Cynllun Gweithredu Thematig Natura 2000
Llygredd Aer: Gwaddodi Nitrogen

Natura 2000 Thematic Action Plan
Air Pollution: Nitrogen Deposition

Rhaglen Natura 2000 LIFE yng Nghymru
LIFE Natura 2000 Programme for Wales

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October 2015

1. Cyflwyniad

Rhaglen Natura 2000 LIFE yng Nghymru

Mae 92 Ardal Cadwraeth Arbennig (ACA) ac 20 Ardal Gwarchodaeth Arbennig (AGA) Cymru'n cynnwys 123 o nodweddion cynefinoedd a rhywogaethau dynodedig. Gyda'i gilydd, y rhain yw rhwydwaith Natura 2000.

Mae Rhaglen Natura 2000 LIFE yng Nghymru wedi datblygu blaen-gynllyn strategol i reoli ac adfer Natura 2000 yng Nghymru. Drwy weithio â rhanddeiliaid mae wedi pennu'r prif heriau sy'n wynebu'r safleoedd, y rhywogaethau a'r cynefinoedd hyn a warchodir gan Ewrop, a nodi'r camau gweithredu sydd eu hangen, y blaenoriaethau, y costau a'r cyfleoedd cyllido i fynd i'r afael â nhw. Cafodd y rhaglen ei chynnal gan Cyfoeth Naturiol Cymru a'i hariannu gan gynllun LIFE+ Nature yr Undeb Ewropeaidd.

Y pwrpas yw galluogi Cymru i wneud cynnydd sylweddol tuag at sicrhau bod rhywogaethau a chynefinoedd Natura 2000 mewn cyflwr ffafriol a helpu i gyflawni ei hymrwymiadau o dan Gyfarwyddeb Cynefinoedd ac Adar yr Undeb Ewropeaidd. Mae'r Rhaglen yn ceisio darparu llwyfan hefyd i sicrhau rhagor o gyllid ar gyfer prosiectau sy'n gysylltiedig â Natura 2000 o bob ffynhonnell bosibl, ac i integreiddio cyllid Natura 2000 mewn offerynnau ariannol a meysydd polisi eraill.

Mae manylion llawn Rhaglen Natura 2000 LIFE a rhwydwaith Natura 2000 yng Nghymru yn Ffeithiau a Ffigurau, Rhaglen Natura 2000 LIFE yng Nghymru: Adroddiad 1.

Cynlluniau Gweithredu Thematig

Mae Rhaglen Natura 2000 LIFE wedi creu 11 Cynllun Gweithredu Thematig, pob un yn ymdrin â chamau gweithredu strategol blaenoriaeth i fynd i'r afael â'r prif broblemau a'r risgiau[1] a nodwyd fel y rhai sy'n cael effaith andwyol ar nodweddion Natura 2000 ledled y rhwydwaith.

Y Cynlluniau Gweithredu Thematig yw:

- Mynediad a hamdden
- Llygredd aer: Gwaddodi nitrogen
- Newid yn yr hinsawdd a chwalu cynefinoedd
- Llygredd dŵr gwasgaredig
- Rheoli perygl llifogydd ac erydu arfordirol
- Rheoli pori a da byw
- Rhywogaethau a phathogenau estron goresgynnol
- Newidiadau gan ddyn i amodau hydrolig
- Sbwriel y môr
- Pysgodfeydd morol
- Rheoli coetiroedd

[1] Problemau (neu bwysau) yw adweithiau andwyol i nodweddion Natura 2000 sy'n digwydd ar hyn o bryd ar neu yng nghyffiniau ACA neu AGA sy'n rhwystro'r rhywogaeth neu'r cynefin dynodedig rhag cyrraedd cyflwr ffafriol.
Risgiau (neu fygythiadau) i nodweddion Natura 2000 sy'n debygol o ddigwydd erbyn 2020.

Y brif gynulleidfa ar gyfer y Cynlluniau Gweithredu yw rheolwr, pobl sy'n gwneud penderfyniadau a chyllidwyr yn Cyfoeth Naturiol Cymru, Llywodraeth Cymru a sefydliadau partner allweddol.

Mae'r camau gweithredu i'w gweld yn y tabl yn Adran 9. Camau yw'r rhain y gellir eu cyflawni ar lefel genedlaethol neu ranbarthol, i ategu camau gweithredu ar safleoedd o fewn Cynlluniau Gwella â Blaenoriaeth. Maent yn ceisio mynd i'r afael â rhwystrau sylfaenol, a'u hachosion lle bo'n bosibl, a datblygu fframwaith strwythurol sy'n cefnogi ac yn hyrwyddo trefniadau rheoli priodol yn lleol. Mae'r camau gweithredu'n cynnwys y rhai sydd eu hangen i fynd i'r afael â bylchau mewn tystiolaeth sy'n atal dealltwriaeth lawn o anghenion rheoli.

Gall rhai camau gweithredu strategol gynnig ffrydiau gwaith newydd a mentrau mawr; mae eraill yn cyd-fynd i raddau helaeth â pholisïau, strategaethau a rhaglenni gwaith sy'n bodoli eisoes neu sydd wrthi'n cael eu datblygu.

Cafodd y camau gweithredu strategol eu nodi yn ystod gweithdai a gynhaliwyd gyda gweithwyr proffesiynol arbenigol yn y maes, o Cyfoeth Naturiol Cymru a sefydliadau eraill. Roeddynt yn seiliedig hefyd ar grynodebau o gamau gweithredu ar safleoedd a oedd yn deillio o'r Cynlluniau Gwella â Blaenoriaeth a'r Gronfa Ddata Camau Gweithredu (gweler isod). Cafodd y rhain eu hadolygu a'u dilysu gan weithgor bychan a buont yn destun proses ymgysylltu a thrafod gyda rhanddeiliaid hefyd. Gweler Adran 8 am ragor o fanylion.

