



The Second State of Natural Resources Report (SoNaRR2020)

SoNaRR2020 Register woodlands evidence

Natural Resources Wales

Final Report

About Natural Resources Wales

Natural Resources Wales's purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales's well-being, and provide a better future for everyone.

Evidence at Natural Resources Wales

Natural Resources Wales is an evidence-informed organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

Title: **SoNaRR2020 Register woodlands evidence**

Peer Reviews: Internal and external peer review

Restrictions: None

The Second State of Natural Resources Report (SoNaRR2020) contents

This document is one of a group of products that make up the second State of Natural Resources Report (SoNaRR2020). The full suite of products are:

Executive Summary. Foreword, Introduction, Summary and Conclusions. Published as a series of webpages in December 2020

The Natural Resource Registers. Drivers, Pressures, Impacts and Opportunities for Action for eight Broad Ecosystems. Published as a series of PDF documents and as an interactive infographic in December 2020

Assessments against the four Aims of SMNR. Published as a series of PDF documents in December 2020:

SoNaRR2020 Aim 1. Stocks of Natural Resources are Safeguarded and Enhanced

SoNaRR2020 Aim 2. Ecosystems are Resilient to Expected and Unforeseen Change

SoNaRR2020 Aim 3. Wales has Healthy Places for People, Protected from Environmental Risks

SoNaRR2020 Aim 4. Contributing to a Regenerative Economy, Achieving Sustainable Levels of Production and Consumption

The SoNaRR2020 Assessment of Biodiversity. Published in March 2021

Assessments by Broad Ecosystem.. Published as a series of PDF documents in March 2021:

Assessment of the Achievement of SMNR: Coastal Margins

Assessment of the Achievement of SMNR: Enclosed Farmland

Assessment of the Achievement of SMNR: Freshwater

Assessment of the Achievement of SMNR: Marine

Assessment of the Achievement of SMNR: Mountains, Moorlands and Heaths

Assessment of the Achievement of SMNR: Woodlands

Assessment of the Achievement of SMNR: Urban

Assessment of the Achievement of SMNR: Semi-Natural Grassland

Assessments by Cross-cutting theme. Published as a series of PDF documents in March 2021:

Assessment of the Achievement of SMNR: Air Quality

Assessment of the Achievement of SMNR: Climate Change

Assessment of the Achievement of SMNR: Energy Efficiency

Assessment of the Achievement of SMNR: Invasive Non-native Species

Assessment of the Achievement of SMNR: Land use and Soils

Assessment of the Achievement of SMNR: Waste

Assessment of the Achievement of SMNR: Water Efficiency

Updated SoNaRR evidence needs. Published in March 2021

Acronyms and Glossary of terms. Published in December 2020 and updated in March 2021

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Woodlands Natural Resource Register Evidence List

SoNaRR2020

The evidence below has been extracted from the woodlands chapter unless otherwise stated.

If the original piece of evidence is not cited within this document then it can be found in the woodlands chapter or associated chapters, which will be published in March 2021. At that point this document will be superseded.

Contents

Contents	5
Evidence List: Drivers, Pressures and Impacts Table	6
Climate Change	6
Pollution	7
References: Drivers, Pressures and Impacts Summary Table	9
Evidence List: Opportunities for Action.....	11
Aim 1: Stocks of Natural Resources are safeguarded and enhanced.....	11
Aim 2: Resilient Ecosystems	11
Aim 3: Healthy Places for People	11
Aim 4: A Regenerative Economy	12
Evidence List: Assessment of SMNR	13
Aim 1: Stocks of Natural Resources are Safeguarded and Enhanced.....	13
Aim 2: Resilient Ecosystems	13
Aim 3: Healthy Places for People	13
Aim 4: A Regenerative Economy	13
References: Opportunities for Action and Assessment of SMNR.....	13

Evidence List: Drivers, Pressures and Impacts Table

Climate Change

1. Changing Weather Patterns

1.1. Increased risk from pests and disease

Pests and diseases are resulting in declining tree health, at a species and woodland level and the situation is worsening (Welsh Government, 2019). The situation is likely to be further exacerbated by future climatic changes as well as global trade.

