Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A

2019-2024

Conservation status assessment for the habitat:

H2190 - Humid dune slacks

Wales

Cyfoeth Naturiol Cymru
Natural Resources Wales

JNCC

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This report was produced by JNCC in collaboration with Natural Resources Wales.

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Important note - Please read

- The information in this document represents Wales Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural Resources Wales, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the habitat are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this habitat (section 11 National Site Network coverage for Annex I habitats).

Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the JNCC website.

Assessment Summary: Humid dune slacks

Distribution Map

Range Map

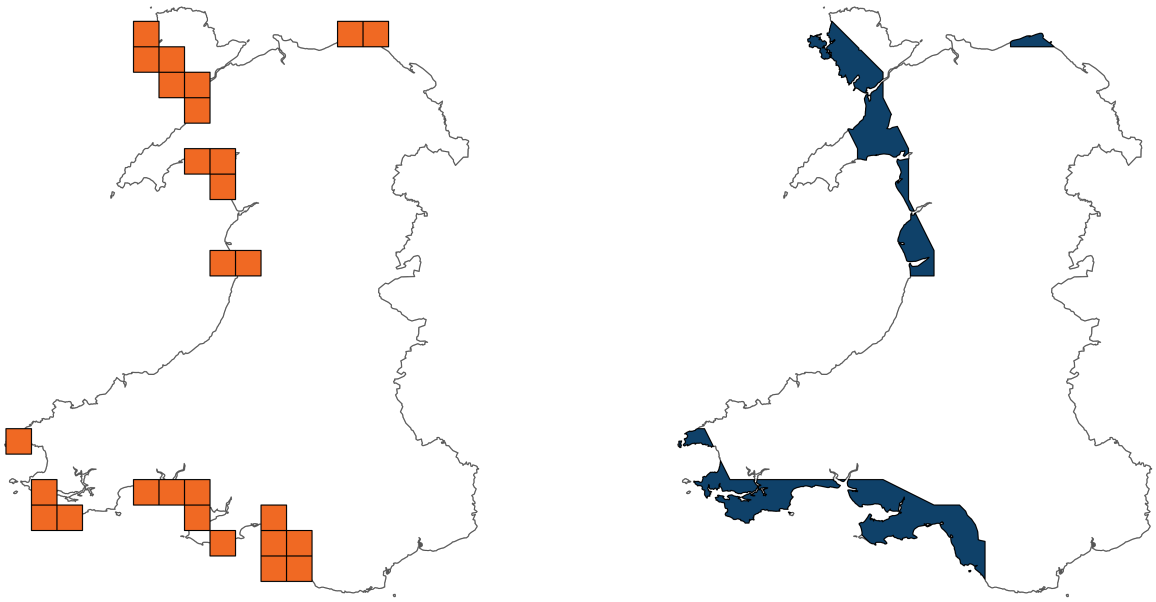

Figure 1: Wales distribution and range map for H2190 - Humid dune slacks. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available habitat records within the current reporting period.

Table 1: Table summarising the conservation status for H2190 - Humid dune slacks. Overall conservation status for habitat is based on assessments of range, area covered by habitat, structure and functions, and future prospects.

Overall Conservation Status (see section 10)

Unfavourable-bad (U2)

Breakdown of Overall Conservation Status

Range (see section 4)	**Favourable (FV)**
Area covered by habitat (see section 5)	**Unfavourable-inadequate (U1)**
Structure and functions (see section 6)	**Unfavourable-bad (U2)**
Future prospects (see section 9)	**Unfavourable-bad (U2)**

List of Sections

National Level

1. General information

1.1 Country	Wales
1.2 Habitat code	H2190 - Humid dune slacks

2. Maps

2.1 Year or period	1991-2022
2.2 Distribution map	Yes
2.3 Distribution map; Method used	Complete survey or a statistically robust estimate

2.4 Additional information

No additional information

Biogeographical Level

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	ATL

3.2 Sources of information

See section 13 References

4. Range

4.1 Surface area (km²)	2,232.04
4.2 Short-term trend; Period	2013-2024
4.3 Short-term trend; Direction	Stable
4.4 Short-term trend; Magnitude	

a) Estimated minimum

b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
4.5 Short-term trend; Method used	Complete survey or a statistically robust estimate
4.6 Long-term trend; Period	
4.7 Long-term trend; Direction	
4.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	
4.9 Long-term trend; Method used	

4.10 Favourable Reference Range (FRR)

a) Area (km²)	
b) Pre-defined increment	Current range is less than 2% smaller than the FRR
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

4.11 Change and reason for change in surface area of range

a) Change	Yes
b) Genuine change	No
c) Improved knowledge or more accurate data	Yes

d) Different method	Yes
e) No information	No
f) Other reason	No
g) Main reason	Improved knowledge/more accurate data