Y camau gweithredu strategol yw'r rhai a nodwyd sydd eu hangen i gael y nodweddion i gyflwr ffafriol. Maent yn amodol ar y graddau y mae adnoddau ar gael ac ar gytundeb rhanddeiliaid. Nid ydynt yn cynrychioli cynllun gweithredol sydd wedi'i ariannu'n llawn nac wedi ymrwymo'n llawn iddo. Fodd bynnag, y bwriad yw defnyddio'r camau gweithredu i lywio amrywiaeth o gynlluniau gweithredol a rhaglenni gwaith yn y dyfodol.

Er bod y camau gweithredu strategol yn canolbwyntio ar gyfres Natura 2000, gellir defnyddio llawer ohonynt yn eang a gallent fod o fudd i Safleoedd o Ddiddordeb Gwyddonol Arbennig a helpu i warchod bioamrywiaeth a chryfhau'r ecosystem yn yr amgylchedd ehangach.

Cynlluniau Gwella â Blaenoriaeth a Chronfa Ddata Camau Gweithredu

Mae Rhaglen Natura 2000 LIFE wedi cynhyrchu Cynlluniau Gwella â Blaenoriaeth ar gyfer pob safle Natura 2000 yng Nghymru. Mae'r cynlluniau hyn yn nodi'r prif broblemau a risgiau sy'n effeithio ar nodweddion Natura 2000 ac yn disgrifio'r camau gweithredu â blaenoriaeth, wedi'u costio, sydd eu hangen i gael a chynnal nodweddion y safle mewn cyflwr ffafriol. Mae'r cynlluniau'n defnyddio gwybodaeth o Gronfa Ddata Camau Gweithredu Cyfoeth Naturiol Cymru sy'n cynnwys yr holl gamau gweithredu (blaenoriaeth uchel, canolig, isel) ar gyfer safleoedd Natura 2000. Datblygwyd y camau gweithredu gan Swyddogion Cadwraeth Cyfoeth Naturiol Cymru ar y cyd â rhanddeiliaid a phartneriaid. Cafodd cynnwys y Gronfa Ddata ei ymestyn a'i ddiweddaru'n llawn yn ystod 2014/5.

2. Introduction

LIFE Natura 2000 Programme for Wales

There are 123 designated habitat and species features on the 92 Special Areas of Conservation (SACs) and 20 Special Protection Areas (SPAs) in Wales. Together these comprise the Natura 2000 network.

The LIFE Natura 2000 Programme for Wales has developed a strategic forward plan to manage and restore Natura 2000 in Wales. Working with stakeholders it has determined the key challenges facing these European protected sites, species and habitats and identified the actions required, priorities, costs and funding opportunities to address them. The Programme was run by Natural Resources Wales (NRW) and funded by the European Union scheme LIFE+ Nature.

The purpose is to enable Wales to make significant progress towards bringing Natura 2000 species and habitats into favourable condition and help meet its commitments under the European Habitats and Birds Directives. The Programme also aims to provide a platform to seek further funding for Natura 2000 related projects from all potential sources, and to integrate Natura 2000 funding into other financial instruments and policy areas.

Full details about the LIFE Natura 2000 Programme and the Natura 2000 network in Wales can be found in the *LIFE Natura 2000 Programme for Wales: Fact and Figures Report 1*.

Thematic Action Plans

The LIFE Natura 2000 Programme has created 11 Thematic Action Plans, each of which detail priority strategic actions to address major issues and risks[2] which have been identified as having an adverse impact on Natura 2000 features across the network.

The Thematic Action Plans are as follows:

- Access and recreation
- Air pollution: Nitrogen deposition
- Climate change and habitat fragmentation
- Diffuse water pollution
- Flood and coastal erosion risk management
- Grazing and livestock management
- Non-native invasive species and pathogens
- Man-made changes to hydraulic conditions
- Marine litter
- Marine fisheries
- Woodland management

[2] Issues (or pressures) are adverse impacts to Natura 2000 features which are currently taking place on or around SACs or SPAs which act as barriers to the designated habitat or species features reaching favourable condition. Risks (or threats) are impacts to Natura 2000 features which are likely to occur by 2020.

The primary audience for the Actions Plans are managers, decision makers and fund holders within Natural Resources Wales, Welsh Government and key partner organisations.

The strategic actions are set out in the table in Section 9. These are actions which may be delivered at national or regional level, to complement the site-level actions within Prioritised Improvement Plans (PIPs). They seek to address fundamental barriers and where possible their root causes, and to develop a structural framework which supports and promotes appropriate management at a local level. Actions include those needed to address evidence gaps which are hindering full understanding of management needs. Some strategic actions may propose new work streams and larger-scale initiatives; others align closely to existing or developing policies, strategies and work programmes.

The strategic actions were identified during workshops held with professionals with expertise in the field, from Natural Resources Wales and other organisations. These were also informed by summaries of site level actions derived from the PIPs and Actions Database (see below). These were reviewed and validated by a small working group and also subject to a process of engagement and discussion with stakeholders. See Section 8 for more details.

The strategic actions are those which have been identified as being required to bring features into favourable condition. They are subject to resource availability and stakeholder agreement. They do not represent a fully funded or committed operational plan. However, the intention is that the actions will be used to inform a range of operational plans and work programmes in the future.

While the strategic actions are focused on the Natura 2000 series, many have a broad applicability and may also be of benefit to Sites of Special Scientific Interest and other biodiversity conservation and ecosystem resilience work in the wider environment.