1.2. Changes in tree species suitability based on tree growth and woodland productivity

NRW (2016) summarised observed and predicted changes in tree species suitability based on tree growth and woodland productivity.

1.3. Changes in the range, distribution, composition, condition and even survival of native woodland types

Mitchell et al (2005) reported that Atlantic Oakwoods are especially vulnerable to nitrogen deposition because of their high diversity and biomass of lichens and bryophytes. This may exacerbate changes to composition resulting from climate change.

1.4. Impacts on woodland flora and fauna

Evidence from Biodiversity Chapter

There is growing evidence that climate change is driving widespread and rapid changes in the abundance, distribution and ecology of the UK's wildlife, causing changes to species communities and will continue to do so for decades or even centuries to come (SoN, 2019).

1.5. Changes in carbon sequestration rates

Climate change may have direct impacts on the ability of soils and vegetation to sequester and store carbon. A longer growing season and increased CO₂ concentrations in the atmosphere could increase sequestration rates by trees but expected future changes in tree growth are subject to considerable uncertainty as they will be influenced by a range of climate-related risks such as drought, pests and pathogens, and wildfire. A review of the complexity of carbon sequestration and balance considerations is contained in Matthews (2020).

1.6. Increased risk from extreme weather and wildfires events

Evidence from Climate Change Chapter

Drier summers and increased drought could also increase the wildfire risk in Wales. Using the McArthur Forest Fire Danger Index, increases of fire risk of 30-40% are projected for the Pembrokeshire Coast and Brecon Beacons and 40-50% for Snowdonia by the 2080s compared to 1980s (Defra, 2012).

Extreme weather events such as storms and high winds and summer droughts and fires could become more frequent. Predicting future changes in storm tracks is highly uncertain (NRW, 2016)

1.7. Changes in land availability and suitability

Recent research (CCC, 2020) suggests changes in the availability of land suitable for planting of sessile oak and Sitka spruce. It states that planting schemes should take a longer-term view in order to consider the large geographic shift in land suitability (from lowland to upland areas) which is predicted to occur between 2050 and 2080 [as a result of climate change], as these trends could affect the viability of woodlands planted between now and 2050.

Pollution

2. Air Pollution

2.1. Nutrient enrichment – particularly Nitrogen could cause changes to woodland flora composition.

Woodland specialist ground flora and epiphytic flora may be adversely affected by pollution and changes in nutrient status (Bosanquet, 2019).

Assessment of the proportion of ancient woodland sites exposed to critical levels of ammonia (NRW, unpublished) found that 61% of Ancient Semi-natural Woodland in Wales is modelled as experiencing ammonia concentrations above the Critical Level for lichen and bryophyte-rich ecosystems. Above this level, these communities will be unable to survive; both are crucial for woodland ecosystem function especially water interception/cycling, carbon capture, nutrient cycling and 'cultural' services.

Nitrogen is an essential plant nutrient, but excessive nitrogen compounds affect the composition and functioning of both terrestrial and aquatic ecosystems (NRW, 2019).

Evidence from Air Quality Chapter

Woodlands are affected mainly by Nitrogen deposition and Ammonia with large areas of Welsh woodlands exceeding the Critical Level for Ammonia and the Critical Load for Nitrogen. Lowland woodland is particularly affected by ammonia from nearby agriculture, but even in less intensively farmed areas, such as the Meirionnydd Oakwoods and Bat Sites SAC, Nitrogen deposition impacts are significant (Bosanquet, 2019).

Kirby et al. (2005) found signs of nutrient enrichment in ground flora of woodlands that were correlated with models of diffuse pollution and adjacent land management.

Land Use Change

3. Built Development and Infrastructure

3.1. Reduction in extent.

Woodland loss will have occurred due to approved development, illegal activity, grazing and browsing by animals and government policy, but there is incomplete evidence to quantify the amount (NFI Forestry Commission, 2016). Permanent woodland loss has been offset to a very limited degree by new woodland creation.