4.12 Additional information

No additional information

5. Area covered by habitat

5.1 Year or period	1991-2022
5.2 Surface area (km²)	
a) Minimum	
b) Maximum	
c) Best single value	3.7483
5.3 Type of estimate	Best estimate
5.4 Surface area; Method used	Complete survey or a statistically robust estimate
5.5 Short-term trend; Period	
5.6 Short-term trend; Direction	Unknown
5.7 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
5.8 Short-term trend; Method used	Insufficient or no data available
5.9 Long-term trend; Period	1991-2022

5.10 Long-term trend; Direction	Increasing
5.11 Long-term trend; Magnitude	
a) Minimum	13.8
b) Maximum	13.8
c) Confidence interval	
d) Rate of decrease	
5.12 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data
5.13 Favourable Reference Area (FRA)	
a) Area (km²)	
b) Pre-defined increment	Current area is between 2% and 10% smaller than the FRA
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

5.14 Change and reason for change in surface area of range

a) Change	Yes
b) Genuine change	Yes
c) Improved knowledge or more accurate data	Yes
d) Different method	Yes
e) No information	No
f) Other reason	No
g) Main reason	Improved knowledge/more accurate data

5.15 Additional information

No additional information

6. Structure and functions

6.1 Condition of habitat (km²)	
Area in good condition	
ai) Minimum	0
aii) Maximum	0
Area not in good condition	
bi) Minimum	3.3024
bii) Maximum	3.3024
Area where condition is unknown	
ci) Minimum	0.4459
cii) Maximum	0.4459
6.2 Condition of habitat; Method used	Based mainly on extrapolation from a limited amount of data
6.3 Short-term trend of habitat area in good condition; Period	
6.4 Short-term trend of habitat area in good condition; Direction	Unknown
6.5 Short-term trend of habitat area in good condition; Method used	Insufficient or no data available
6.6 Typical species	
Has the list of typical species changed in comparison to the previous reporting period?	No
6.7 Typical species; Method used	

6.8 Additional information

Typical species were not used directly in the assessment of conservation status for habitat structure and function as a comprehensive list of typical species for each habitat was not available. However, the status of typical species was considered when the

condition of individual sites was assessed using Common Standards Monitoring Guidance. Common Standards Monitoring (CSM) data was used to assess the area of habitat in ‘good’ and ‘not good’ condition (field 6.1). Species were a component of the attributes assessed under CSM. Therefore, an assessment of species is considered to have formed part of the reporting under field 6.1 which supported the Habitats Structure and Function assessment (field 10.3).

7. Main pressures

7.1 Characterisation of pressures

Table 2: Pressures affecting the habitat, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PA05: Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	Ongoing and likely to be in the future	Medium (M)
PA08: Extensive grazing or undergrazing by livestock	Ongoing and likely to be in the future	High (H)
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PB02: Conversion from one type of forestry land use to another	Ongoing and likely to be in the future	Medium (M)
PD06: Transmission of electricity and communications (cables)	Only in future	Medium (M)
PE01: Roads, paths, railroads and related infrastructure	Ongoing and likely to be in the future	Medium (M)
PF03: Creation or development of sports, tourism and leisure infrastructure	Ongoing and likely to be in the future	Medium (M)
PF05: Sports, tourism and leisure activities	Ongoing and likely to be in the future	High (H)
PH01: Military, paramilitary or police exercises and operations on land and freshwater	Ongoing and likely to be in the future	Medium (M)
PI02: Other invasive alien species (other than species of Union concern)	Ongoing and likely to be in the future	High (H)

PI03: Problematic native species	Ongoing and likely to be in the future	High (H)
PJ01: Temperature changes and extremes due to climate change	Ongoing and likely to be in the future	High (H)
PJ03: Changes in precipitation regimes due to climate change	Ongoing and likely to be in the future	High (H)
PJ05: Saline intrusion	Ongoing and likely to be in the future	Medium (M)
PJ10: Change of habitat location, size, and / or quality due to climate change	Ongoing and likely to be in the future	Medium (M)
PK03: Mixed source air pollution, air-borne pollutants	Ongoing and likely to be in the future	High (H)
PK04: Atmospheric N-deposition	Ongoing and likely to be in the future	High (H)
PL01: Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PL02: Drainage (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PM07: Natural processes without direct or indirect influence from human activities or climate change	Ongoing and likely to be in the future	High (H)

7.2 Sources of information

See section 13 References

7.3 Additional information

No additional information

8. Conservation measures

8.1: Status of measures

a) Are measures needed?	Yes
b) Indicate the status of measures	Measures identified and taken

8.2 Main purpose of the measures taken	Restore the structure and functions, including the status of typical species (related to 'Specific structure and functions')
8.3 Location of the measures taken	Both inside and outside National Site Network
8.4 Response to measures	Long-term results (after 2036)