Prioritised Improvement Plans and Actions Database

The LIFE Natura 2000 Programme has produced Prioritised Improvement Plans (PIPs) for all Natura 2000 sites in Wales. The PIPs identify the main issues and risks affecting the Natura 2000 features on the site and describe costed, prioritised actions required to achieve and maintain the site features in favourable condition.

The PIPs draw information from the Natural Resources Wales Actions Database which hold all actions (high, medium, low priority) for Natura 2000 sites. Actions were developed by Natural Resources Wales Conservation Officers in association with stakeholders and partners. The content of the Database was fully extended and updated during 2014/5.

3. Background

Work carried out by the LIFE Natura 2000 Programme for Wales in 2014/15 identified air pollution, particularly nitrogen deposition as a priority issue/risk affecting Natura 2000 designated habitat and species features in Wales.[3] This is consistent with the recent Article 17 report which shows that less than 3% of Annex I habitats in the UK is currently in favourable conservation status and that the impact of air pollution is the most widespread issue of high importance to these habitats[4].

Atmospheric nitrogen (N) deposition leads to nutrient imbalances associated with eutrophication and acidification, resulting in declines in many of the key species of high conservation value at the expense of a smaller number of fast growing species that can exploit conditions of improved nitrogen supply[5] [6]. Since ongoing nitrogen deposition tends to accumulate in the ecosystem, even small inputs can eventually impact on species communities that are adapted to low nutrient conditions. In recognition of these effects, internationally agreed critical loads (CL)[7] have been set for the protection of habitats where the exceedance of these critical loads indicates where there is the potential for harmful effects.

The total UK deposition of nitrogen is currently more or less equally derived from emissions of oxides of nitrogen (NO_x) and ammonia (NH_3). NO_x is derived primarily from transport, industry, power generation and other combustion sources, while NH_3 is produced mainly from agricultural sources (which accounts for 86% of UK ammonia emissions). Substantial pressure from UK and European policies over recent decades have resulted in a considerable reduction in NO_x emissions, with an expected decrease of 55% between 2005 and 2020. However, the latest data shows that in Wales ammonia emissions have increased significantly since 2008[8].

Therefore many of the potentially more readily implemented measures that could reduce nitrogen deposition on protected sites are therefore likely to be related to agricultural practices. Many protected sites in the Wales, including Natura 2000 sites, remain under substantial threat as thresholds for atmospheric nitrogen pollution effects[7] are being exceeded across a large proportion of the Welsh Natura 2000 network.[9]

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[3] Natural Resources Wales, 2015. *LIFE Natura 2000 Programme for Wales Summary Report*.
[4] Joint Nature Conservation Committee 2013 *Summary of conclusions & qualifiers – 3rd UK Habitats Directive Reporting*.
[5] Dise, N. B., Ashmore, M., et al, 2011. 'Nitrogen as a threat to European terrestrial biodiversity - Chapter 20', in: *The European Nitrogen Assessment. Sources, effects and policy perspectives*, Cambridge University Press.
[6] ROTAP 2012, JNCC Reports 447 and 449.
[7] Defined as "A quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (Nilsson & Grennfelt 1988).
[8] Aether and Ricardo-AEA, 2014, *National Atmospheric Emissions Inventory, Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2012*.
[9] Centre for Ecology and Hydrology 2015. *Critical Loads Exceedance in the UK- Report to Defra* (Contract AQ 0826).

4. Issues and risks

Critical Load (CL) is the threshold for nitrogen deposition below which significant harmful effects do not occur. Information is derived from the Air Pollution Information System (APIS)[10]. Critical Load information was used in by the LIFE Natura 2000 Programme to determine the potential impact of nitrogen deposition on each species and habitat feature for each Natura 2000 site in Wales. The results show that air pollution (nitrogen deposition) is having (or likely to have) an adverse impact on 71 out of 123 different Natura 2000 habitat or species features (58%), on 73 out of 112 Natura 2000 sites across Wales (65%). Table 1 provides a list of features most frequently affected. The range of features affected are wide ranging, including heaths, bogs, mires and fens, forests, coastal sand dunes, fish, birds and mammals.

For a full list of sites and features affected see Appendices A and B respectively.

A total of 75 instances of issues and risks related to air pollution were recorded across the Natura 2000 series out of a total of 3,090 records (for all types of issue and risk) (2%). However, 71 of these instances referred to impacts on the whole site (rather than for individual management units within sites). This equates to 12% of the 602 instances of site-level issues across Wales.

Table 1. Natura 2000 features most frequently adversely affected by air pollution (nitrogen deposition)

Feature (common name)	No of instances feature affected
Dry heaths	21
Marsh fritillary butterfly	13
Western acidic oak woodland	13
Purple moor-grass meadows	12
Wet heathland with cross-leaved heath	11
Blanket bog	8
Active raised bogs	7
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	7
Mixed woodland on base-rich soils associated with rocky slopes	7
Very wet mires often identified by an unstable 'quaking' surface	7

The 'number of instances' indicates the number of times air pollution (nitrogen deposition) is logged as an issue or risk for the feature at a site level, across SACs and SPAs in Wales. This includes high, medium and low priority issues/risks. The information is derived from the LIFE Natura 2000 Programme data held in the NRW Actions Database. Sourced September 2015.

[10] http://www.apis.ac.uk/

5. Policy and legislative context

There is a broad framework of policy and legislation at the international, UK and Welsh level which drives and supports the management of Natura 2000. The primary European legislation is the Habitats Directive and the Birds Directive which promote the conservation and management of natural habitats and wild species. Key UK legislation includes the Habitats Regulations, Wildlife and Countryside Act, and the Countryside and Rights of Way Act. Wales is developing a new approach to integrated and sustainable natural resource management, through for example, the Environment (Wales) Bill and the Nature Recovery Plan. Further information is provided in the *LIFE Natura 2000 Programme Facts and Figures Report 1.*

Air pollution policy in the UK is governed by international, European and UK agreements, commitments, policies and legislation. In addition, a range of other policy areas, including water, agriculture, energy, transport and climate change also influence emissions of air pollutants; and there is a growing awareness of the need to integrate these policy areas.

