest is more attractive for ecotourism and associated local enterprises
 - e) for all these reasons natural forest is environmentally, ecologically and even socio-economically attractive
- With long timescales it can also be difficult to control outcomes in the absence of non-intervention stipulation. In some countries much

'conservation related' forest planting with native species is only protected for up to 85 years, following which it is legally open whether there is felling; in the interim, intrusive management can be conducted along commercial lines, with brashing, thinning, undergrowth clearance and even use of pesticides.

- *Planting density should be based on biodiversity considerations, not commercial timber production.* Many planting grants still stipulate excessively high quantities commercial densities per hectare; more widely spaced planting for biodiversity is also substantially lower cost. The result should be trees not poles. Trees should be distributed in natural patterns, not straight lines
- *Restoration strategy* needs to include a range of biogeographic locations, with richer lowland and riverine soils; it should not be not disproportionately confined to lower cost upland and other locations of marginal fertility
- Afforestation should also occur in areas where forests have disappeared, though there may be a need for ground de-compaction, manual planting and even pioneer species-led transition to rebuild soil structure in arid or eroded areas
- *Restoration should occur through natural regeneration* in damaged old growth/primary forest. This is the preferred approach wherever possible in restoration generally, including reforestation and afforestation, unless seed sources are absent. This can be achieved in some areas through relaxation of GAEC provisions for regeneration clearance in CAP.
- *A focus on food plants should be included*, to help fast-track biodiversity recovery

Connectivity

- This should be achieved with ecological corridors of appropriate design, width and species content to ensure achievement of objectives – eg movement of given species, effective integration of gene pools etc
- Corridors can be 'green' (land) and 'blue' (riparian)
- Non-intervention management practice should be adopted wherever possible, with minimal disturbance

9. The economic dimension

- *Adequate compensation for local land users and communities is essential* for the private sector, involving some 60% of EU forest. There is a need to reform the grant system and develop cash flow mechanisms from ecosystem services; much can be done through EC facilitation

- *Strict protection can often offer more sustainable economic benefits from ecosystem services [eg carbon, flood mitigation, nature tourism, compensation payments] than forestry can provide. The latter frequently involves one-off contracts using imported labour, delivering periodic tranches of income much of which can leave the locality, whereas ecosystem service provision can provide ongoing income & employment for local communities.*
- The key here lies in wide replication of current examples of PES delivery, entailing development of multiple projects
- *State Agencies (EUSTAFOR) should be focus more on their social remit. They manage 40% of EU forest, and should set aside all areas where felling is uneconomic or in old growth/primary forest – with focus on economic benefits from the PES agenda. This should produce net positive financial gains in many instances.*

9. Application to non-EU countries in Europe

As indicated at the start, it is important that strict protection for old growth/primary forest be implemented as strongly as possible outside in non EU countries.

Processes facilitating this include: Neighbourhood Agreements, Accession Treaties, trade and aid policies, exchange of best practice and other mechanisms. Non EU bodies need to be engaged including UNESCO with its World Heritage and Biosphere sites particularly outside the EU. And the Council of Europe/Bern Convention with its Emerald Network - with special attention to ongoing support for the latter.

Funding for non-EU states needs to be identified and secured for parallel projects involving identification, mapping, monitoring, galvanising the PES agenda and other aspects. Aside from the mechanisms listed above, sources could also include the 45% Europe component of the new Neighbourhood, Development, International Cooperation Instrument (NDICI) to address climate change, as well as PES related funding mechanisms.

10. Implications for Mapping

It is hoped that the above definition structure can provide practical support for the mapping exercise being promoted through the new EU Biodiversity Strategy.

This exercise also needs to identify the natural forest area (c 10-12% of total forest cover) that should be restored and strictly protected adjacent to the 4% of old growth/primary known to exist.

The mapping should additionally focus on a MAES basis (Mapping & Assessment of Ecosystem Services), so that the ecosystem benefits of old growth/primary forests can be fully realized in calculation of their value, and converted – wherever possible – into income to incentivise local landowners and users for their protection, in addition to provision of conservation grants.

Remote sensing can be used for initial prospect identification, along with available local knowledge and ground truthing.