8.5 List of main conservation measures

Table 3: Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MA04: Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures	High (H)
MA05: Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	Medium (M)
MB01: Prevent conversion of (semi-) natural habitats into forests and of (semi-) natural forests into intensive forest plantation	Medium (M)
MB05: Adapt/change forest management and exploitation practices	Medium (M)
MC06: Reduce impact of service corridors and networks	Medium (M)
MC07: Habitat restoration/creation from resources, exploitation areas or areas damaged due to installation of renewable energy infrastructure	Medium (M)
ME01: Reduce impact of transport operation and infrastructure	Medium (M)
MF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities	High (H)
MF03: Reduce impact of outdoor sports, leisure and recreational activities (incl. restoration of habitats)	High (H)
MF08: Manage changes in hydrological and coastal systems and regimes for construction and development (incl. restoration of habitats).	High (H)

MH01: Reduce impact of military installations and activities	Medium (M)
MH04: Habitat restoration of areas related to military installations and activities and other specific human activities.	Medium (M)
MI03: Management, control or eradication of other invasive alien species	High (H)
MI05: Management of problematic native species	Medium (M)
MJ02: Implement climate change adaptation measures	High (H)
MK01: Reduce impact of mixed source pollution	High (H)
MK02: Reduce impact of multi-purpose hydrological changes	Medium (M)
MK03: Restoration of habitats impacted by multi-purpose hydrological changes	Medium (M)
MM01: Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes that occur without direct or indirect influence from human activities or climate change	Medium (M)
MS03: Restoration of habitat of species from the directives	Medium (M)

8.6 Additional information

No additional information

9. Future prospects

9.1a Future trends of parameters

ai) Range	Overall stable
bi) Area	Negative - decreasing <=1% (one percent or less) per year on average
ci) Structure and functions	Negative - slight/moderate deterioration

9.1b Future prospects of parameters

aii) Range	Good
bii) Area	Poor

cii) Structure and functions	Bad

9.2 Additional information

No additional information

10. Conclusions

10.1 Range	Favourable (FV)
10.2 Area	Unfavourable-inadequate (U1)
10.3 Specific structure and functions (incl. typical species)	Unfavourable-bad (U2)
10.4 Future prospects	Unfavourable-bad (U2)
10.5 Overall assessment of Conservation Status	Unfavourable-bad (U2)
10.6 Overall trend in Conservation Status	Unknown

10.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.8 Additional information

No additional information

11. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (km²)

a) Minimum	
b) Maximum	
c) Best single value	3.2063
11.2 Type of estimate	Best estimate
11.3 Habitat area inside the network; Method used	Complete survey or a statistically robust estimate
11.4 Short-term trend of habitat area within the network; Direction	Unknown
11.5 Short-term trend of habitat area within the network; Method used	Based mainly on extrapolation from a limited amount of data
11.6 Short-term trend of habitat area in good condition within the network; Direction	Unknown
11.7 Short-term trend of habitat area in good condition within the network; Method used	Insufficient or no data available

11.8 Additional information

No additional information

12. Complementary information

12.1 Justification of percentage thresholds for trends

No justification information

12.2 Other relevant information

No other relevant information

13. References

Biogeographical and marine regions

3.2 Sources of information

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Main pressures

7.2 Sources of information

No sources of information

14. Explanatory Notes

Field label	Note
2.3: Distribution map; Method used	The 10km square distribution and habitat area estimates are derived from a combination of different original sources, summarised below. A single aggregated GIS layer has been created for this habitat across Wales (data source 1 below) joining together the maps and records from the other listed sources. Data source 1 (MAIN DATA SOURCE): Digital GIS Map Layer: Article 17 H2190 Humid Dune Slacks Extent Layer 2025 (NRW, 2025). This GIS layer (updated in 2025) supersedes the layer produced for the 2019 Article 17 submission. Data source 2 (MAIN DATA SOURCE): Sands of LIFE National Vegetation Classification (NVC) survey (Heathcote, Finch, Lamacraft, et al., 2022), is a vegetation survey of the Sands of LIFE sand dune sites using the UKs National Vegetation Classification (NVC) (Rodwell, 2000). Data source 3 (MAIN DATA SOURCE): Dynamic Dunescapes National Vegetation Classification (NVC) survey (Heathcote, Finch, Carter, et al., 2022), is a vegetation survey of the Dynamic Dunescapes Welsh sand dunes sites using the UKs National Vegetation Classification (NVC) (Rodwell, 2000). Data source 4 (MAIN DATA SOURCE): National Vegetation Classification Survey of coastal shingle sites in Wales 2022 (Heathcote, Finch, & Harrison, 2022), is a vegetation survey of the vegetated shingle structures around the coastline of Wales using the UKs National Vegetation Classification (NVC) (Rodwell, 2000) and Coastal Vegetated Shingle communities defined by Sneddon and Randall (Sneddon & Randall, 1993).

Data source 5 (MAIN DATA SOURCE): Sand Dune Vegetation Survey of Great Britain Part 3 – Wales (Dargie, 1995). This was a comprehensive survey of all sand dunes in Wales (Ashall, Duckworth, & Holder, 1992a, 1992b, 1994, 1995; Ashall, Duckworth, Holder, et al., 1992a, 1992b, 1992c, 1994a, 1994b; Ashall, Duckworth, Holder, McConnell, et al., 1995a, 1995b; Ashall, Duckworth, Holder, & Smart, 1995a, 1995b; Ashall et al., 1994, 1994, 1994, 1994, 1995, 1995; Ashall, Holder, et al., 1992; Ashall & Holder, 1992a, 1992b, 1992c; Duckworth et al., 1992, 1995a, 1995b, 1995c; Duckworth & Holder, 1995a, 1995b; Holder, Duckworth, et al., 1994; Holder, Smart, et al., 1994; Huckbody et al., 1993) based on the UKs National Vegetation Classification (NVC) (Rodwell, 2000).