Over the past few decades there have been a number of important agreements and initiatives to address air pollution, such as the international Convention on Long Range Transboundary Air Pollution (CLRTAP) and its protocols. At a European scale, the Gothenburg Protocol (amended 2012), the Air Quality Directive, and the Industrial Emissions Directive are key drivers. In addition, a new air quality package was published by the European Commission in 2013. This included proposals for a revision of the National Emissions Ceilings Directive (NECD), which will set new ceilings for air pollutants, for 2030, and be expanded to include fine particulate matter and methane. The proposed revision to the NECD also includes a range of measures that Member States can adopt to reduce NH_3 emissions, and provisions for monitoring the impacts of air pollution on ecosystems.

Similarly, a range of policies and initiatives exist at various scales to protect and enhance biodiversity, which include targets or recommendations for reducing air pollution. At a global scale, the Strategic Plan 5 of the Convention on Biological Diversity 1992[11], published in 2010, includes the target: “by 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity”.

The European Biodiversity Strategy and the country biodiversity strategies in the UK also set targets or outcomes for biodiversity and ecosystem services which provide a driver for the reduction of air pollution impacts on ecosystems. These strategies sit alongside the provisions of other specific legislation such as the Habitats Directive and domestic legislation for the protection of Sites of Special Scientific Interest.

At a UK level, the 2013 UK Biodiversity Framework implementation plan includes the following interim milestones for air pollution:

- Mainstream the impacts of air pollutants on biodiversity into wider air pollution work and policy evaluation. In 2013, summarise the implications of air pollution impacts for biodiversity commitments (such as the Habitats Directive) and evaluate

effectiveness of emission reductions to inform UK position on the revision to the National Emission Ceilings Directive.

- By 2015, have established methods to provide future evidence of impacts (and recovery) via broad-scale vegetation surveillance.

- By 2015, identify 'remedies/actions' feasible to reduce pressure from air pollution on protected sites and to work across countries to share best practice for implementation.

The legal and policy framework is described in more detail below:

There is a broad framework of policy and legislation at the international, UK and Welsh level which drives and supports the management of Natura 2000. The primary European legislation is the Habitats Directive and the Birds Directive which promote the conservation and management of natural habitats and wild species. Key UK legislation includes the Habitats Regulations, Wildlife and Countryside Act, and the Countryside and Rights of Way Act. Wales is developing a new approach to integrated and sustainable natural resource management, through for example, the Environment Bill and the Nature Recovery Plan. Further information is provided in the *LIFE Natura 2000 Programme Facts and Figures Report 1.*

Policy and legislation which specifically relates to the issue of air pollution are as follows:-

International

- **Convention on Long-Range Transboundary Air Pollution (CLRTAP) 1979** - and the accompanying Gothenburg Protocol set national emission targets for a number of pollutants including NO_x and NH_3.

- **National Emissions Ceiling Directive (NECD) 2001** - sets emission ceilings for a number of pollutants including NO_x and NH_3 and requires EU member states to draw up a national programme with policies and measures to achieve them. It (partly) implements CLRTAP in Europe.

  NECD is enacted in the UK through the **National Emissions Ceiling Regulation 2002**. New ceiling targets for 2030 were proposed in 2013 and are currently under discussion; they include specific requirements to monitor adverse impacts of air pollution on ecosystems. When ceilings for 2030 are established, the UK will subsequently revise its national programme. The current programme largely relies on European measures and the Air Quality Strategy.

- **Industrial Emissions Directive (IED) 2010** - consolidates seven existing directives including the Large Combustion Plant Directive (2000/80/EC) which set NO_x emission limit values for large (> 50 MW) combustion plants. IED aims to minimise pollution, from various industrial activities, including air pollution from large combustion (power plants) and large pig and poultry units. It defines Best Available

Techniques (BATs) (as referenced in Best Available Techniques Reference Documents, BREFs) and emission limit values for a range of sectors.

- **Ambient Air Quality Directive (AAQD) 2008** - sets air quality limit values at a European level to ensure human health standards for concentrations of NO_x are not exceeded; there are no concentration limits or measures for NH_3 but the directive includes a NO_x level for the protection of vegetation (30 µg/m3).

- **Emissions Standards for Vehicles Directive 1970** – vehicle emission standards are established through this Directive and a range of subsequent amendments. Increasingly tight limits are set for exhaust emissions of new vehicles sold in the EU. The standards have significantly reduced the emissions of NO_x from roads.[12]

Domestic

- **Air Quality Strategy (AQS)** - sets out air quality objectives and policy options to further improve air quality in the UK. It covers the limit values set by the AAQD and introduces a number of more ambitious UK targets. These air quality limit values are transposed into national legislation by the Air Quality Standards Regulations 2010.

- **Environment Act 1995 -** Part IV of sets provisions for protecting air quality in the UK and for local air quality management (LAQM). Local councils are required to monitor air quality and where limit values are exceeded they must designate air quality management areas (AQMAs), draw up and implement action plans. Local authorities are required to assess the quality of air at locations which are situated outside of buildings or other natural or man-made structures where members of the public are regularly present. As a result AQMAs have generally been established in urban areas. There is no requirement for local authorities to review exceedances of critical levels at protected sites under LAQM.

[12] Aether, Ricardo-AEA. 2015. *Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland. 1990-2013. A report to the National Atmospheric Emissions Inventory*.