3.2. Habitat fragmentation

The majority of native woodlands are smaller and more isolated with less semi-

natural habitat in the surrounding 100km² than non-native stands; larger forests are ecologically well connected to other woodland or habitats in the landscape. (NFI Forestry Commission, 2020).

4. **Competing Land Use**

4.1. **Reduction of extent**

See evidence provided in 3.1

4.2. **Habitat fragmentation**

See evidence provided in 3.2

4.3. **Reduced opportunity to expand ecosystem**

The physical availability of suitable land could be a constraining factor due to climate change [see 2.2.1] as well as the restoration of other habitats such as semi-natural grasslands and mountain, moorland and heath. Farm tenancy restrictions may inhibit expansion, and woodland expansion onto agricultural land would mean less land for food production.

Evidence from Energy Chapter

Land utilised for renewable energy development has continued to increase to meet the target of 70% of Wales' electricity consumption from renewable energy sources by 2030 (50% as of 2018) (SoNaRR 2020).

5. **Insufficient Management**

5.1. **Reduction in woodland condition**

Herbivore pressure, squirrel damage and deer browsing are present in a third of native and near native woodlands stands (NFI Forestry Commission 2020). Grazing can be beneficial to woodlands, but the type and level of grazing is important, and a lack of management can impact on condition. Deer grazing is recorded as a pressure on Annex 1 woodland habitats (Article 17 reporting) along with unfavourable tree regeneration in many oak woodlands. Deer are cited as a pressure on woodland biodiversity in the State of Nature report, 2019.

5.2. **Impacts on woodland flora and fauna**

Goodwin (2018) found that the abundance of hazel dormouse populations was higher at sites with active woodland management. Defra (2019) report that 'The long-term decline of woodland butterflies is thought to be due to a lack of woodland management and loss of open spaces in woods'. Grazing can be beneficial to woodlands, but the type and level of grazing is important to improve condition (SoNaRR 2020).

INNS, Pests and Disease

6. **Pests and Diseases**

6.1. **Declining tree health**

Pests and diseases are resulting in declining tree health, at a species and woodland level and the situation is worsening (Welsh Government, 2019).

More pests and diseases are becoming established and impacts of existing pests and diseases are increasing. The situation is likely to be further exacerbated by

future climatic changes as well as global trade. As of 31st March 2020, stands of larch covering approximately 12,921 ha in Wales have been found to be infected with *Phytophthora ramorum* (NRW, 2020). This is an increase of over 4,000 ha since SoNaRR1. *Chalara Ash Dieback* (*Hymenoscyphus fraxineus*) is now evident throughout virtually the whole of Wales (Welsh Government, 2019), a worsening of the situation since SoNaRR (NRW, 2016). The significance of oak processionary moth (OPM) *Thaumetopoea processionea* has also increased since SoNaRR (NRW, 2016).

INNS such as *Rhododendron* and grey squirrels are also a concern, impacting woodland condition (NRW, 2016).

Evidence from INNS Chapter

The INNS of interest to Wales that primarily impact woodland ecosystems can reduce biodiversity by out-competing and out-shading native species. This affects the ability of other plants to grow on land by producing chemicals (allelopathic), affecting the ability of saplings to establish and grow thereby affecting woodland structure (SoNaRR, 2020).

7. Herbivore Pressure

7.1. Declining tree health

Herbivore pressure, squirrel damage and deer browsing are present in a third of native and near native woodlands stands (NFI Forestry Commission 2020). Grazing can be beneficial to woodlands, but the type and level of grazing is important to improve condition. Deer grazing is recorded as a pressure on Annex 1 woodland habitats (Article 17 reporting) along with unfavourable tree regeneration in many oak woodlands. Deer are cited as a pressure on woodland biodiversity in the State of Nature report, 2019.

References: Drivers, Pressures and Impacts Summary Table

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Evidence List: Opportunities for Action

Aim 1: Stocks of Natural Resources are safeguarded and enhanced

Evidence from Land Use and Soils Chapter

More trees on farms can provide multiple benefits to food production and carbon stocks especially if they are incorporated as part of agroforestry and provide nature-based solutions. The benefits to food production and society include shelter and shade for livestock, supporting pollinators and enhancing crop yields, source of timber/fuel/fodder/fruit/nuts/berries, stock enclosures, reducing pests and diseases, supplement to livestock diet, habitat and cover for game, enhancing output for free-range poultry farms and source of biofuels (Soil Association, 2019).