Data source 6 (MAIN DATA SOURCE): Ynyslas National Vegetation Classification (NVC) survey (Wallace, 2022), is a vegetation survey of Ynyslas sand dune site using the UKs National Vegetation Classification (NVC) (Rodwell, 2000).

The Sand Dune surveys (Dargie, 1995) were carried out over 20 years ago and so several intra-site changes are likely to have occurred, but, no sites have been lost or irreversibly damaged.

H2190 vegetation equates to NVC communities;

SD13 Sagina nodosa – Bryum pseudotriquetrum dune slack

SD14 Salix repens – Campylium stellatum dune slack

SD15 Salix repens – Calliergon cuspidatum dune slack

SD16 (c, d & e) Salix repens – Holcus lanatus dune slack

SD17 Potentilla anserina – Carex nigra dune slack

	Occurrences of these NVC communities in the above data sources were used to compile the habitat map for Wales. The wetter sub-communities of SD16 were included in the assessment SD16c Salix repens – Holcus lanatus dune slack Prunella vulgaris – Equisetum varigatum sub-community SD16d Salix repens – Holcus lanatus dune slack Agrostis stolonifera sub-community SD16e Salix repens – Holcus lanatus dune slack Molinia caerulea sub-community (provisional) The linking of SD16 to both H2170 and H2190 is an ongoing issue in the UK. Separating the habitat on the ground for mapping and monitoring purposes and for reporting on each individual habitat has proved problematic. However, for reporting purposes the drier SD16 sub-communities (a & b) have been assigned to H2170 and the wetter sub-communities (c, d & e) to H2190. The H2190 habitat is found in 27, 10km grid squares, the distribution differs to that reported in 2013 (25 grid squares), however, this is due to the use of recent surveys (Heathcote, Finch, Carter, et al., 2022; Heathcote, Finch, & Harrison, 2022; Heathcote, Finch, Lamacraft, et al., 2022) rather than a genuine change in the distribution of the feature. The data presented in this report is considered to give good representation of the current distribution and extent of this habitat.
4.3: Short-term trend; Direction	Whilst losses and (more rarely) gains in the area of this habitat have undoubtedly occurred at individual sites over the last eleven years, changes to the 10km square distribution and linked range of H2190 are considered unlikely. There are no known instances where the habitat

	has either been totally lost from a 10km square or created or restored within a 10km square, where it was not present at the start of the period.
4.4: Short-term trend; Magnitude	Not applicable (no decrease in range), i.e. 'stable' see 4.3.
4.8: Long-term trend; Magnitude	Not applicable (no decrease in range), i.e. 'stable' see 4.3.
4.11: Change and reason for change in surface area of range	There is no evidence of actual change in the range of this habitat in Wales since the last report in 2018. However, the total number of 10km2 grid squares has increased from 25 in the last reporting round to 27, this is due to the use of recent surveys (Heathcote, Finch, Carter, et al., 2022; Heathcote, Finch, & Harrison, 2022; Heathcote, Finch, Lamacraft, et al., 2022) confirming presence or absence of the habitat, rather than a genuine change in the distribution of the feature.
5.2: Surface area	[2013-2018: 3.2295 km2 (322.95 ha)] Surface area figure has been generated from recent National Vegetation Classification (NVC) survey data from the Sands of Life and Dynamic Dunescapes projects (Heathcote, Finch, Carter, et al., 2022; Heathcote, Finch, Lamacraft, et al., 2022). These datasets have been combined with an older dataset (1991 – 1995) covering the remainder of the sand dune sites in Wales (Sand Dune Vegetation Survey of Great Britain – Wales (SDSW) (Dargie, 1995)). Analysis of the 2022 data (Heathcote, Finch, Carter, et al., 2022; Heathcote, Finch, & Harrison, 2022; Heathcote, Finch, Lamacraft, et al., 2022) compared against the Sand Dune Vegetation Survey of Wales (Dargie, 1995) shows that the habitat has changed in extent on some sites due to vegetation succession and changes in management. Overall increase in recorded area of 51.88 ha (13.8%).
5.3: Type of estimate	The vegetation surveys undertaken by the Sands of Life and Dynamic Dunescapes projects (Heathcote, Finch,