6. Current mechanisms and planned actions on sites to 2020

During 2014/15, the LIFE Natura 2000 Programme identified and costed actions to address issues relating to air pollution on Natura 2000 sites for the period to 2020. These actions are held in full in the NRW Actions Database and summarised in Prioritised Improvement Plans (PIPs). A total of 78 proposed actions were identified across the Natura 2000 series, at an estimated total cost of nearly £355,000 to 2020.

Virtually all actions identified relate to the preparation of Site Nitrogen Action Plans (71) at an approximate cost of £5,000 each with input of 500 days of NRW staff time.

The deposition of ammonia can be spatially highly variable, even at a local scale, with high deposition often occurring close to farms and livestock units[13]. For targeted nitrogen abatement measures at individual sites, more detailed analysis of local sources is necessary. Undertaking this would enable the most suitable measures to be applied at the right locations. Site Nitrogen Action Plans are a mechanism, applicable to individual Natura 2000 sites with air pollution issues and risks, which will draw together evidence and identify necessary actions.

The Assessing and Addressing Atmospheric Nitrogen Impacts on Sites study in Wales, develops this approach at a more detailed level and which is specific to the Welsh context, and paves the way for producing Natura 2000 Site Nitrogen Action Plans.

At a broader level the main mechanism for reducing nitrogen deposition on Natura 2000 sites is through the framework of national and international policies and legislation described in section 4, with the associated regulatory regimes to control emissions and standards for air quality. These should further reduce nitrogen deposition on most protected sites although they are unlikely to bring the deposition levels down to levels that provide certainty that sites are not being affected.

In recognition of atmospheric nitrogen deposition as a major issue on semi-natural habitats in the UK, The Chief Scientists Group of the Statutory Nature Conservation Bodies[14] has agreed that evidence relating to this issue should be reflected in the reporting of habitat status and designated site condition. It has been agreed that, where possible, the Conservation Bodies would seek to put in place measures to reduce nitrogen impacts to sites.

The Chief Scientists Group has established a Nitrogen Task and Finish Group to oversee two parallel work-streams:

- Work stream 1 develops a way to better incorporate nitrogen deposition in site assessments made under the Common Standards monitoring.

[13] In maps produced as part of national modelling these effects are often masked due the aggregation of data at a higher spatial scale (5km x 5km).
[14] Joint Nature Conservation Committee, Natural England, Natural Resources Wales, Scottish Natural Heritage and Northern Ireland Environment Agency.

- Work stream 2 identifies suitable remedies/actions and delivery mechanisms for sites in unfavourable condition due to air pollution. Mainly through Remedies for Air Pollution Impacts on Designated Sites (RAPIDS) project[15] and the subsequent implementation of the results.

The RAPIDS project has identified possible measures and potential delivery mechanisms that could reduce nitrogen deposition on sensitive habitats within protected sites and in the wider countryside. RAPIDS determines six source attribution scenarios to link potential packages of measures to various types of sites (see initial scenarios in Appendix C). It provides guidance on the available tools and data that can be used to identify which nitrogen emission sources contribute to nitrogen deposition on protected sites.

Natural England have developed the RAPIDS approach into a more detailed analysis via the IPENS[16] project in England. The LIFE Natura 2000 Programme study Assessing and Addressing Atmospheric Nitrogen Impacts on Sites[17] draws on this work, benefiting from the methodologies and tools that were created for those projects, and will apply the results to all Natura 2000 sites in Wales.

Although current habitat management is not aimed at mitigating the effect of nitrogen deposition on Natura 2000 sites the effectiveness of on-site habitat management in reducing atmospheric nitrogen deposition impacts was reviewed in a study commissioned by Natural Resources Wales on behalf of all the Statutory Nature Conservation Bodies (Stevens *et al* 2013)[18]. For all habitats covered in the study, management techniques with the potential to mitigate nitrogen deposition impacts were identified.

As a regulator NRW issues permits for a number of industrial processes releasing compounds of nitrogen. NRW is also a statutory consultee to local authorities under planning legislation. For example in rural Wales many of the emissions of concern originate from rural agricultural sources. Under planning procedures, NRW is consulted about many small scale intensive livestock units, even though they are not formally regulated by NRW.

[15] Dragosits U., *et al.* (2014a) *Identification of Potential "Remedies" for Air Pollution (Nitrogen) Impacts on Designated Sites (RAPIDS).* Defra project AQ0834, Draft final report.
[16] Dragpsots U., Carnell E.J., Misselbrook T.H. and Sutton M.A. (2014b) *Site categorisation for nitrogen measures. Final report to Natural England on project* IPENS-049.
[17] E.J. Carnel and U. Dragosits. July 2015. *AAANIS – Assessing and Addressing Atmospheric Nitrogen Impacts on Sites Phase 1 Report.* Project LIFE N2K Wales: LIFE 11 NAT/UK/385/AANIS.
[18] Stevens, C., *et al* 2013*. Review of the effectiveness of on-site habitat management to reduce atmospheric nitrogen deposition impacts on terrestrial habitats.* CCW Science Series Report No: 1037 (part A), CCW.

7. Rationale for strategic actions

While there is a broad body of legislation, policy and implementation measures in place in the UK and Wales, there are, nevertheless, gaps in the raft of current mechanisms able resolve the issue of nitrogen deposition on Natura 2000 sites. Therefore, Section 8 identifies a set of strategic actions which can be taken at a Welsh level to address these gaps.

A key area for strategic action, is to build upon the earlier work to develop tools and Natura 2000 Site Nitrogen Action Plans that apply specifically to individual Welsh Natura 2000 sites. Earlier work (RAPIDS, Assessing and Addressing Atmospheric Nitrogen Impacts on Sites study) provides a valuable framework, and this needs to be progressed in Wales to the point of being able to assess in detail what the actual nitrogen deposition sources are for individual sites and identify necessary local actions.