Evidence from Land Use and Soils Chapter

Increased woodland creation to UKFS standards is central to optimising ecosystem services (SoNaRR, 2020).

Evidence from Biodiversity Chapter

More tree planting and accelerated rates of new woodland creation would deliver wide-ranging benefits such as improved ecological resilience, carbon storage, increased biodiversity. However, as with all wildlife management, it is vital that such schemes are carried out in the right place, for example to avoid damaging semi-natural habitats and located to complement existing woodland cover. Tree species and their provenance also matter, as well as a recognition that an important woodland habitat and the biodiversity it supports may take centuries to establish (in contrast to the simple presence of trees) (SoNaRR, 2020).

Aim 2: Resilient Ecosystems

Evidence provided in Opportunities for Action

Aim 3: Healthy Places for People

Evidence from Air Quality Chapter

In 2015 an estimated 16,211 tonnes of PM10 and 145 tonnes of SO₂ were absorbed by forests in Wales. The annual value of removing PM10 in Wales in 2015 was estimated (at 2015 prices) to be £385 million. The annual value of removing SO₂ in Wales in 2015 was estimated (at 2015 prices) to be £0.3 million.

Evidence from Air Quality Chapter

The NPV asset value of pollution absorption, estimated in terms of the ability of forests to provide air quality regulation services into the future (50 years), was estimated to be around £11.2 billion for PM10 and £9.8 million for SO₂ (at 2015 prices) based on average pollution levels over the period 2011-5.

Evidence from Air Quality Chapter

Woodlands are known to contribute to improving overall air quality, not just in the wider rural environment but in urban areas. Increasing woodland cover in Wales can improve air quality, particularly where woodland is adjacent to agricultural or industrial buildings, urban or transport corridors. Tree planting is one of many options to improve

green infrastructure and is consistent with the ambition set out in the Clean Air Plan to improve air quality (SoNaRR 2020).

Evidence from Land Use and Soil Chapter

The benefits of more trees are habitats for wildlife, recreation and well-being, diffuse pollution control, slope stability, erosion control, climate mitigation, flood storage and protection, urban and livestock cooling, riparian cooling for fish, air pollutant removal and water filtration. Woodlands can provide a range of multiple benefits in varying amounts depending on their location, type and management. -SoNaRR2020 Land Use and Soils Chapter.

Evidence from Climate Change Chapter

Nature recovery and habitat restoration will be crucial to climate change mitigation by increasing carbon sequestration (SoNaRR, 2020). The Welsh Government has a target to increase woodland cover by at least 2000 hectares per year from 2020 to 2030 (Welsh Government, 2019), and this increase should comprise a mix of woodland types (conifer / broadleaf / mixed) in urban and rural locations, with the 'right tree in the right place for the right reason'.

Aim 4: A Regenerative Economy

Evidence from Land Use and Soil Chapter

Use of a wider range of farming, forestry and integrated management systems offers the best opportunity for medium to long term delivery of public goods from our management of the land. Precision farming, agro-ecological systems, agro-forestry, low-impact regular and irregular silvicultural systems and innovative horticultural systems combined with collaboration and training in best practice is key to achieving the outcomes we seek (SoNaRR, 2020).

Evidence List: Assessment of SMNR

Aim 1: Stocks of Natural Resources are Safeguarded and Enhanced

Aim 1: Progress towards meeting the aim

Evidence provided in Assessment of SMNR

Aim 2: Resilient Ecosystems

Aim 2: Progress towards meeting the aim

Evidence provided in Assessment of SMNR

Aim 3: Healthy Places for People

Aim 3: Progress towards meeting the aim

Evidence provided in Assessment of SMNR

Aim 4: A Regenerative Economy

Aim 4: Progress towards meeting the aim

Evidence provided in Assessment of SMNR

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