	Carter, et al., 2022; Heathcote, Finch, Lamacraft, et al., 2022) have provided a comprehensive (but not complete) representation of the habitat in Wales. These datasets have been combined with an older dataset covering the remainder of the sand dune (sand dune survey of Wales (SDSW)) sites in Wales (Dargie, 1995). It is very likely that the habitat has changed in extent on some sites due to vegetation succession and changes in management.
5.6: Short-term trend; Direction	Studies show there has been a clear trend towards increasing stabilisation that has likely resulted in the loss of part of this habitat due to successional changes with dune slacks being lost to scrub development (Rhind et al., 2001, 2006, 2013; Rhind & Jones, 2009). However, these losses have to some extent been offset by positive conservation management on some sites, notably extensive removal of Sea buckthorn (from Merthyr Mawr, Laugharne & Pendine and Pembrey), scrub control and introduced grazing to Kenfig. The short-term trend for this habitat in Wales is 'unknown' as some data is available, but not enough to determine direction or magnitude.
5.8: Short-term trend; Method used	There is limited information on short term trends in extent of area for this habitat.
5.14: Change and reason for change in surface area	The change in the estimated area of this habitat is the result of the re-analysis of existing survey data (see section 5.2) in addition to the more accurate data for the areas of Humid dune slacks identified through recent survey work undertaken by the Sands of LIFE and Dynamic Dunescapes projects (Heathcote, Finch, Carter, et al., 2022; Heathcote, Finch, Lamacraft, et al., 2022). Based on studies from Welsh sand dunes (Rhind et al., 2001, 2006, 2013; Rhind & Jones, 2009), there has been a clear trend towards increasing stabilisation that has likely resulted in the reduction of part of this habitat as this

	habitat becomes invaded by scrubby species and become more stable. Increases in area have occurred where management to improve the condition of the Humid dune slacks has been undertaken. Conservation management actions have included scraping the dune slack surface, mowing and scrub removal. These conservation management actions have largely focused on restarting the successional processes within Humid dune slacks but will also have promoted the local expansion of the community at the expense of Dunes with Salix repens (H2170) and dense scrub.
6.1: Condition of habitat	Figures from habitat condition monitoring from the Sands of LIFE and Dynamic Dunescapes projects.
6.2: Condition of habitat; Method used	100% of the habitat resource in Wales is found in areas where the deposition of atmospheric nitrogen (2022 data) exceeds the Critical Load. The remainder of the habitat may be also be affected, to a lesser extent, by sub-critical load deposition.
7.1: Characterisation of pressures	Data held in SAFLE, NRW's statutory sites actions database (NRW, 2024), which provides information on 'issues' affecting habitats and species within the protected sites series in Wales, were used to provide a basis for quantifying pressures relating to the habitat (NRW, 2018). The special sites (SSSI and SAC) include 88% of the H2190 resource in Wales by area. Pressures: Ten pressures are ranked as having a High impact: PA08: Extensive grazing or under-grazing by livestock – Establishing and maintaining adequate grazing has been an ongoing problem for a number of sites and several sites are now showing evidence of insufficient grazing, resulting in rank dune slack vegetation and scrub encroachment. Efforts are being made to reverse this trend on a number of sites. For example, insufficient grazing has been partially

resolved at Kenfig and Aberffraw. At Kenfig the erection of fences and the introduction of new grazing stock has allowed targeted grazing on the habitat. At Aberffraw shepherded cattle grazing has allowed the fixed dune grassland to be grazed where previously it has been problematic to use heavy stock due to a lack of fencing on the site.

PA17: Agricultural activities generating pollution to surface or ground waters (including marine) – This has been a problem on at least one site (Aberffraw) where abattoir slurry was being used on adjacent fields to the dunes and having a negative impact on the Annex I habitats.

PF05: Sports, tourism and leisure activities – Problems include vehicle access, pedestrian access, camping and making fires within the habitat. The effect of pedestrian access can be significant where access to beaches through the dune front can cause significant erosion. Many Welsh sand dunes support golf courses and despite dune flora being 'maintained" outside of the fairways and greens, the habitat can still be significantly modified by mowing, abstraction / drainage and fertilisation.

PI02: Other invasive alien species (other than species of Union concern) - Several dune systems in Wales (particularly in south Wales) have been badly affected by Sea buckthorn (Hippophae rhamnoides) invasion (which is not native to Wales). The Sands of LIFE and Dynamic Dunescapes projects have both implemented a programme of Sea buckthorn management and control. However, Sea buckthorn is still extensive at Pembrey and Laugharne & Pendine. The AfterLIFE plan outlines actions to continue management to facilitate removal. Until Sea buckthorn has been eradicated from affected sites the pressure will remain classed as High. Other species of concern include conifer species, Japanese rose, Montbretia, Black cherry and Cotoneaster.

PI03: Problematic native species – Lack of appropriate grazing combined with increasing levels of stabilisation have led to native scrub species encroachment on several sites.

PJ01: Temperature changes and extremes due to climate change – Sand dune habitats and species are adapted to drought conditions, however, premature desiccation and prolonged periods of drought associated with high temperatures can lead to dune slack species change and an overall shift in species composition altering the overall structure and function of the habitat. Changes in temperature and precipitation will affect overall evapotranspiration rates affecting groundwater levels in dune slacks changing vegetation community composition and overall structure and function (Curreli et al., 2013).