As an organisation NRW is ideally placed to tackle nitrogen impacts in an integrated manner to support a Natural Resource Management approach to air pollution in Wales. In its role as regulator, NRW will be affected by recent legal developments, (for example, the Environment (Wales) Bill). Therefore, strategic actions have been identified to enhance and support NRW's regulatory role.

The new actions will require collaborative working between Natural Resources Wales, Statutory Nature Conservation Bodies, the Chief Scientists' Nitrogen Task and Finish Group, Joint Nature Conservation Committee and the Welsh Government with stakeholder involvement by Local Authorities, the private and third sector organisations, and landowners and managers in establishing and delivery of the management initiatives, programmes and project required.

8. Development of strategic actions

The following table in Section 9 describes the proposed strategic actions required to manage and address impacts from air pollution on Natura 2000 features. The strategic actions were developed by the NRW air pollution specialists in consultation with other air pollution specialists across England and Wales.

The draft strategic actions were made available for comment to a wider audience through a series of three workshops during the summer of 2015. The first workshop was open to sector leads from Welsh Government, while the second and third workshops (held on the 19 and 25 August 2015, in Garwnant and Bangor respectively) were attended by representatives of interested organisations in Wales, from, for example, the third sector, local authorities, farming unions and other user groups. There was a total of 84 attendees. The consultation drafts were also available to other organisations on request. The feedback received was reviewed and included in the actions as appropriate.

The strategic actions are intended to be SMART (Specific, Measurable, Assignable, Realistic and Time-related) and therefore information has been provided on costs and time-scales where possible. A proposed lead delivery organisation is listed against each action. The intention is that this organisation will drive the action forward, collaborating with other partners and stakeholders as necessary. It is anticipated that the strategic actions will be used to guide future work programmes

8. Strategic Actions for Natura 2000 in Wales: Air Pollution: Atmospheric Nitrogen

The following represent a list of proposed actions which are needed to make progress towards favourable condition of Natura 2000 features. They do not represent a fully funded or committed operational plan.

	Action	Detail	Priority	Link to existing work programmes	Proposed lead organisation	Proposed partner organisation(s)	Estimated Cost (£)	Proposed Timetable
1	Influence NRW permitting and advisory roles (e.g. under Industrial Emissions Directive and local planning) in order to reduce the levels of atmospheric nitrogen affecting N2K sites.	Integrate NRW permitting decisions with responses to Local Authorities as planning advisors, by: Developing new policies/guidance on how to respond to planning casework likely to contribute to atmospheric nitrogen i.e. the need for air pollution assessments under EIA schedule 2 as directed by Welsh Government and under Section 6.1 of the Environment (Wales) Bill Wales 2015. Establish training/ operational guidance for NRW Operations teams and permitting staff to help implement these policies.	High	Wales Biodiversity Strategy NRW Review of N2K Management Plans	Natural Resources Wales	Welsh Government Local Authorities	Staff time	2018
2	Review policies to identify changes required to reduce the levels of atmospheric nitrogen affecting N2K sites.	Review Welsh Government funding for rural agriculture developments where air quality is an issue (e.g. for new poultry developments) which are likely to affect N2K sites	High	Rural Development Programme	Welsh Government	Natural Resources Wales	Staff time	2020
3	Identify and set air pollution objectives and targets for the restoration of N2K sites.	Set the targets in the context of other strategies and work as measures to reduce the contribution from nitrogen will have significant additional benefits (e.g. diffuse water pollution and human health).	High	Chief Scientist Group (Task and Finish Nitrogen Decision Framework) Review of N2K Management Plans	JNCC	NRW Welsh Government Defra Natural England	Staff time	2018
4	Develop an integrated diffuse pollution strategy to include diffuse air pollution impacts.	Ensure NRW diffuse pollution strategy includes diffuse air pollution.	High	Water Framework Directive	Natural Resources Wales	Welsh Government Farming unions Water companies	Staff time	2017

5	Produce Site Nitrogen Action Plans* for N2K sites. Initially trial the approach on two pilot sites, followed by a roll-out across all N2K sites adversely affected by atmospheric nitrogen.	Plans to be developed using the process and framework established by the Assessing and Addressing Atmospheric Nitrogen on Sites** study. Initially develop two pilot plans for: • Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses SAC on the border with England • Corsydd Mon SAC on Anglesey	High	NRW Special Sites Programme	Natural Resources Wales	Welsh Government Natural England North Wales Wildlife Trust	Staff time	2016
6	Scope and develop a potential bid for a major externally funded sand dune restoration project.	Project to focus on on-site habitat management to reduce atmospheric nitrogen impact, alongside wider ecological, ecosystem service and socio-economic benefits.	High		Natural Resources Wales	TBC	Staff time	2016
7	Develop and implement actions identified in the Site Nitrogen Action Plans, working with key internal and external stakeholders.		Medium	NRW Special Sites Programme	Natural Resources Wales	Welsh Government Local Authorities Farming unions Land owners	TBC	2018

* Site Nitrogen Action Plans - Delivering action on the ground on Natura sites. Site plans which have the aim of reducing atmospheric nitrogen deposition affecting N2K sites by identifying spatially targeted measures which could be implemented to reduce the levels of atmospheric nitrogen and also habitat restoration measures which could mitigate the impact of atmospheric nitrogen deposition.

**Assessing and Addressing Atmospheric Nitrogen on Sites study provides an assessment of local and regional risks of atmospheric nitrogen deposition to every Natura 2000 site in Wales and focuses on two selected Natura 2000 sites, with the aim of verifying whether spatially targeted mitigation measures identified in the initial assessment are suitable.

Appendix A: Natura 2000 sites recorded as having air pollution as an issue or risk adversely affecting (or having the potential to adversely affect) features of that site

Data was derived from the NRW Actions Database following work by the LIFE Natura 2000 Programme. High, medium and low priority current issues and potential future risks caused by air pollution are included. The issue/risk is recorded for the whole site.

Data from September 2015

Site name	Designation
Aberbargoed Grasslands	SAC
Afon Eden-Cors Goch Trawsfynydd	SAC
Afon Gwyrfai a Llyn Gwellyn	SAC
Afon Teifi / River Teifi	SAC
Afonydd Cleddau / Cleddau Rivers	SAC
Alyn Valley Woods / Coedwigoedd Dyffryn Alun	SAC
Bae Caerfyrddin / Carmarthen Bay	SPA
Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	SAC
Blackmill Woodlands	SAC
Blaen Cynon	SAC
Brecon Beacons / Bannau Brycheiniog	SAC
Cadair Idris	SAC
Caeau Mynydd Mawr	SAC
Cardiff Beech Woods	SAC
Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd	SAC
Carmarthen Bay Dunes / Twyni Bay Caerfyrddin	SAC
Cernydd Carmel	SAC
Coed Cwm Einion	SAC
Coedwigoedd Dyffryn Elwy / Elwy Valley Woods	SAC
Coedwigoedd Penrhyn Creuddyn / Creuddyn Peninsula Woods	SAC
Coedydd a Cheunant Rheidol / Rheidol Woods and Gorge	SAC
Coedydd Aber	SAC
Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat	SAC
Coetiroedd Cwm Elan / Elan Valley Woodlands	SAC
Cors Caron	SAC
Cors Fochno	SAC
Corsydd Eifionydd	SAC
Corsydd Mon / Anglesey Fens	SAC
Crymlyn Bog / Cors Crymlyn	SAC
Cwm Cadlan	SAC
Cwm Clydach Woodlands / Coedydd Cwm Clydach	SAC
Cwm Doethie - Mynydd Mallaen	SAC

Dee Estuary / Aber Dyfrydwy	SAC
Deeside & Buckley Newt Sites	SAC
Drostre Bank	SAC
Elenydd	SAC
Eryri / Snowdonia	SAC
Fenn's,Whixall, Bettisfield, Wem and Cadney Mosses	SAC
Glannau Mon: Cors Heli / Anglesey Coast:Saltmarsh	SAC
Glannau Ynys Gybi / Holy Island Coast	SPA
Glannau Ynys Gyb i/ Holy Island Coast	SAC
Glaswelltiroedd Cefn Cribwr / Cefn Cribwr Grasslands	SAC
Glynllifon	SAC
Gower Ash Woods / Coedydd Ynn Gwyr	SAC
Gower Commons / Tiroedd Comin Gwyr	SAC
Great Ormes Head / Pen Y Gogarth	SAC
Grogwynion	SAC
Gweunydd Blaencleddau	SAC
Halkyn Mountain / Mynydd Helygain	SAC
Kenfig / Cynffig	SAC
Llangorse Lake / Llyn Syfaddan	SAC
Migneint-Arenig-Dduallt	SAC
Migneint-Arenig-Dduallt	SPA
Morfa Harlech a Morfa Dyffryn	SAC
Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines	SAC
Mynydd Epynt	SAC
North Pembrokeshire Woodlands / Coedydd Gogledd Sir Benfro	SAC
North West Pembrokeshire Commons / Comins Gogledd Orllewin Sir Benfro	SAC
Pembrokeshire Bat Sites and Bosherston Lakes / Safleoedd Ystlum Sir Benf	SAC
Pembrokeshire Marine / Sir Benfro Forol	SAC
Preseli	SAC
Rhinog	SAC
Rhos Goch	SAC
Rhos Llawr-cwrt	SAC
Rhos Talglas	SAC
River Wye / Afon Gwy	SAC
Severn Estuary / Mor Hafren	SAC
St David's / Ty Ddewi	SAC
Sugar Loaf Woodlands	SAC
Usk Bat Sites / Safloedd Ystlumod Wysg	SAC
Wye Valley Woodlands / Coetiroedd Dyffryn Gwy	SAC
Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes	SAC
Yerbeston Tops	SAC

Appendix B: Natura 2000 features identified as being adversely affected (or having the potential to be adversely affect) by air pollution on sites

Data was derived from the NRW Actions Database following work by the LIFE Natura 2000 Programme. High, medium and low priority current issues and potential future risks are included. The issues/risks are recorded at a site level.

Data from September 2015.

Feature (common name)	Number of instances feature affected
Dry heaths	21
Marsh fritillary butterfly	13
Western acidic oak woodland	13
Purple moor-grass meadows	12
Wet heathland with cross-leaved heath	11
Blanket bog	8
Active raised bogs	7
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	7
Mixed woodland on base-rich soils associated with rocky slopes	7
Very wet mires often identified by an unstable 'quaking' surface	7
Atlantic salt meadows	6
Calcium-rich springwater-fed fens	6
Depressions on peat substrates	5
Dry grasslands and scrublands or chalk or limestone	5
Estuaries	5
Humid dune slacks	5
Lesser horseshoe bat	5
Plants in crevices in base-rich rocks	5
Degraded raised bogs	4
Dune grassland	4
Dunes with creeping willow	4
Grasslands on soils rich in heavy metals	4
Shifting dunes	4
Shifting dunes with marram	4
Southern damselfly	4
Beech forests on neutral to rich soils	3
Glasswort and other annuals colonising mud and sand	3
Intertidal mudflats and sandflats	3
Otter	3
Plants in crevices on acid rocks	3
Tall herb communities	3
Acidic scree	2
Allis shad	2