PJ03: Changes in precipitation regimes due to climate change – Increased rainfall during winter months can favour INNS such as Sea buckthorn, by facilitating growth (Burden et al., 2020) and exacerbating the effects of accelerated succession in sand dune vegetation communities. Changes in temperature and precipitation will affect overall evapotranspiration rates affecting groundwater levels in dune slacks changing vegetation community composition and overall structure and function (Curreli et al., 2013).

PK03: Mixed source air pollution, air-borne pollutants – Sand dunes in close proximity to major roads in Wales are vulnerable to elevated levels of CO2 and other pollutants from road transport. Elevated levels of CO2 are linked to increased plant productivity which on sand dunes results in accelerated succession to rank vegetation and scrub communities.

PK04: Atmospheric N-deposition – Atmospheric nitrogen deposition primarily in the form of nitrogen oxides (NOx) and ammonia (NH3), poses a significant threat to sand

dune ecosystems. Excessive nitrogen inputs can accelerate ecological succession, leading to; nutrient imbalances, altered plant communities, and have negative impacts on sensitive sand dune habitats, leading to a loss of diversity in species-rich dune slacks and hampering restoration goals (Aggenbach et al., 2017). There have been concerns over the levels of atmospheric nitrogen pollution and its links to soil enrichment and eutrophication. 100% of the humid dune slacks in Wales is in areas which are currently subject to Nitrogen deposition rates which exceed the relevant Critical Load mapping value (2022 data).

PM07: Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) – Natural succession has undoubtedly been influenced by atmospheric nitrogen deposition and eutrophication of ground water and coupled with the lack of geomorphological processes, most sand dune sites in Wales are undergoing succession towards more stable rank dune slack and scrub communities.

The following pressures are considered to be important and are ranked as having a Medium impact:

PA05: Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming) – Several dune systems in Wales have had a cessation of grazing and traditional management such as rabbit warrening, which has allowed dune habitats to become rank with scrubby species becoming dominant changing the character of the dune vegetation. Establishing appropriate grazing has been an ongoing problem for several sites and some sites are now showing evidence of insufficient grazing. In some cases, there is insufficient grazing to maintain good species diversity and prevent scrub encroachment. There are some examples in Wales where dune slacks have turned into wet woodland, although conservation measures are being

undertaken to reverse this trend.

PB02: Conversion from one type of forestry land use to another – Opportunities to restore areas of dune slack and dynamic conditions within conifer plantations on sand dunes are constrained or prevented by existing conifer plantations and future forest plans for re-stocking and changes from commercial conifer plantation to broadleaf forest.

PD06: Transmission of electricity and communications (cables) – The potential impacts of cabling on dune habitats are impacts relating to physical loss of extent and damage to the integrity of the dune habitats due to excavations, or the effects of cabling installation on underlying hydrology and geomorphology affecting the structure and function of the habitats.

PE01: Roads, paths, railroads and related infrastructure – Roads and paths criss-cross sand dune systems disrupting connectivity, geomorphological processes and acting as barriers to effective grazing. Pressure on sand dune systems also occurs when dune habitats are unable to rollback with natural geomorphological processes due to the presence of a road, railway or related infrastructure.

PF03: Creation or development of sports, tourism and leisure infrastructure – This pressure relates to the redesign of golf courses in response to coastal erosion, where dune habitats are modified into 'golf play areas'.

PH01: Military, paramilitary or police exercises and operations on land – This relates to various factors such as military use and inappropriate vehicle use. Several of the sand dune sites in Wales have been historically used by the military and some are currently used by the military. Historical pressures relate to abandoned and demolished buildings and structures within the dune slack areas and the threat of Unexploded Ordnance (UXO) to management

	practices for habitat conservation. Where sand dune sites are currently used by the military the risk of UXO is great and military exercises can preclude the occurrence of conservation management due to safety issues. PJ05: Saline intrusion – Saline intrusion will become more problematic to dune slack habitats as sea levels rise due to the increase in salt concentration of groundwater and slack soils. Elevated salt levels in dune slacks will disrupt the structure and function of the habitat as salt intolerant dune slack species will decline with a reduction in biodiversity and species loss. PJ10: Change of habitat location, size, and / or quality due to climate change – Dune habitats naturally fluctuate in size and location in response to geomorphological processes, however, these fluctuations are expected to be more pronounced and acute in response to climate change and the natural balance is likely to be disrupted affecting both structure and function of dune habitats. All the main pressures affecting the habitat in Wales are considered to be ongoing and are expected to continue to impact the habitat over the next two reporting cycles.
8.5: List of main conservation measures	The special sites (SSSI and SAC) include 88% of the H2190 resource in Wales by area, a further 12% of the H2190 resource is not covered by any statutory designation. Conservation Measures identified and taken Conservation measures have been made on several sites to maintain the open nature of this habitat, which has become invaded by scrub and wetland trees, invasive native and non-native species. On overly mature sites, turf stripping is also often a necessary requirement to re-establish links with the water table. These measures are creating areas of both H2170 Dunes with Salix repens ssp. argentea (Salicion arenariae) and H2190 Humid dune

slacks, but part of this strategy is to create embryonic dune slacks and reinvigorate the geomorphological processes within the dunes. These conservation measures have included mowing, scraping dune slacks down to the level of the water table, native scrub removal and the removal non-native invasive species (MA04, MA05, MB01, MB05, MF02, MF03, MH04, MI03, MI05, MK03 MM01, MS03).