Alpine and subalpine heaths	2
Bog woodland	2
Calcium-rich fen dominated by great fen sedge (saw sedge)	2
Chough	2
River lamprey	2
Sea lamprey	2
Shallow inlets and bays	2
Twaite shad	2
Vegetated sea cliffs	2
Yew-dominated woodland	2
Acid peat-stained lakes and ponds	1
Alluvial forest	1
Barbastelle	1
Base-rich scree	1
Beech forests on acid soils	1
Calcium-rich nutrient-poor lakes, lochs and pools	1
Fen orchid	1
Floating water plantain	1
Geyer`s whorl snail	1
Greater horseshoe bat	1
Grey seal	1
Hard-water springs depositing lime	1
Hen harrier	1
Lagoons	1
Merlin	1
Montane acid grasslands	1
Narrow-mouthed whorl snail	1
Naturally nutrient-rich lakes or lochs which are often dominated by pondweed	1
Oystercatcher	1
Peregrine	1
Petalwort	1
Pintail	1
Reefs	1
Shore dock	1
Slender green feathered -moss	1
Species-rich grassland with mat-grass in upland areas	1
Waterbird assemblage	1

Appendix C Overview of RAPIDS source attribution scenarios

The Defra Remedies for Air Pollution Impacts on Designated Sites (RAPIDS)[19] project has identified possible measures and potential delivery mechanisms that could reduce nitrogen deposition on sensitive habitats within protected sites and in the wider countryside. RAPIDS determines six source attribution scenarios to link potential packages of measures to various types of sites. These are shown below.

1. Lowland agriculture (many diffuse sources)

The Designated Site is embedded in a lowland agricultural landscape with a multitude of farming activities taking place in the immediate vicinity of the site and the wider area. Typical agricultural activities include livestock grazing and animal houses (e.g. cattle sheds) with associated farmyard manure heaps and slurry tanks and manure and fertiliser spreading. Ammonia emissions from these activities, and the resulting medium to high atmospheric concentrations and near-source dry deposition of nitrogen, cannot easily be linked to a single source or activity across the area or throughout the year, and could be characterised as of a diffuse nature, with a multitude of sources. Example: Shropshire/ Cheshire area.

Suitable measures would depend on farm and land use types present (e.g. arable, dairy), which are suggested to be used in the subsequent steps of a flow chart/decision tree approach.

2. Agricultural point source(s)

The Designated Site is located near a single or small number of agricultural point sources. Such nitrogen 'hot spots' are mainly large intensive livestock farms, such as pig or poultry businesses, with the potential for large ammonia emissions and associated high atmospheric concentrations and near-source dry deposition of nitrogen which can be linked to a single source or activity across the area or throughout the year. These point sources may be situated among other agricultural activities, in lowland or upland areas, with general background NH_3 concentrations and N deposition from other sources not constituting a major threat. The relative spatial location of the Designated Site and the point source(s) may be an important factor in determining potential impacts on the site, depending on prevailing wind directions. Example: Norfolk

Suitable measures would depend on farm and land use types present (e.g. pig, poultry), which are suggested to be used in the subsequent steps of a flow chart/decision tree approach.

3. Non-agricultural point source(s)

The Designated Site is located in the vicinity of a single or a number of non-agricultural point sources, such as industrial plants, combustion/power generation or waste processing sites. Depending on the activities taking place, emissions of NH_3 or NO_x may result in locally or regionally increased atmospheric concentrations or dry deposition of nitrogen.

[19] Dragosits U., *et al.* (2014a) *Identification of Potential "Remedies" for Air Pollution (Nitrogen) Impacts on Designated Sites (RAPIDS).* Defra project AQ0834, Draft final report.

The relative spatial location of the Designated Site and the point source(s) may be an important factor in determining potential impacts on the site, depending on prevailing wind directions.

This category may also be used for more 'diffuse' local non-agricultural sources (e.g. shipping channel nearby), however 'diffuse' depends on the scale/perspective taken. Suitable measures depend on the type of source(s) present, which are suggested to be used in subsequent steps of a flow chart/decision tree approach.

4. Roads

The Designated Site is located near a major road or even dissected by it, or otherwise in an area with large amounts of motorised traffic. The main N threat in this scenario, with local background NH_3/NO_x concentrations and N deposition from other sources not constituting a major threat, would come from NO_x emissions originating from large numbers motor vehicles. Elevated NO_x concentrations and dry deposition in the immediate vicinity of busy roads may impact adversely on the Designated Site. Example: New Forest.

Depending on the nature of the motorised traffic, different types of measures can be suggested at next level, distinguishing between arterial roads (e.g. motorways) vs. diffuse transport sources (e.g. suburban/urban areas) vs. local destination traffic (e.g. to Designated Site as tourist attractions). For example, measures such as tree planting may be appropriate to provide a screen between a Designated Site and a motorway to capture and disperse NO_x emissions, other measures such as removing car parking and providing shuttle bus access may be more suitable for tourist destination Sites.

5. Remote (upland) sites

The Designated Site is in a remote location, often in the uplands, away from nearby diffuse or point sources of nitrogen. For such sites, source attribution to any particular activity may be difficult to determine, and wet deposition is often the main source of N input, originating from medium to long range transport. Example Pennines or Lake District.

It may be possible to determine the main source sector(s) or geographical region(s) of the nitrogen, such as whether it is likely to be of UK origin or from further afield (transboundary such as mainland Europe, main shipping lines). In contrast to the other scenarios, where sources are often identifiable in the vicinity of the Site, and hence there may be a possibility to implement local measures, remote sites may need national scale or international scale interventions to achieve significant reductions in N impacts.

6. Mixed categories

Sites with more than one type of major N threat present. For example, there may be sites with both diffuse and point agricultural sources in the immediate vicinity, or a mix of agricultural sources together with major roads.