Restoration of H2190 has been implemented via externally funded projects under the EU LIFE programme and Heritage Lottery Fund where 105 ha of dunes (including H2190) have been mown, 73ha of dunes (including H2190) have had invasive native species removed, 22ha of non-native conifers have been removed and 35ha of conifer stump and brash removal undertaken. 30km of new fencing has facilitated grazing on dune habitats (including H2190) and 132ha of invasive non-native species have been removed from dune habitats (including H2190) (MA04, MA05, MB01, MB05, MF02, MF03, MI03, MI05, MK03, MM01, MS03). Restoration and conservation measures will continue on these sites through AfterLIFE and legacy management plans.

MH01: Reduce impact of military installations and activities

Both the Sands of LIFE and the Dynamic Dunescapes projects undertook Unexploded Ordnance (UXO) surveys prior to undertaking ground-penetrating conservation interventions. The Sands of LIFE project developed an Unexploded Ordnance (UXO) Assessment and Mitigation Procedure in consultation with the MOD (Explosive Ordnance Clearance Officer Team and Porton Down) and NRW's Health and Safety Team. The Procedure follows CIRIA (industry standard) guidance and aims to ensure that potentially lethal UXO risks to staff and contractors undertaking conservation works on sand dunes are adequately managed in line with legislation and to a consistent and appropriate standard. This procedure can be used on any sand dune site where there is a potential

risk of UXO.

Other conservation measures include special projects, e.g. towards BAP targets for maintenance, improvement of condition, restoration and expansion of the resource (MF03, MI03, MI05, MM01).

Measure identified and not yet taken (ranked High)

MF08: Manage changes in hydrological and coastal systems and regimes for construction and development (incl. restoration of habitats).

Pressures relating to construction and development activities (coastal protection and sea defences) causing changes to hydrological conditions are continuing, restoration of shifting dunes impacted by these changes would be beneficial for the structure and function of this coastal habitat. Implementation of Shoreline Management policies (Atkins, 2010; Halcrow Group Limited, 2012b, 2012a) and associated mitigation measures is required in order to maintain sediment supply to sand dune systems.

MJ02: Implement climate change adaptation measures

The creation of buffer zones with appropriate conservation management to allow for the dynamic movement of dune habitats inland where there are no existing barriers would be beneficial. Where there are defences such as sea walls, targeted realignment to enable more connectivity of dune habitats with the hinterland is desirable. Implementation of Shoreline Management policies (Atkins, 2010; Halcrow Group Limited, 2012b, 2012a) and associated mitigation measures is required in order to maintain sediment supply to sand dune systems.

MK01: Reduce impact of mixed source pollution

National regulations are in place, but have been insufficient

to prevent continued high levels of N deposition nationally and locally increasing ammonia pollution from expansion of poultry units.

There are various air quality strategies and initiatives in place to protect and enhance biodiversity. Air quality limit values set out in the Air Quality Strategy (AQS) are transposed into national legislation by the Air Quality Standards Regulations 2010. Nitrogen deposition continues to impact semi-natural habitats in Wales. These regulations are not habitat-specific, however with introduction of The Environment (Air Quality and Soundscapes) (Wales) Act 2024 in Wales, this brings in new national targets for air quality pollutants, with the potential of directly influencing habitat protection.

This key legislative advancement requires mandatory targets for fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) to be established by February 2027, including new powers for Welsh Ministers to set pollutant-specific targets in future years (e.g., ammonia, nitrogen dioxide) linked to biodiversity outcomes, potentially enabling future habitat-sensitive thresholds.

Welsh Government have also introduced The Agriculture (Wales) Act in 2023. It aims to establish a framework of Sustainable Land Management (SLM) objectives to underpin agricultural support, including the Sustainable Farming Scheme (SFS). The Act provides Welsh Ministers with the power to provide support (financial or otherwise) for or in connection with 15 purposes, including 'Improving air quality'. Welsh Government published a consultation on the SFS which closed in March 2024. Welsh Ministers will not be making final scheme design decisions until further stakeholder work is undertaken.

Measures identified and not yet taken (ranked Medium)

MC06: Reduce impact of service corridors and networks &

MC07: Habitat restoration/creation from resources, exploitation areas or areas damaged due to installation of renewable energy infrastructure

Several pressures and their potential impacts of caballing on sand dunes have been identified including but not limited to damage and loss of habitat, disturbance to hydrology, introduction of INNS, loss of sediment and an increased risk of erosion. Conservation measures should take these impacts into consideration to minimise impacts of development on dune habitats from these types of installations.

ME01: Reduce impact of transport operation and infrastructure

Pressure on sand dune systems occurs when dune habitats are unable to rollback with natural geomorphological processes due to the presence of a road, railway or related infrastructure. Conservation measures to reduce the fragmentation impact from transport infrastructure are necessary as coastlines change in a response to sea-level rise and climate change.

MK02: Reduce impact of multi-purpose hydrological changes

Dune slack habitats are sensitive to out of normal range fluctuations in water levels. Pressures influencing water levels such as water abstraction (golf courses), afforestation, atmospheric nitrogen deposition, the effects of sea-level rise and changes in seasonal precipitation due to climate change, can have a significant effect on the vegetation composition and the functioning of the habitat (A. Davy et al., 2010). Conservation measures are required to minimise the impact of these pressures to safeguard the hydrological functioning of dune slack habitats.

	Regulations may often be inadequate to fully protect the habitat, e.g. in tackling under-management or neglect.
9.1:Future trends and prospects of parameters	Range: Despite several ongoing pressures to the habitat, significant change to the 10km square distribution and linked range is considered unlikely to occur within the short to medium term, as it would require either the total loss of the habitat within a hectad or its creation/restoration within a square where it is not currently represented. Area: The lack of dynamic processes and dune stabilisation across the wider Welsh sand dune systems has had a negative impact on humid dune slack vegetation. Afforestation, scrub encroachment and increased biomass through reduced grazing levels, have led to the lowering of groundwater levels resulting in shrubs and rank grass species invading humid dune slacks and important pioneer dune slack communities being lost from the successional sequence (A. J. Davy et al., 2006; Houston, 2008). Unless, management measures are implemented to address these issues it is likely that this habitat will decrease in area as humid dune slacks develop into later successional habitats where humid dune slack vegetation types are no longer maintained by natural processes as other dune slack types mature. Structure and function: 88% of the habitat is within the protected sites network. Condition assessments (Gillis & Heathcote, 2024; Heathcote, 2024a, 2024b, 2024c; Heathcote, Gillis, Wallis, & Tomas, 2024a, 2024b; Heathcote, Gillis, Wallis, & Williams, 2024a, 2024b; Heathcote & Jones, 2024a, 2024b, 2024c; Williams & Heathcote, 2024) conclude that of the 18 sites assessed all 18 sites (4 SACs, 5 SSSIs and 3 non-

designated sites) are in unfavourable condition (see section 6.2).

Climate change may well pose the most significant threat to the series of dune slacks in Europe. Most have been formed by natural sand movement but now lie within more stable dune systems. If water tables fall, as predicted in some areas, the habitat could be left 'high and dry' (Houston, 2008). The lack of mobility and dynamism most dune systems in Wales are undergoing results in succession moving towards more stable 'rank vegetation' and undesirable scrub communities, probably exacerbated by increasing levels of eutrophication due in part to atmospheric pollution and possibly ground water contamination in places.

Several pressures currently ranked High are projected to intensify in the future e.g. PA08, PI02, PI03, PJ01, PJ03, PK03, PK04 and PM07 as a result of climate change. Whilst several pressures currently ranked Medium are projected to be exacerbated by climate change and expected to be ranked as High within the next two reporting rounds (PA05, PB02, PJ05, PJ10, PL01 and PL02). Furthermore the combined impacts of several listed pressures are also expected to increase in the future adversely affecting the structure and function of H2190.

100% of the habitat is found in areas where the deposition of atmospheric nitrogen (2024 data) exceeds the Critical Load. Despite modest predicted declines in deposition levels for the UK, indications are that this will have little impact on the proportion of the habitat in areas of Critical Load exceedance in the medium-term.

Taking the above into account it is likely that the future trend for the structure and function of the habitat is likely to be 'negative' if conservation measures are not implemented.

10.1: Range	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range.
10.2: Area	Conclusion on Area reached because:(i) the short-term trend direction in Area is unknown; (ii) the current Area is not more than 10% below the Favourable Reference Area and iii) the change in distribution pattern is unknown.
10.3: Specific structure and functions	Conclusion on Structure and function reached because: i) habitat condition data indicates that more than 25% of the habitat is in unfavourable (not good) condition; ii) short-term trend in area of habitat in good condition is unknown; and iii) expert opinion determines that there are significant issues for this habitat, and as the short-term trend in area of habitat in good condition is unknown then this habitat should be considered as unfavourable-bad under the precautionary principle.
10.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Area covered by habitat are poor; and (iii) the Future prospects for Structure and function are bad.
10.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-bad because two of the conclusions are Unfavourable-bad.
11.1: Surface area of the habitat type inside the pSCIs, SCIs and SACs network	This is the total surface area of the feature within SACs (irrespective of whether the feature has been notified).
5.13: Favourable Reference Area (FRA)	The UK-level FRV for surface area was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based

	on current habitat extent and trends.
4.10: Favourable Reference Range (FRR)	The UK-level FRV for range was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current distribution and trends.